GENERIC DELIMITATION IN SIMAROUBACEAE TRIBUS SIMAROUBEAE AND A CONSPECTUS OF THE GENUS QUASSIA L.

by

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During the pre-naming of some new collections made by the Forestry Service of North Borneo, Mr L. L. Forman, Kew, provisionally identified a collection from Pulau Gaya, District of Jesselton, San 20499, gathered by Dr. W. Meijer, as an undescribed species of the American genus *Simaba*. As he knew that I had almost finished a revision of the *Simaroubaceae* for the Flora Malesiana, he immediately gave notice and sent the material with the permission of the Director of the Royal Botanic Gardens, Kew, without delay to Leyden. I have to thank him most cordially for this friendly and generous gesture. Later Dr. J. A. R. Anderson, of the Sarawak Forestry Service, Kuching, kindly pointed our attention to the fact that the species had been collected in the past, both in Borneo and Sumatra, and that these specimens had been distributed as *Parishia* sp.

In critical checking the generic identity of the specimen, Mr Forman's opinion appeared to be correct, and the new plant has been since described as a new species in the Flora Malesiana. At the same time it appeared possible to accommodate it also in several other American and African genera as well, for example *Simarouba, Hannoa,* and *Odyendyea*. This necessitated a closer comparison of these genera, and some others, a desirability which I had earlier thought to lie outside the scope of the Flora Malesiana revision.

For this purpose I have borrowed African material from the Herbaria at Utrecht, Wageningen, and Brussels, and I express my sincere thanks to the Directors of these Herbaria for making this material available to me. Special thanks are due to Prof. Dr. W. Robijns, who has kindly received me at Brussels and provided all facilities needed.

These genera all belong to a rather compact group which is characterized by stamens having a scale, and a pistil with free carpels, sessile on a usually well-developed disk, and nearly always ending in one style. Together with the genus *Harrisonia* these genera represent the tribe *Simaroubeae, Harrisonia* differing from the others in having united carpels.

The genera under discussion are: *Eurycoma* Jack from Malaysia, *Samadera* Gaertn. from Indo-Australia, *Hannoa* Planch., *Odyendyea* (Pierre) Engl., and *Pierreodendron* Engl. from Africa, *Quassia* L., *Simaba* Aubl., and *Simarouba* Aubl. from America. The characters which are used for generic delimi-

tation in this group are according to Engler (in E. & P., Pfl. Fam. 3, 4, 1896, 207, 210; 2nd ed. 19a, 1931, 365, 366) and Cronquist (Bull. Torr. Bot. Cl. 71, 1944, 226—234; Lloydia 7, 1944, 81) the following:

(a) The leaves can be simple or compound; if compound the rachis can be either winged or not and it can also be either jointed at the nodes or not.
(b) The inflorescence can be a raceme, a panicle, or a pseudo-umbel.
(c) The sexual differentiation of the flowers (unisexual, bisexual or polygamous).
(d) The calyx, which can be regularly 4—6-lobed or is closed in bud and ruptures in anthesis into 2—3 unequal segments.
(e) The aestivation of the corolla, which can be induplicate-valvate, imbricate or contorted.
(f) The number of stamens, which can be once, twice, or thrice the number of petals.
(g) The position, size, and shape of the disk.
(h) The relative length of pistil and stigmas; there can be one, slightly lobed or punctate stigma, or the stigmas can be free, stellately spreading, in the latter case they can be much shorter than the pistil or about as long as or longer than the pistil (fig. 1).

A diagnosis of these genera on the basis of these characters reads as follows:

Eurycoma. Leaves compound, rachis not articulated. Inflorescence a panicle. Flowers polygamous, with induplicate-valvate petals; stamens the same number as petals, alternating with staminodes. Disk inconspicuous. Stigmas free, stellately spreading or one peltate 5—6-lobed stigma.

In all the other genera the petals are imbricate or contorted and the androecium is obdiplostemonous or (in one case) pleiostemonous.

Hannoa. Leaves compound, rachis not jointed. Flowers polygamous in panicles. Calyx closed in bud, irregularly rupturing in 2—3 lobes towards anthesis. In ♂ flowers the barrel-shaped disk surrounds the ovary and leaves in some species only the stigmas free (fig. 1g). In ♀ flowers the pistil is only at the base surrounded by the disk or the ovary is sessile on the disk (fig. 1f). Stigmas small, spreading.

Odyendyea and *Simaba.* Leaves compound (but simple in at least one species of *Simaba*), rachis not jointed. The flowers are polygamous (in *Odyendyea*) or bisexual (in *Simaba*). Inflorescence a panicle. Stigmas small, spreading, or one slightly lobed or punctate stigma (fig. 1c, m). Ovaries sessile on the disk or immersed in it.

Pierreodendron. Leaves compound, not jointed. Inflorescence a narrow panicle or a thyrse. Flowers polygamous. Number of stamens twice or thrice the number of petals. Stigmas small, spreading. Ovaries sessile on the disk or more or less surrounded by it (fig. 1h, i).

Quassia. Leaves compound, rachis jointed, and winged in *Q. amara.* Inflorescence a raceme with sometimes a few branches at the base (or a true panicle in *Q. africana*). Pedicels jointed about in the middle in *Q. amara.* Flowers bisexual, stigma punctate or shortly lobed. Ovaries sessile on the disk (fig. 1j).

Samadera. Leaves simple. Inflorescence an umbel either stalked or not,

or a raceme. Flowers bisexual; stigma punctate. Ovaries sessile on the disk (fig. 1k).

Simarouba. Leaves compound, rachis not jointed. Inflorescence a panicle. Flowers unisexual. Stigmas about as long as the style or longer, stellately spreading. Ovaries sessile on the disk (fig. 1a).

The difference between an imbricate or contorted corolla does not seem to be of great importance for generic discrimination as in *Simarouba* imbricate and contorted aestivation can be found in a single specimen.

The fruits of all the taxa under consideration, which should be called drupaceous, although the epicarp is possibly not always very fleshy, differ somewhat in shape, size, and in degree of lignification. The largest are found in *Samadera,* where they may measure 9 by 10 cm. This size has probably nearly been reached in fruits of *Pierreodendron* and *Simaba* spp. too.

The shape and size of the disk are in all groups involved highly variable and are therefore of no use for generic separation.

The genus *Eurycoma* Jack differs from all other genera by its induplicate-valvate aestivation, a character which is in this family, where it occurs, constant for the genera. Furthermore, in this genus the outer whorl of stamens is reduced to staminodes. In my opinion the combination of these two characters is sufficient to keep it apart as a separate genus.

The genus *Samadera* Gaertn. is more difficult to distinguish from the others. The inflorescence is very different for different species of this genus, and simple leaves occur occasionally also in *Simaba.* Otherwise there are no essential differences between *Samadera* and *Simaba.*

According to Cronquist l. c. the genus *Simarouba* differs from *Simaba* in two minor respects only, viz unisexual flowers in *Simarouba,* bisexual ones in *Simaba,* and in the pistil, a short common style and long, divergent stigmas in *Simarouba,* a long style and short stigmas in *Simaba* (fig. 1a, c, m). In the genera *Hannoa* and *Odyendyea,* which are difficult if at all to be distinguished from *Simaba,* and which have exactly the same pistil with long style and short stigmas, often unisexual flowers occur, similar to those of the genus *Simarouba.* The unisexuality is clearly due to reduction; there are always vestigial ovaries or stamens in the ♂ or ♀ flowers respectively (fig. 1). Consequently there remains only the difference in the proportional length of style and stigmas, which is only a matter of degree. Cronquist (Lloydia 1944, l. c.) was convinced that *Odyendyea* should be included in *Simaba.* I conclude that *Simaba* and *Simarouba* cannot be separated generically.

The genus *Quassia* was kept apart because of its winged and jointed leaf rachis, its racemiform inflorescences, and its pedicels articulated about in the middle, with 2 tiny bracteoles, just beneath the articulation. However, in *Q. africana* the wings of the rachis are very narrow or even absent, and the pedicels are not articulated in the middle. Therefore, Cronquist was of the opinion that *Q. africana* belongs in *Simaba.* In most of the other taxa involved (and often also in *Q. africana*) the ultimate parts of the paniculate inflorescences are cymose, the pedicels are either jointed at the base or (in the same specimen) not, and beneath the joint there are usually 2 tiny bracteoles. The racemiform inflorescences of *Q. amara* with its jointed pedicels

can be considered the result of reduction of such a panicle, especially in view of the fact that the racemes are sometimes again branched. Besides, in an unidentified specimen of *Hannoa* the joints of the rachis (see above) are occasionally found in the apical half. For these reasons *Quassia* cannot be upheld against *Simaba* and *Simarouba*.

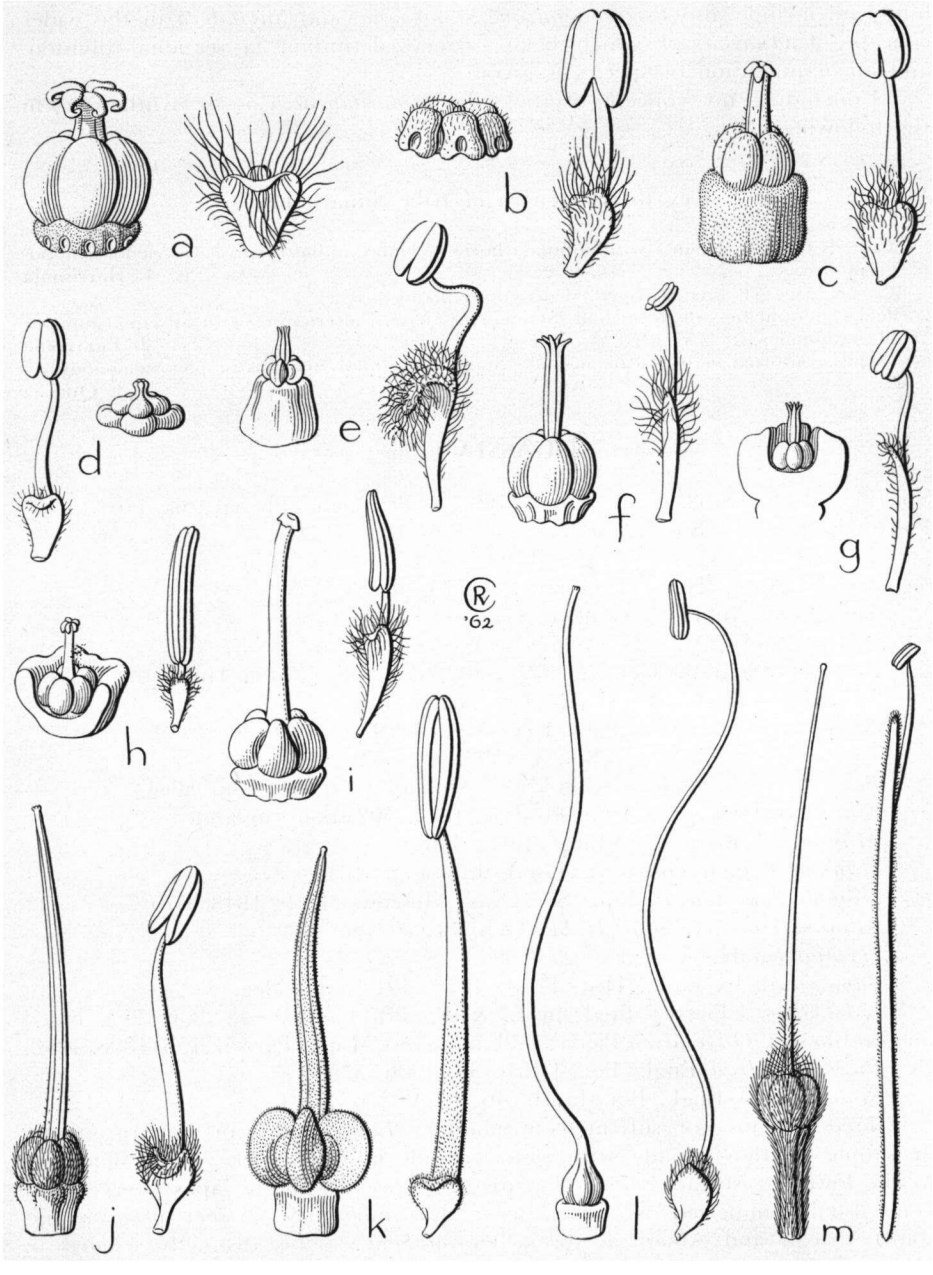
Engler (1896, l. c.) considered *Mannia*, an illegitimate name for *Pierreodendron*, to belong to a distinct subtribe, the *Manniinae*, on account of the number of stamens which is thrice the number of petals. Later Engler (Bot. Jahrb. 46, 1911, 278, fig. 1) described a new genus, *Simarubopsis*, of which the sole species is very similar to the only one known of *Mannia*, but differs from that in having only twice as many stamens as petals. Hutchinson & Dalziel (Fl. W. Trop. Afr. 1st ed., 1, 1928, 484) reduced *Simarubopsis* to *Mannia*, and herein they were followed by Pellegrin (Bull. Soc. Bot. Fr. 76, 1930, 665) and Harms (in E. & P., Pfl. Fam. 2nd ed., 19a, 1931, 371). Both Harms and Keay (Fl. W. Trop. Afr. 2nd ed., 1, 2, 1958, 690) suggested that they are possibly conspecific; Hutchinson & Dalziel were convinced of this.

The genus *Hannoa* was distinguished by its calyx, which is closed in bud and ruptures into 2—3 unequal segments at anthesis. In some specimens (of other species?), however, the calyx lobes grow while maturing, and the rupturing does not or hardly take place. In *Ailanthus*, another simaroubaceous genus, rupturing and lobed calyces are found within the same species. In the ♂ flowers of some species of *Hannoa* the disk surrounds the vestigial ovary, a condition, which in minor degree, also occurs in the other involved taxa with unisexual flowers. In conclusion I find that the differences between *Hannoa, Simaba, Odyendyea,* and *Pierreodendron* are insufficient to distinguish them as separate genera.

Thus it appears that with exception of *Harrisonia* and *Eurycoma*, all genera of the tribe *Simaroubeae* should be merged into one genus, for which the oldest generic name available is that of *Quassia* L.

This view is not new, as in 1896 Pierre (Bull. mens. Soc. Linn. Paris n. 156, 1896, 1236) had already considered *Hannoa, Quassia, Odyendyea,* and

Fig. 1. Of each species in this figure a disk with pistil and a stamen are depicted, of polygamous or dioecious species two figures are given; they are representative of the various genera under discussion. The names used in the legend are the original names of the sheets, not the names accepted in the text. — a. *Simarouba berteroana* Krug & Urban, pistil with stellately spreading stigmas which are as long as the style or longer, × 6, and the reduced stamen of this ♀ flower, × 16, *Fuertes 47.* — b. *Simarouba amara* Aubl., disk with very small abortive ovaries and a stamen of a ♂ flower, × 10, *Baker 2266.* — c. *Simaba multiflora* A. Juss., disk with pistil and stamen, × 10, *Ule 5905.* — d. *Quassia borneensis* Nooteboom, disk with abortive ovary and a stamen of a ♂ flower, × 10, *San 20499*, type. — e. *Odyendyea klaineana* (Pierre) Engl., × 10, *Klaine 223 bis.* — f. *Hannoa undulata* (Guill. & Perr.) Planch., disk with pistil and stamen from bisexual flower, × 10, *Courtet s.n.* — g. ibid., barrel-shaped disk with abortive ovaries and a stamen from a ♂ flower, × 10, *Chevalier 142.* — h. *Pierreodendron africanum* (Hook.f.) Little, barrel-shaped disk with abortive ovaries, × 10, and a stamen, × 6, from a ♂ flower, *Evrard 5866.* — i. ibid., disk with pistil and a stamen from a ♂ flower, × 6, *Gilbert 6046.* — j. *Quassia africana* (Baill.) Baill., disk with pistil and a stamen, × 6, *Zenker 581.* — k. *Samadera indica* Gaertn., disk with pistil and a stamen, × 6, *Blume 1092.* — l. *Quassia amara* L., disk with pistil and stamen, × 4, *Nedi & Idjan 288.* — m. *Simaba trichilioides* A. St. Hil., disk with pistil and a stamen, × 4, the appendage nearly as long as the filament.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Simaba to represent sections of a single genus, *Quassia* L. I fully agree with him, and include also *Pierreodendron, Simarouba,* and *Samadera* in the wider concept of *Quassia,* of which below a new definition, a sectional division, and an enumeration of species is given.

Concluding my concept of the tribe *Simaroubeae* can be synthesized in the following key:

Key to the genera of tribe Simaroubeae

1. Carpels connate. Plants with stipular thorns. Ovules amphitropous. Cotyledons hippocrepiform . . . . . **1. Harrisonia**
1. Carpels free. Plants unarmed. Cotyledons planoconvex.
2. Petals induplicate-valvate in bud. Stamens isomerous, alternating with an equal number of staminodes . . . . . **2. Eurycoma**
2. Petals contorted or imbricate in bud. Stamens obdiplostemonous or pleiostemonous. **3. Quassia**

QUASSIA Linné

Sp. Pl. ed. 2, 1762, 553, app., 1763, 1679; Gen. Pl. ed. 6, 1764, 212; Pierre, Bull. mens. Soc. Linn. Paris n. 156, 1896, 1236.

Locandi Adans., Fam. Pl. 2, 1763, 449, nom. gen. rejic.

Simaba Aubl., Hist. Pl. Guian. 2, 1775, 400, t. 153.

Simarouba Aubl., l. c. 859, t. 331, 332.

Aruba Aubl., l. c. 293, t. 115.

Zwingera Schreb., Gen. 2, 1791, 802, nom. illeg., non Hofer.

Samadera Gaertn., Fruct. 2, 1791, 352, t. 156, "f. 3".

Niota Poir. in Lamk, Tabl. Enc. Méth. 1792, t. 299.

Vitmannia Vahl, Symb. Bot. 3, 1794, 51, t. 60.

Biporeia Petit-Thouars, Gen. Nov. Madag. 1806, 14, nom. illeg.

Mauduita Comm. ex DC., Prod. 1, 1824, 592, nom. invalid.

Manungala Blanco, Fl. Filip. 1837, 306.

Hannoa Planch. in Hook. Lond. J. Bot. 5, 1846, 566.

Homalolepis Turcz., Bull. Soc. Nat. Moscow 21, 1, 1848, 575.

Mannia Hook. f. in B. & H., Gen. Pl. 1, 1862, 309.

Hyptiandra Hook. f., l. c. 293, 990.

Samandura ex Baill., Hist. Pl. 4, 1873, 491, nom. illeg.

Odyendyea (Pierre) Engl. in E. & P., Pfl. Fam. 3, 4, 1896, 215, based on *Quassia* sect. *Odyendyea* Pierre, Bull. mens. Soc. Linn. Paris n. 156, 1896, 1238.

Pierreodendron Engl., Bot. Jahrb. 39, 1906, 575.

Simarubopsis Engl., Bot. Jahrb. 46, 1911, 276.

Trees, shrubs (or suffrutescent plants). *Leaves* pari- or impari-pinnate, or simple; leaflets usually with pitted glands in the upper — or sometimes in the lower — surface, along the margin, especially in the apex; nerves and veins usually immersed or obscure when dry, sometimes (in sect. *Quassia* and some African and American species) prominent; rachis distinctly winged in *Q. amara,* with 2 small ribs or terete in other species; rachis jointed in sect. *Quassia* and in *Q. africana* Baill., not jointed or only in the apical part in the other species. *Inflorescence* a raceme, either branched or not, a panicle, or an umbel; bracts usually spathulate, often more or less succulent, or

triangular, not succulent; bracteoles nearly opposite, tiny, triangular, ciliate, sometimes absent. *Flowers* 4—6-merous, mono- or bisexual or polygamous; pedicels jointed about the middle in *Q. amara,* either jointed at the base or not in the other species. Calyx more or less lobed, or rarely closed in bud and irregularly rupturing. Petals imbricate or contorted in bud, longer than the calyx, sometimes very long. Stamens obdiplostemonous (in *Q. grandifolia* (Engl.) Nooteboom the outer whorl has been doubled), with a shorter or longer, adaxial, usually hairy scale; this scale with shorter or longer free apex. Disk ± cylindrical or subglobose, highly varying in size. Ovaries free, more or less immersed on top of the disk (the abortive ovary of the ♂ flowers in *Q. undulata* and *Q. grandifolia,* except the stigmas, surrounded by the disk); carpels 4—6, free or somewhat coherent; style 1, but the parts of each carpel discernible (in *Q. schweinfurthii* (Oliv.) Nooteboom the styles are only coherent); stigmas more or less stellately spreading or one slightly lobed or capitate stigma. *Fruits* 1—6 from each flower, drupaceous or woody, often more or less compressed, either bicarinate or not, sometimes very large.

Distribution: Pantropical, c. 25 species in tropical and subtropical America, 5—10 species in Africa, 2 species in Lower Burma and Cambodia, one of these also throughout Malaysia (except Java and the Lesser Sunda Is.) to the Bismarcks and the Solomons, and 2 species in Queensland.

Notes. I have seen material of all Old World species and I have tried to give a critical census of all species. For the neotropics I was handicapped by a lack of material of the American species of *sect. Simaba* and I had largely to rely on Cronquist's revision in Lloydia 7, 1944, 81, who himself already complained of their scarcity in herbaria, many being merely represented by their type specimen.

Key to the sections

1. Inflorescence a raceme (sometimes branched). Pedicels articulated at about the middle. Leaf rachis jointed. . . . . **1. Sect. Quassia**
1. Inflorescence either a raceme or not. Pedicels either articulated at the base or not. Leaf rachis jointed in only one species (*Q. africana*).
2. Leaves simple, not more than thrice as long as broad. Inflorescence an umbel or a raceme . . . . . **2. Sect. Samadera**
2. Leaves compound or simple, in the latter case either the leaves more than thrice as long as broad, or the inflorescence a panicle. Inflorescence a panicle, which is sometimes reduced to a few-flowered umbel-like axillary cluster.
3. Leaves compound. Inflorescence a panicle. Plants dioecious. Stigmas stellately spreading, as long as the style or longer . . . . . **3. Sect. Simarouba**
3. Leaves compound or simple. Inflorescence a panicle which is sometimes reduced to a few-flowered umbel-like axillary cluster. Plants polygamous or flowers bisexual. Stigmas small, stellately spreading, much shorter than the style, or one 4—6-lobed or punctate stigma, or styles only coherent (in *Q. schweinfurthii*). **4. Sect. Simaba**

1. Section Quassia

Leaves pinnate, with a more or less winged and conspicuously articulated rachis. Racemes terminal, either branched or not. Pedicels articulated at about the middle, with 2 tiny bracteoles below the joint. Flowers bisexual. Petals 5, contorted, oblong, erect, much longer than the calyx. Disk large, nearly as high as broad. Style long, with a small, slightly 5-lobed stigma.

Distribution: Monotypic, native in Brazil and introduced in all tropical countries for medicinal and ornamental purposes.

1. **Quassia amara** Linné, Sp. Pl. ed. 2, 1762, 553, app. 1763, 1679; Back., Fl. Bat. 1, 1907, 256; Schoolfl. Java 1911, 190; Lecomte, Fl. Gén. I.-C. 1911, 689; Merr., Fl. Manila 1912, 272; En. Philip. 2, 1923, 346; Craib, Fl. Siam. En. 1, 1926, 239; Heyne, Nutt. Pl. 1927, 870; Back., Bekn. Fl. Java (em. ed.) 6, 1948, fam. 146, p. 3.

Very bitter, erect shrub, 2—3 m high. *Leaves* with broadly winged rachis; rachis and petiole c. 5—16 cm; leaflets usually 5, apical ones reduced to 3—1; flush purple, almost sessile, obovate-oblong. *Racemes* 10—25 cm long, often branched. Pedicels 8—14 mm, accrescent. Bracts spathulate, the lowermost sometimes foliaceous, 3—14 mm long. *Calyx* patent, bright red, 7—8 mm. *Petals* bright red outside, whitish inside, 27—32 by 5—6 mm. *Stamens* longer than the petals, slightly unequal, 3½—4 cm. *Drupes* 1—5, purple-black, 12—13 mm long.

Distribution: Native of Brazil, in Malaysia cultivated, occasionally naturalized.

Uses: The Quassi-wood is used as a tonic in case of stomach diseases and as an insecticide to destroy for instance plant lice. The active constituent of the wood consists of a number of bitter substances (Heyne, l. c.).

2. Section Samadera

Nooteboom, nov. stat. — *Locandi* Adans., Fam. Pl. 2, 1763, 449, based on Rheede, Hort. Mal. 6, 1686, t. 18, nom. gen. rejic.; O. K., Rev. Gen. Pl. 1, 1891, 104. — *Samadera* Gaertn., Fruct. 2, 1791, 352, t. 156, "f. 3", nom. gen. cons.; Boerl., Ned. Kruidk. Arch. II, 5, 1890, 520—524. — *Niota* [Poir. in Lamk, Tabl. Enc. Méth. 1792, t. 299] Lamk, Enc. Méth. 4, 1797, 490. — *Vitmannia* Vahl, Symb. Bot. 3, 1794, 51, t. 60. — *Biporeia* Petit-Thouars, Gen. Nov. Madag. 1806, 14, nom. illeg. — *Mauduita* Comm. ex DC., Prod. 1, 1824, 592, nom. inval. — *Manungala* Blanco, Fl. Filip. 1837, 306. — *Samandura* Linné [Fl. Zeyl. 1748, 202, pro specim. Herm., excl. Rheede t. 21] ex Baillon, Hist. Pl. 4, 1873, 491, nom. illeg.; Bot. Méd. 2, 1884, 845, 874; Pierre in De Laness., Pl. Utiles Col. Fr. 1886, 305; Baill., Dict. Bot. 4, 1892, 11.

Leaves simple, with more or less scattered concave glands, usually on the under surface. Flowers bisexual, in axillary or terminal, peduncled pseudo-umbels or in racemes. Calyx lobes 3—5, imbricate in bud, obtuse, in the centre with a concave gland. Petals 3—5, contorted, much longer than the calyx, usually hairy on the back. Disk large, as high as broad, gynophore-like. Style with a terminal inconspicuous stigma. Fruits rather large, (in Mal.) laterally compressed, with a narrow unilateral sharp-edged thinner part in the apical half (in the Indo-Chinese species very large and dorsoventrally compressed).

Distribution: Two species, one from Madagascar and Lower Burma and Cambodia throughout Malaysia (except Java and the Lesser Sunda Is.) to the Bismarcks and Solomons, the other native in Indo-China. *Q. indica* is cultivated in Java.

Ecology: Usually at low altitude under everwet climatic conditions.

Notes. Backer (1907) defined the flowers as 3—5-merous. In *Q. indica* I have only seen 4-merous ones.

2. **Quassia indica** (Gaertn.) Nooteboom, comb. nov. — *Samadera indica* Gaertn., Fruct. 2, 1791, 352, t. 156, f. 3; W. & A., Prod. 1834, 151; Hook., Ic. Pl. 1, 1837, t. 7; Grah., Cat. Bomb. Pl. 1839, 37; Planch. in Hook. Lond. J. Bot. 5, 1846, 562; Thwaites, En. 1858, 70; Miq., Fl. Ind. Bat. 1, 2, 1859, 677; Benn., Fl. Br. Ind. 1, 1875, 519; Kurz, For. Fl. Burma 1, 1877, 200; Blanco, Fl. Filip. ed. 3, 4, 1880, 38; Vidal, Sin. Atlas 1883, 19, t. 26, f. c.; Phan. Cuming. 1885, 101; Rev. Pl. Vasc. Filip. 1886, 78; Trimen, Fl. Ceyl. 1, 1893, 231; Greshoff, Schetsen 1894, 17—19, t.; Merr., Gov. Lab. Publ. Philip. n. 27, 1905, 29; Back., Fl. Bat. 1907, 258, incl. var. *brevipetala* (Scheffer) Back.; Schoolfl. Java 1911, 191; Laut., Bot. Jahrb. 56, 1920, 342, incl. var. *papuana* Laut.; Merr., Sp. Blanc. 1918, 206; En. Born 1921, 315; Ridley, Fl. Mal. Pen. 1, 1922, 363; Merr., En. Philip. 2, 1923, 345; Back., Bekn. Fl. Java (em. ed.) 4, 1948, fam. 146, p. 2; Capuron, Adans. 1, 1961, 83. — *Karin-Njoti* Rheede, Hort. Mal. 6, 1686, t. 18. — *Vitmannia elliptica* Vahl, Symb. Bot. 3, 1794, 51, t. 60. — *Niota pentapetala* Poir. in Lamk, Enc. Méth. 4, 1797, 490; DC., Prod. 1, 1824, 592; Blanco, Fl. Filip. ed. 2, 1845, 213. — *Niota tetrapetala* Poir. in Lamk, Enc. Méth. 4, 1797, 490; in Lamk, Tabl. Enc. Méth. 1792, t. 299; DC., Prod. 1, 1824, 592; Blanco, Fl. Filip. ed. 2, 1845, 213. — *Niota commersonii* Pers., Syn. 1, 1805, 416, nom. inval. — *Mauduita penduliflora* Comm. ex DC., Prod. 1, 1824, 592, nom. inval. — *Samadera madagascariensis* Juss., Mém. Mus. Hist. Nat. Paris 12, 1825, 516, t. 27, n. 46, nom. illeg. — *Niota lamarckiana* Bl., Bijdr. 5, 1825, 251, nom. illeg. — *Niota lucida* Wall., Pl. As. Rar. 2, 1831, 54, t. 168. — *Samadera tetrapetala* G. Don, Gard. Dict. 1, 1831, 811. — *Samadera pentapetala* G. Don, l. c. — *Samadera glandulifera* Presl, Symb. Bot. 2, 1833, 1, t. 51. — *Manungala pendula* Blanco, Fl. Filip. 1837, 306. — *Vitmannia lucida* Steud., Nomencl. ed. 2, 1841, 779. — *Samadera brevipetala* Scheff., Nat. Tijd. N. I. 32, 1871, 410. — *Samandura indica* Baill., Bot. Med. 2, 1884, 874; Pierre in De Laness., Pl. Utiles Col. Fr. 1886, 305. — *Locandia indica* O. K., Rev. Gen. Pl. 1, 1891, 104. — *Locandia lucida* O. K., l. c. — *Locandia madagascariensis* O. K., l. c. — *Samandura mekongensis* Pierre, Fl. For. Coch. 4, 1892, t. 262, t.; Lecomte, Fl. Gén. I.-C. 1, 1911, 694. — *Locandia glandulifera* Pierre, Fl. For. Coch. 4, 1892, sub t. 262, text. — *Locandia mekongensis* Pierre, l. c. t. 262, text. — *Locandia merguensis* Pierre, l. c. sub t. 262, text, nomen. — *Locandia pendula* Pierre, l. c. sub t. 262, text. — *Samadera mekongensis* Engl. in E. & P., Pfl. Fam. 3, 4, 1896, 210. — *Samandura madagascariensis* Perrier de la Bâthie, Fl. Madag. fam. 105, 1950, 6, t. 2. — Fig. 1k.

Vernacular names: Philip.: *daraput, linatoganat, linton-gamai, mabingdato, palagarium, palagium, ponoan,* Bis., *maluñggál, móñgal,* Tag., *manuñggál,* Tag., Bik., Pamp., P. Bis., Lan., Ibn., *palo santo,* Spanish, *rapus* (tree), *kĕlĕpis, klipis* (fruit), Banka, *kaju pait,* Borneo, *gatĕp pait,* Java, *onne,* Ternate.

Notes. According to Capuron, l. c., the species is doubtless native in Madagascar and not rare in the substage of swampy forests along the east coast, rarely ascending on crests to 400—600 m.

The leaves show a resemblance to those of *Irvingia* and *Inocarpus* but are distinguished by the occurrence of scattered concave glands.

3. **Quassia harmandiana** (Pierre) Nooteboom, comb. nov. — *Samandura harmandiana* Pierrre in De Laness., Pl. Utiles Col. Fr. 1886, 305. — *Samandura harmandii* Pierre, Fl. For. Coch. 4, 1892, t. 261, t.; Lecomte, Fl. Gén. I.-C. 1, 1911, 693. — *Locandia harmandii* Pierre, Fl. For. Coch. 4, 1892, t. 261, text. — *Samadera harmandiana* (Pierre) Greshoff, Schetsen 1, 1894, 19. — *Samadera harmandii* Engl. in E. & P., Pfl. Fam. 3, 4, 1896, 210.

Distribution: Southeast Asia (Indo-China)

3. Section Simaba

Pierre, Bull. mens. Soc. Paris n. 156, 1896, 1236. — *Simaba* Aubl., Hist. Pl. Guian. 1775, 400, t. 153. — *Aruba* Aubl., l. c. 293, t. 115. — *Zwingera* Schreb., Gen. 2, 1791, 802, no species mentioned. — *Hannoa* Planch. in Hook. Lond. J. Bot. 5, 1846, 566. — *Homalolepis* Turcz., Bull. Soc. Nat. Moscow 21, 1, 1848, 575. — *Mannia* Hook. f. in B. & H., Gen. Pl. 1, 1862, 309. — *Hyptiandra* Hook. f., l. c. 293, 990. — *Odyendyea* (Pierre) Engl. in E. & P., Pfl. Fam. 3, 4, 1896, 215, based on *Quassia* sect. *Odyendyea* Pierre, Bull. mens. Soc. Linn. Paris n. 156, 1896, 1238. — *Pierreodendron* Engl., Bot. Jahrb. 39, 1906, 575. — *Simarubopsis* Engl., Bot. Jahrb. 46, 1911, 276.

Leaves pinnate or simple, if simple more than thrice as long as broad. Flowers bisexual, polygamous, in terminal or axillary panicles which are sometimes reduced to few-flowered axillary umbel-like clusters or to pseudo-umbels with forked peduncles. Petals imbricate or contorted. Scales of the stamens sometimes nearly as long as the filament and somewhat coherent. Stigmas short, or only one 4—5-lobed or punctate stigma. Styles only connivent in *Quassia schweinfurthii* (Engl.) Nooteboom.

Distribution: Pantropical, c. 20 species in tropical South and Central America, c. 5—10 in Africa, 1 in West Malaysia, and 2 in Australia.

4. **Quassia borneensis** Nooteboom, Fl. Mal. I, 6, 1962, in press.

Tree, 14 m by 25 cm diam., outer bark densely fissured, brittle and corky. *Leaves* spirally arranged, pari- or imparipinnate; leaflets 2—3 pairs, glabrous, elliptic to obovate oblong, shortly rounded-acuminate, 8—12 by 4—4½ cm; upper surface shining, lower surface opaque; very small pitted glands along the margins and in the acumen on the upper side; nerves sunken in both upper and lower surface, or obscure, ending in a marginal vein; veins obscure; petiole c. 5 cm, as the rachis ± terete; petiolules 1—1½ cm, articulated at the base. *Panicle* puberulous in all its parts, not quite as long as the leaves. Bracts spathulate, succulent in the apical part, up to 2½ mm long. ♂ *Flowers* 4—5-merous. Pedicels up to 7 mm. *Calyx* c. 1 mm high, outside puberulous, lobes ovate to triangular, longer than the tube. *Petals* contorted or imbricate in bud, glabrous, elliptic to ovate oblong, c. 3—4 by 2 mm. *Stamens* slightly shorter than the petals; filaments sigmoid-folded in bud, with a hairy, adaxial scale at the base; scale free for $^1/_3$ of its length,

more or less emarginate, c. ½—1 mm long; anthers oblong, latrorse, c. ½—1 mm long. Disk c. ½ mm high, at the base c. 2 and at the apex c. 1 mm wide, the upper half distinct from the lower half and folded around the barren ovaries. *Carpels* free, c. $^1/_4$ mm high; style as long as the carpels, with a small 4—5-lobed stigma. ♀ Flowers unknown. *Fruits* ellipsoid, but slightly compressed and bicarinate, c. 3 by 1½ cm; pericarp thin but hard (when fresh prune-shaped, dark purple red, sec. coll.).

Distribution: Malaysia: Borneo, Sarawak (*Sar. 0413, Sar. 0891, Sar. 2697, Sar. 15951,* all collected by Anderson in the Rejang delta), Br. N. Borneo (*San 20495* and *San 20499,* all collected by *Meijer* and *Burgess 2849* in the Jesselton Distr.), N. E. Borneo (*bb 18305* from the Tidung lands and *Kostermans 9238* from Nunukan); Sumatra, Central Indragiri (*Buwalda 6479, bb 25744, bb 28570, bb 29120, bb 29122*).

Ecology: Primary rain-forest, often in peat-swamp forest, and on mineral soil (sec. Anderson).

Vernacular names: *Mědang pahit, pelai pahit,* Sarawak; *kedongdong umpang,* Indragari.

Notes. Obviously closely allied to the African species described by Pierre in *Quassia* sect. *Odyendyea.* All these species have the filaments sinuously folded in bud, a condition not observed in other species of *Quassia.*

Nearly all of the above numbers where distributed as *Parishia* sp. (*Anacardiaceae*).

5. Quassia bidwillii (Hook. f.) Nooteboom, comb. nov. — *Hyptiandra bidwillii* Hook. f. in B. & H., Gen. Pl. 1, 1862, 293; Benth., Fl. Austr. 1, 1863, 374. — *Samadera bidwillii* Oliv. in Hook., Ic. Pl. 25, 1896, t. 2449; F. M. Bailey, Queensl. Fl. 1, 1899, 213; Compr. Cat. Queensl. Pl. 1912, 90, t. 66 bis.

Shrub of small tree. *Leaves* simple, elliptic-lanceolate, the base narrowing into the c. 4 mm long petiole, 7—12 by 1—2 cm. *Flowers* in clusters in the axils of the leaves. Appendages of the filaments nearly as long as the filament with small free tip. *Fruits* c. 1 cm long.

Distribution: Australia (Queensland).

6. Quassia baileyana (Oliv.) Nooteboom, comb. nov. — *Hyptiandra bidwillii* var. *grandiuscula* Bailey & F. v. M., Syn. Queensl. Fl. Suppl. 3, 1890, 12. — *Samadera baileyana* Oliv. in Hook., Ic. Pl. 25, 1896, t. 2450; Bailey, Queensl. Fl. 1, 1899, 219; Compr. Cat. Queensl. Pl. 1912, 90, t. 67.

Shrub or small tree. *Leaves* obovate lanceolate, the base narrowing into the petiole, 10—25 by 3—6 cm. *Inflorescence* a stalked pseudo-umbel. Appendage c. ¼ as long as the filament, with small free tip.

Distribution: Australia (Queensland).

Notes. This species forms the connection with *sect. Samadera* as regards the structure of inflorescence and flowers.

7. Quassia undulata (Guill. et Perr.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba undulata* Guill. et Perr., Fl. Sénég. 1830—1833, 136, t. 34. — *Hannoa undulata* Planch. in Hook. Lond. J. Bot. 5, 1846, 567; Oliv., Fl. Trop. Afr. 1, 1868, 309; Engl., Bot. Jahrb. 46, 1911, 283; Hutch. & Dalz., Fl. W. Trop. Afr. 1, 1928, 485; Keay, Fl. W. Trop. Afr. ed. 2, 1, 1958, 691. —

Hannoa ferruginea Engl., Bot. Jahrb. 32, 1902, 122; Keay, Fl. W. Trop. Afr. ed. 2, 1, 1958, 691. — *Hannoa chlorantha* Engl. & Gilg in Warb., Kunene-Sambesi Exp. 1903, 270; Engl., Bot. Jahrb. 46, 1911, 284; Exell & Mendonça, Consp. Fl. Ang. 1, 1951, 277; Gilbert, Fl. Congo Belge 7, 1958, 124. — *Hannoa gabonensis* Pierre mss. in De Wilde, Ann. Mus. Congo Belge Bot. sér. 5, 1, 1904, 161, nomen; Th. & H. Dur., Syll. 1909, 83, nomen. — *Odyendyea longipes* Sprague, J. Linn. Soc. Bot. 37, 1906, 505. — *Hannoa klaineana* Pierre & Engl., Bot. Jahrb. 46, 1911, 282; Exell & Mendonça, Consp. Fl. Ang. 1, 1951, 277; Hutch. & Dalz., Fl. Trop. W. Afr. 1, 1928, 485; Keay, Fl. W. Trop. Afr. ed. 2, 1, 1958, 691; Gilbert, Fl. Congo Belge 7, 1958, 123; Aubrév., Fl. For. Côte d'Ivoire 2, 1959, 134, t. 133. — *Odyendyea zimmermannii* Engl., Bot. Jahrb. 46, 1911, 280, t. 2; Dale & Greenway, Kenya Trees & Shrubs 1961, 536. — *Hannoa njariensis* Gilbert, Bull. Jard. Bot. Brux. 28, 1958; Fl. Congo Belge 7, 1958, 124. — *Hannoa kitombetombe* Gilbert, Bull. Jard. Bot. Brux. 28, 1958; Fl. Congo Belge 7, 1958, 124. — *Hannoa longipes* (Sprague) Gilbert, l. c. 122.

Suffrutex, especially in dry regions, to high forest tree. Leaflets 1—19, but usually 5—11, often with pitted glands on the upper surface, elliptic or obovate, oblong to lanceolate, with cuneate or sometimes very oblique base and emarginate to rounded, often apiculate apex, coriaceous, 3—17 by 1—8 cm; lateral petiolules from very short to 4 cm, constant for each specimen. Panicles axillary or terminal. Calyx 2—3 mm long, often puberulent without, usually irregularly fissuring when maturing, nearly to the base, but sometimes with very short, rounded, apiculate lobes. Petals puberulent without, puberulent to pilose within, 3—7 mm long. Stamens from 2—3 mm in ♀ or bisexual flowers to 5 mm in ♂ flowers; appendage about half as long as the whole stamen, hairy, with short free tip; anther c. 1 mm long. Ovary 1 mm high or a little more, on top of the disk, in ♀ or bisexual flowers; in ♂ flowers very small and entirely surrounded by the barrel-shaped disk. Disk both in ♂ and in ♀ flowers c. 1 mm high, subcylindrical in ♀ flowers, with furrows on the outside fitting the stamens. Fruits about ellipsoid, drupaceous, often slightly bicarinate and sometimes somewhat flattened, 1½—2½ cm long.

Distribution: Africa.

Notes. After careful examination of the material at hand it appeared that most of the hitherto used characters for discriminating between the species reduced here are not useful. They concerned the length of the lateral petiolules and the number of leaflets. It appeared that the length of the petiolules is constant for the specimen only, but in different specimens which are otherwise similar, some can have short and others long petiolules. The same thing is true for the number of leaflets. Another character, which was sometimes used because of its conspicuousness, is the shape of the leaflets, which is, however, highly variable, and all the intermediate shapes can be found. As to the flowers there is only a gradation in their size, but no essential difference in the proportion of the parts. For all this reasons it appeared to be necessary to reduce a fairly large number of specific names.

8. Quassia schweinfurthii (Oliv.) Nooteboom, comb. nov. — *Hannoa schweinfurthii* Oliv. in Hook., Ic. Pl. 3, 1878, t. 1256; Gilbert, Fl. Congo Belge 7, 1958, 122.

Small shrub. Leaflets 3—7, obovate-lanceolate, with obtuse or acutish apex and attenuate base, up to 15 by 3 cm. Panicles reduced, sometimes only 1 flower left on a long peduncle. Calyx c. 2 mm high, irregularly rupturing. Petals 6—9, oblong, c. 5 mm long. Stamens 12—14, c. 4 mm long, appendage c. 1½ mm long, with short free tip. Disk small, subcylindrical, c. ½ mm high. Ovaries 5—6, c. 2 by 1 mm, each with a 1½ mm long style and a recurved stigma 1 mm long. Styles coherent, but not connate. Fruits ellipsoid, c. 2 cm long.

Distribution: Africa.

9. **Quassia africana** (Baill.) Baill., Adansonia 8, 1868, 89; Exell & Mendonça, Consp. Fl. Ang. 1, 1951, 278; Gilbert, Fl. Congo Belge 7, 1958, 125. — *Simaba africana* Baill., Adansonia 7, 1867, 38.

Shrub, up to 4 m high. Rachis of the leaves often narrowly winged, conspicuously constricted at the joints when dry; leaflets 6—9, obliquely elliptic, caudate-acuminate, unequal-sided at the base, 10—15 by 4—6 cm, thin, glabrous. Bracts spathulate, with succulent rounded apical half, c. 2 mm long. Pedicels sometimes articulated at the base, c. 5 mm long. Flowers bisexual. Calyx c. 2 mm high, lobes imbricate, ± orbiculate, ciliate, c. 1½ mm long. Petals imbricate in bud, more or less spreading when mature, pubescent at the base, linear, up to 1½ cm long. Stamens 6—8 mm, appendage 1½—2 mm, with a free tip of ¾—1 mm. Disk pubescent, subcylindrical, c. 1½ mm high and 2 mm wide. Ovary pubescent, the carpels c. 1½ mm high; style with a few hairs at the base, c. 8 mm long, with a small very slightly 4—6-lobed stigma. Fruits slightly flattened, obovate-elliptic, with sharp edges, c. 2½ cm long.

Distribution: Africa.

10. **Quassia gabonensis** Pierre, Bull. mens. Soc. Linn. Paris n. 156, 1896, 1238. — *Q. klaineana* Pierre, l. c. — *Odyendyea gabonensis* (Pierre) Engl., Pfl. Fam. 3, 4, 1896, 215. — *Odyendyea klaineana* (Pierre) Engl., l. c.

Trees. Leaflets 6—11, obovate to elliptic-lanceolate. Flowers polygamous, small; calyx c. 1 mm high, with short to very short rounded lobes. Petals c. 5 times longer than the calyx. Stamens up to 7 mm long, filaments folded in bud; appendage c. 3 mm, the apical 1 mm free. Disk subcylindrical to subhemispherical, ¾—1 mm high. Ovary on top of the disk, slightly immersed, carpels in the ♀ flowers 1—2½ mm high; style c. 2 mm, stigmas free, whether or not spreading, very small. Fruits large, slightly dorso-ventrally compressed, c. 5 by 4 cm.

Distribution: Africa.

11. **Quassia grandifolia** (Engl.) Nooteboom, comb. nov. — *Mannia africana* Hook. f. in B. & H., Gen. Pl. 1, 1862, 309. — *Pierreodendron grandifolium* Engl., Bot. Jahrb. 39, 1907, 576. — *Simarubopsis kerstingii* Engl., Bot. Jahrb. 46, 1911, 279, t. 1. — *Mannia simarubopsis* Pellegrin, Bull. Soc. Bot. Fr. 77, 1930, 665; Aubrév., Fl. For. Côte d'Ivoire 2, 1959, 130, t. 176. — *Mannia kerstingii* (Engl.) Harms apud Engl. in E. & P., Pfl. Fam. ed. 2, 19a, 1931, 371, fig. 168. — *Pierreodendron kerstingii* (Engl.) Little, Phytologia 3, 1949, 156; Keay, Fl. W. Trop. Afr. ed. 2, 1, 1958, 690. — *Pierreodendron africanum*

(Hook. f.) Little, Phytologia 3, 1949, 156; Exell & Mendonça, Consp. Fl. Ang. 1, 1951, 278; Keay, Fl. W. Trop. Afr. ed. 2, 1, 1958, 690; Gilbert, Fl. Congo Belge 7, 1958, 128.

Large tree. Leaves very large; leaflets c. 20, elliptic, or usually lanceolate, with rounded, apiculate apex, 8—20 by 4—8 cm. Inflorescence a narrow thyrse, up to 40 cm long. Bracts cochleariform, succulent. Pedicels up to 5 mm. Calyx c. 1½ mm high, with very short, imbricate, rounded lobes. Flowers polygamous. Petals c. 5 by 4 mm. Stamens obdiplostemonous or pleiostemonous, filaments up to 2 mm long; anthers rod-shaped, up to 4 mm long; appendage small, with small free tip. In ♀ flowers ovary c. 2 mm high, style 3—4 mm, stigma 5-lobed or discoid. Disk c. 1 mm high, in ♂ flowers surrounding the abortive ovary. Fruits 1—5, large, laterally compressed.

Distribution: Africa.

Notes. In specimens with 3 whorls of stamens sometimes 2 anthers of stamens in the outer 2 whorls are connate. This, and the disposition of the stamens in the flower, makes it probable that the pleiostemony in this species has arisen by reduplication of the outer whorl of stamens.

12. Quassia cuspidata (Spruce) Nooteboom, comb. nov. — *Simaba cuspidata* Spruce ex Engl. in Mart., Fl. Bras. 12, 1874, 212; Cronquist, Lloydia 7, 1944, 85. — *Simaba nigrescens* Engl. in Mart., Fl. Bras. 12, 1874, 213, t. 41.

Distribution: S. America (Amazonas, Brazil, Surinam).

13. Quassia guianensis (Aubl.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba guianensis* Aubl., Pl. Guian. 1, 1775, 400; Cronquist, Lloydia 7, 1944, 86. — *Aruba guianensis* Aubl., Pl. Guian. 1, 1775, 293. — *Q. crocea* Vahl, Eclog. Am. 3, 1806, 12. — *Simaba aruba* A. St. Hil. ex DC., Prod. 1, 1824, 734. — *Zwingera aruba* Spreng., Syst. 2, 1825, 319. — *Q. aruba* D. Dietr., Syn. Pl. 2, 1840, 1416.

Distribution: S. America (Brazil).

14. Quassia multiflora (A. Juss.) Nooteboom, comb. nov. — *Simaba multiflora* A. Juss., Mém. Mus. Par. 12, 1825, t. 27; Cronquist, Lloydia 7, 1944, 86. — *Simaba foetida* Benth., J. Bot. Kew Misc. 3, 1851, 370. — *Simaba angustifolia* Benth., l. c. — *Simaba guianensis* var. *schomburgkiana* Engl. in Mart., Fl. Bras. 12, 1874, 212. — *Simaba guianensis* var. *angustifolia* Engl., l. c.

Distribution: S. America (Peru, Brazil, French Guiana, Venezuela, Trinidad).

15. Quassia orinocensis (H. B. K.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba orinocensis* H. B. K., Nov. Gen. et Sp. 6, 1823, 18; Cronquist, Lloydia 7, 1944, 87. — *Zwingera orinocensis* Spreng., Syst. 2, 1825, 319.

Distribution: S. America (Venezuela).

16. Quassia crustacea (Engl.) Nooteboom, comb. nov. — *Simaba crustacea* Engl. in Mart., Fl. Bras. 12, 1874, 211; Cronquist, Lloydia 7, 1944, 87.

Distribution: S. America (Brazil).

17. Quassia obovata (Spruce ex Engl.) Nooteboom, comb. nov. — *Simaba obovata* Spruce ex Engl. in Mart., Fl. Bras. 12, 1874, 210; Cronquist, Lloydia 7, 1944, 87.

Leaves simple, otherwise closely related to *Q. multiflora.*

Distribution: S. America (lowlands of Northern Amazonas, Brazil, Venezuela).

18. Quassia monophylla (Oliv.) Nooteboom, comb. nov. — *Simarouba monophylla* Oliv., Ic. Pl. 14, 1882, t. 1387. — *Simaba monophylla* Cronquist, Lloydia 7, 1944, 88.

Leaves simple.

Distribution: S. America (British Guiana).

19. Quassia paraensis (Ducke) Nooteboom, comb. nov. — *Simaba paraensis* Ducke, Arch. Jard. Bot. Rio de Jan. 4, 1925, 195; Cronquist, Lloydia 7, 1944, 88.

Distribution: S. America (Amazonas and Para, Brazil).

20. Quassia floribunda (A. St. Hil.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba floribunda* A. St. Hil., Mém. Mus. Par. 10, 1823, 277; Cronquist, Lloydia 7, 1944, 88. — *Zwingera floribunda* Spreng., Syst. 2, 1825, 315.

Distribution: S. America (Brazil).

21. Quassia glabra (Engl.) Nooteboom, comb. nov. — *Simaba glabra* Engl. in Mart., Fl. Bras. 12, 1874, 218; Cronquist, Lloydia 7, 1944, 88.

Distribution: S. America (Brazil, Paraguay).

22. Quassia warmingiana (Engl.) Nooteboom, comb. nov. — *Simaba warmingiana* Engl. in Mart., Fl. Bras. 12, 1874, 217; Cronquist, Lloydia 7, 1944, 89.

Distribution: S. America (Minas Geraes and Bahia, Brazil).

23. Quassia ferruginea (A. St. Hil.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba ferruginea* A. St. Hil., Mém. Mus. Par. 10, 1823, 277; Cronquist, Lloydia 7, 1944, 89. — *Zwingera ferruginea* Spreng., Syst. 2, 1825, 319. — *Simaba bahiensis* Moric., Mém. Soc. Phys. Hist. Nat. Genève 7, 1836, 251. — *Homalolepis blanchetii* Turcz., Bull. Soc. Nat. Moscow 21, 1, 1848, 575. — *Simaba blanchetii* Turcz., op.cit. 31, 1, 1858, 444.

Distribution: S. America (Brazil).

24. Quassia cuneata (A. St. Hil. & Tul.) Nooteboom, comb. nov. — *Simaba cuneata* A. St. Hil. & Tul., Ann. Sc. Nat. II, 17, 1842, 138; Cronquist, Lloydia 7, 1944, 89. — *Simaba laevis* Casar., Nov. Stirp. Bras. 10, 1842.

Distribution: S. America (Brazil).

25. Quassia subcymosa (A. St. Hil. & Tul.) Nooteboom, comb. nov. — *Simaba subcymosa* A. St. Hil. & Tul., Ann. Sc. Nat. II, 17, 1842, 137; Cronquist, Lloydia 7, 1944, 90.

Distribution: S. America (Brazil).

26. **Quassia suaveolens** (A. St. Hil.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba suaveolens* A. St. Hil., Mém. Mus. Par. 10, 1823, 278; Cronquist, Lloydia 7, 1944, 90. — *Zwingera suaveolens* Spreng., Syst. 2, 1825, 319.
Distribution: S. America (Brazil).

27. **Quassia suffruticosa** (Engl.) Nooteboom, comb. nov. — *Simaba suffruticosa* Engl. in Mart., Fl. Bras 12, 1874, 213; Cronquist, Lloydia 7, 1944, 90.
Distribution: S. America (Brazil).

28. **Quassia praecox** (Hassler) Nooteboom, comb. nov. — *Simaba praecox* Hassler, Bull. Herb. Boiss. II, 7, 1907, 723; Cronquist, Lloydia 7, 1944, 90.
Distribution: S. America (Paraguay).

29. **Quassia insignis** (A. St. Hil. & Tul.) Nooteboom, comb. nov. — *Simaba insignis* A. St. Hil. & Tul., Ann. Sc. Nat. II, 17, 1842, 137; Cronquist, Lloydia 7, 1944, 90. — *Simaba glandulifera* Gardn., Lond. J. Bot. 1, 1842, 169. — *Simaba longifolia* Casar., Nov. Stirp. Bras. 9, 1842.
Distribution: S. America (Brazil).

30. **Quassia intermedia** (Mansfeld) Nooteboom, comb. nov. — *Simaba intermedia* Mansfeld, Notizbl. Bot. Gart. Berl. 9, 1924, 39; Cronquist, Lloydia 7, 1944, 91.
Distribution: S. America (Brazil).

31. **Quassia trichilioides** (A. St. Hil.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba trichilioides* A. St. Hil., Mém. Mus. Par. 10, 1823, 279; Cronquist, Lloydia 7, 1944, 91. — *Zwingera trichilioides* Spreng., Syst. 2, 1825, 319.
Distribution: S. America (Brazil).

32. **Quassia pohliana** (Boas) Nooteboom, comb. nov. — *Simaba pohliana* Boas, Beih. Bot. Centr. Bl. 29, 1913, 337; Cronquist, Lloydia 7, 1944, 91.
Distribution: S. America (Brazil).

33. **Quassia maiana** (Casar.) Nooteboom, comb. nov. — *Simaba maiana* Casar., Nov. Stirp. Bras. 10, 1842; Cronquist, Lloydia 7, 1944, 91.
Distribution: S. America (Brazil).

34. **Quassia cedron** (Planch.) D. Dietr., Syn. Pl. 2, 1840, 1416. — *Simaba cedron* Planch., Lond. J. Bot. 5, 1846, 566; Cronquist, Lloydia 7, 1944, 92.
Distribution: S. America (native to the Amazon basin), now cultivated in Brazil, Northern S. America and Central America.

35. **Quassia salubris** (Engl.) Nooteboom, comb. nov. — *Simaba salubris* Engl. in Mart., Fl. Bras. 12, 1874, 219; Cronquist, Lloydia 7, 1944, 92.
Distribution: S. America (Brazil).

4. Section Simarouba

Nooteboom, nov. stat. — *Simarouba* Aubl., Hist. Pl. Guian. 2, 1775, 859 t. 331, 332.

Leaves pinnate. Inflorescence a panicle. Flowers unisexual, petals imbricate or contorted in bud; ♀ flowers with vestigial stamens, only the appendage and usually the reduced anther left; stigmas as long as the style or longer, stellately spreading with recurved tips; ♂ flowers with vestigial ovaries, with small, sometimes not united styles and inconspicuous stigmas.

Distribution: Four species in tropical and subtropical America.

36. Quassia simarouba Linné f., Suppl. 1781, 234. — *Simarouba amara* Aubl., Hist. Pl. Guian. 2, 1775, 860, t. 331, 332; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 229. — *Zwingera amara* Willd., Sp. Pl. 2, 1799, 569. — *Simarouba glauca* DC., Ann. Mus. Par. 17, 1811, 424. — *Q. glauca* Spreng., Syst. 2, 1825, 319; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 231. — *Simarouba officinalis* DC., Ann. Mus. Par. 17, 1811, 423. — *Simarouba medicinalis* Endl., Med. Pfl. Oesterr. 1842, 528. — *Simarouba berteroana* Krug & Urb., Bot. Jahrb. 15, 1892, 306; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 230.

Tree, 7—35 m high. Leaflets 7—21, narrowly obovate to broadly elliptic with emarginate, rounded or apiculate apex and cuneate base. Calyx c. 1 mm long or a little more, lobes rounded, about as long as the tube. Petals 3½—7 mm long. Appendages of the filaments densely hairy, relatively short and broad, the attached portion not longer than the free portion which bends over and closely envelops the gynophore in the ♂ flowers. Ovary in the ♀ flowers c 2 mm high, with a style of 1 mm. Fruit bicarinate, ellipsoid or ovoid, 1—2 cm long.

Notes. It appeared to be necessary to unite *Simarouba amara* Aubl., *Simarouba glauca* DC., and *Simarouba berteroana* Krug & Urb.. Cronquist, l. c., kept them apart, but the characters he uses are questionable. He even said that one of his key differences, the leaf venation, is not entirely constant. To me it appeared that this is not at all useful, and that the other characters he mentioned are of minor importance. Apparently there are 2 strains, one of them with small flowers, the other having larger ones.

37. Quassia versicolor (A. St. Hil.) Spreng., Syst. IV, 2 (cur. post.), 1827, 163. — *Simarouba versicolor* A. St. Hil., Pl. Us. Bras. 1824, pl. 5; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 233.

Small tree, about 4—5 m high. Leaflets 9—16, narrowly obovate to elliptic oblong, cuneate at the base, rounded to apiculate at the apex, 4—10 by 1½—4 cm. Calyx 1—1½ mm long, glabrous or with ciliate rounded lobes, about as long as the tube or shorter. Petals c. 5 mm long. Appendages of the filaments sparsely to densely hairy, about half as long as the 3 mm long stamens, with short free tip, raised somewhat above the disk in the ♂ flowers. Anthers 1—1½ mm long. Ovary in the ♀ flowers c. 2 mm high, style c. ¾ mm. Fruit 1—1½ cm long, bicarinate.

38. Quassia laevis (Griseb.) Nooteboom, comb. nov. — *Simarouba laevis* Griseb. Cat. Pl. Cub. 1866, 49; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 234.

Shrub or small tree, usually 2—6 m high. Leaflets 3—5(—7), glabrous, obovate or elliptic, with rounded apex, 3—7 by 1½—3 cm. Calyx c. 1½ mm long, glabrous except for some ciliae on the margins of the rounded lobes which slightly exceed the tube. Petals 4½—5½ mm long. Filaments inserted essentially on the edge of the top of the very short gynophore in the ♂ flowers; appendage of the filaments thick, firm, erect, the free portion longer than the short attached portion; anthers 1.2—1.4 mm long. Fruit 1½—2 cm long, ellipsoid, 2-ridged.

Notes. Unfortunately I was not in the opportunity to examine material of this species and the description is taken from Cronquist. It shows a very queer character, viz the stamens being inserted on top instead of at the base of the disk.

39. **Quassia tulae** (Urb.) Nooteboom, comb. nov. — *Simarouba tulae* Urb., Jahrb. Bot. Gart. Berl. 14, 1886, 245; Cronquist, Bull. Torr. Bot. Cl. 71, 1944, 234.

Shrub or tree, usually 2—8 m high. Leaflets 5—10, rather abruptly acuminate at the apex, elliptic, 5—11 by 1½—5 cm. Calyx c. 2 mm high, lobes about as long as the tube, with bluntish apex. Petals c. 1 cm long. Stamens c. 7 mm long, with c. 2 mm long anthers; appendage entirely glabrous, 1—2½ mm long with free short tip. Fruit flattened, broadly ovate, 2—3½ cm long.

Index to scientific names

The numeral after the name refers to the number of the species in the conspectus. Names in *italics* are synonyms, names in bold face are new.