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REVISION OF RAUVOLFIA (APOCYNACEAE) IN MALESIA

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SUMMARY

The genus *Rauvolfia* L. is revised in the Malesian region. Nine species are recognised including two new species, *Rauvolfia kamarora* Hendrian and *R. oligantha* Hendrian.

Key words: *Rauvolfia*, Apocynaceae, Malesia, taxonomic revision.

INTRODUCTION

The name *Rauvolfia* was first used by Charles Plumier in 1703 to commemorate Leonard Rauwolf using the Latin version of Rauwolf's name. In his 'Species Plantarum' (1753) Linnaeus used this spelling of *Rauvolfia.* However, several different spellings have been used by other authors. Burman (1755) changed the spelling to *Rawolfia, Rauwolffia,* and *Rauwolfia.* The spelling *Rauwolfia* later became widely used. Jack (1820), Blume (1826), De Candolle (1844), Hasskarl (1845), Teijsmann & Binnendijk (1852, 1866), Bentham & Hooker (1876), Kurz (1877), Hooker (1882), Baillon (1888, 1889), Hemsley (1889), Koorders & Valeton (1894), Boerlage (1899), Koorders (1900), King & Gamble (1907), Koorders-Schumacher (1912), Elmer (1912), Merrill (1925), and Markgraf (1927) have all used the alternative spelling. However, the spelling of the generic name is governed by the provisions of Article 60.1 of the International Code of Botanical Nomenclature (Greuter, 1994) and *Rauvolfia* is the valid name.

Rauvolfia is included in subfamily Plumerioideae, tribe Alyxieae, subtribe Rauvolfiinae by Leeuwenberg (1994). In this subtribe there are only two genera: *Rauvolfia* and *Petchia. Rauvolfia* is the larger and more widespread of the two. Ongoing work, however, is likely to substantially change the tribal classification of the Apocynaceae (Mary Endress, pers. comm.).

The first Malesian species of *Rauvolfia* was described by Linnaeus in his Species Plantarum (1753) as an *Ophioxylon,* based on a specimen from Zeylona (= Sri Lanka). He named it *Ophioxylon serpentinum.* Bentham (in Bentham & Hooker, 1876) then removed the species from *Ophioxylon* and placed it in *Rauvolfia* although the valid combination was made by Kurz (1877). The species became *Rauvolfia serpentinum,* which was changed by Hooker (1882) to *Rauvolfia serpentina.* In 1790 *Dissolena* was proposed by Loureiro with a single species, *Dissolena verticillata.* Baillon (1888) then put it into *Rauvolfia* and named it *Rauvolfia verticillata.* The first Malesian species to be described in *Rauvolfia* is *Rauvolfia sumatrana* which was described by Jack

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(1820) based on a specimen from Benkoelen (= Bengkulu). In 1856 Miquel proposed the genus *Cyrtosiphonia* with several species amongst which was *Cyrtosiphonia sumatrana.* The species was based on several specimens including Jack's specimen from Bengkulu and Diepenhorst's specimen from Priaman (= Pariaman), so is clearly a new combination based on Jack's species. As Jack's type specimen is lost Markgraf (1984) proposed Diepenhorst's specimen as a neotype for *Rauvolfia sumatrana.*

In 1984 Markgraf recognised 9 species in a study on Malesian *Rauvolfia.*

MATERIAL AND METHODS

Herbarium material was studied from the following herbaria: A, BM, BO, FR, G, GH, K, L, M, P, U, UC.

The dimensions given in the descriptions are for dried material except for the gynoecium and androecium characters which are for flowers rehydrated with water.

RAUVOLFIA

Rauvolfia L., Sp. Pl. 1 (1753) 208; Markgr., Blumea 30 (1984) 157. — Type species: *Rauvolfia tetraphylla* L.

Ophioxylon L., Sp. Pl. 2 (1753) 1043. — Type species: *Ophioxylon serpentinum* L. [= *Rauvolfia serpentina* (L.) Benth. ex Kurz].

Dissolena Lour., Fl. Cochinch. (1790) 137. — Type species: *Dissolena verticillata* Lour. [= *Rauvolfia verticillata* (Lour.) Baill.].

Cyrtosiphonia Miq., Fl. Ind. Bat. 2 (1856) 401. — Type species: *Cyrtosiphonia sumatrana* (Jack) Miq., designated by Van Dilst & Leeuwenberg, 1991 [= *Rauvolfia sumatrana* Jack].

Heurckia Müll.Arg., Flora 53 (1870) 168. — Type species: *Heurckia semperflorens* Müll.Arg. [= *Rauvolfia semperflorens* (Müll.Arg.) Schltr.].

Shrubs, trees or sometimes rhizomatous undershrubs, with white latex; spines, tendrils and stipules absent; bark smooth, rough, fissured or scaly; branches lenticellate. *Leaves* in whorls of 2–7, often confined to the apices of the branchlets, sometimes opposite on the lower nodes, glabrous, petiole varies considerably in length; lamina membranous, thinly papyraceous, papyraceous, or coriaceous when dried, ovate, obovate, elliptic or narrowly so, acute or acuminate at the apex, rarely obtuse, rounded, or retuse, cuneate or decurrent, entire or sometimes undulate. *Inflorescence* terminal, sometimes seemingly lateral, lax or congested, a few- to many-flowered cyme, glabrous or pubescent. *Sepals* vary in size, shape and texture, broadly ovate to narrowly so, rarely slightly rhomboid or subtriangular, connate at the base, glabrous or pubescent outside, glabrous inside, ciliolate or not. *Corolla* green, white, pinkish-white, creamy, yellow, reddish or red-brown, hypocrateriform, infundibuliform, urceolate, or campanulate; tube glabrous outside, variably hairy inside; lobes broadly ovate, ovate or elliptic, in bud overlapping to the left. *Stamens* free from each other or from the pistil, included or exserted; filaments short and narrow, glabrous or pubescent; anthers ovoid, obtuse, acute to cuspidate at the apex, cordate at the base, glabrous. *Disc* annular or cupular, entire, undulate, crenate, or sometimes serrate, glabrous. *Pistil*: ovary superior, composed of two free to completely fused carpels, cylindrical, ovoid, obovoid, or globose, glabrous; style filiform, glabrous to pubescent; pistil-head cylindrical with a membranous collar

at the base and a stigmoid biapiculate apex. *Fruit* yellow, orange, red, dark red, whitish-purple, or almost black, apocarpous or partly to completely syncarpous drupes, subglobose, globose, ovoid, trapezoid, obversely trapezoid, or ellipsoid, laterally compressed; often only one carpel developing, each carpel contains a single seed. *Seeds* laterally compressed, obliquely ovoid or ellipsoid.

Distribution — A pantropical genus of c. 60 species, 9 of which are represented in Malesia.

KEY TO THE SPECIES

1a. Sepals ≥ 2 times as long as wide; corolla tube ≥ 9 mm long; anthers obtuse to acute; leaves with or without submarginal veins 2
b. Sepals ≤ 1.5 times as long as wide; corolla tube < 6 mm long; anthers cuspidate; leaves with submarginal veins 4
2a. First branch of inflorescence less than 0.3 cm long; flowers clustered; carpels connate at base; mericarps subglobose or ovoid, connate at base **7. R. serpentina**
b. First branch of inflorescence more than 0.5 cm long; inflorescence lax; carpels free from each other; mericarps globose or ellipsoid, free from each other ... 3
3a. Leaf blade thinly papyraceous; inflorescences in whorls of 2 or 3, with fewer than 10 flowers; fruits sub}ïobose to globose, red when mature ... **3. R. kamarora**
b. Leaf blade papyraceous; inflorescences in whorls of 3 or 4, with 8–more than 35 flowers; fruits ovoid, whitish purple when mature ..... **9. R. verticillata**
4a. Leaf blade papyraceous or thinly so; inflorescence with fewer than 8 flowers 5
b. Leaf blade subcoriaceous to coriaceous; inflorescence usually with more than 25 flowers 6
5a. Inflorescence branches usually with many bracteoles; corolla tube ≤ 4 mm long; fruits obversely trapezoid, with two acute apices ..... **6. R. rostrata**
b. Inflorescence branches with few bracteoles or absent; corolla tube > 5 mm long; fruits ovoid, with one rounded apex ..... **5. R. oligantha**
6a. Corolla tube 2–2.4 mm long; disc serrate; petiole and midrib yellowish when dried ..... **1. R. amsoniifolia**
b. Corolla tube 2.6–4.9 mm long; disc crenate; petiole and midrib not yellowish when dried 7
7a. Corolla tube 2.4–3.4 times as long as the calyx; fruits globose or subglobose, apex of mericarps rounded to cleft (when cleft, distance between apices ≤ 0.3 of fruit length) ..... **8. R. sumatrana**
b. Corolla tube 1.5–2.2 times as long as the calyx; fruits obversely trapezoid, apex of mericarps widely split into two acute apices, distance between apices > 0.3 of fruit length 8
8a. Disc less than 0.45 times as long as the ovary ..... **4. R. moluccana**
b. Disc more than 0.6 times as long as the ovary ..... **2. R. javanica**

1. Rauvolfia amsoniifolia A.DC.

Rauvolfia amsoniifolia A.DC., Prodr. 8 (1844) 338; Hemsl., Bot. Chall. Exp. 3 (1885) 163; Warb., Bot. Jahrb. 13 (1891) 404; Boerl., Handl. 2 (1899) 393; Merr., For. Bur. Bull. 1 (1903) 49; Enum. Philipp. Flow. Pl. 3 (1923) 329; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2 (1927) 1285; Quisumb.,

Med. Pl. Philipp. (1951) 736; Markgr., Blumea 30 (1984). — *Cyrtosiphonia amsoniifolia* (A.DC.) Miq., Fl. Ind. Bat. 2 (1856) 402. — Type: *Cuming 1249* (lecto G-DC, designated by Markgraf, 1984; iso BM, FR, G, K, L), Philippines, Luzon, Cagayan.

Shrub or tree, 1.5–7(–20) m high. Branches sparsely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole, 0.5–1.5 cm long, often yellowish when dried, glabrous; blade subcoriaceous when dried, usually narrowly elliptic, rarely elliptic, 5.5–12.5(–21.5) by 1–3.6 cm, 3–9.7 times as long as wide, entire, apex acute, rarely acuminate, base cuneate to slightly decurrent, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side, usually yellowish when dried; secondary veins not prominent, inconspicuous, in (14–)21–27(–31) pairs, 0.1–0.3(–0.6) mm spaced, more or less straight, forming an angle of 45–65° with the midrib, not reaching the margin, joining near the margin, forming a submarginal vein; tertiary venation not prominent, inconspicuous on abaxial side, usually invisible on adaxial side. *Inflorescence* 3–9.5 cm long, in whorls of 2–4(–6), congested, 32–more than 35-flowered; peduncle 2.3–5 by 0.1–0.2 cm, glabrous; first branch of inflorescence 0.5–1.6 cm long, glabrous; pedicels 1–2.5(–5) mm long, glabrous. *Sepals* broadly ovate, 1.1–1.3 by 0.9–1.4 mm, 0.9–1.3 times as long as wide, apex obtuse to rounded, undulate, nerves conspicuous, glabrous on both sides, connate at base for 0.2 mm. *Corolla* glabrous outside, villose from just around the mouth downwards for 1–1.2 mm, 3 mm long in the mature bud, and forming a subglobose head of 1 by 1.5 mm, usually indistinct from the tube; tube cylindrical, 2–2.4 mm long, 1.65–1.85 times as long as calyx, 1.43–1.82 times as long as lobes, straight, slightly narrowed at the insertion of the stamens; lobes broadly and obliquely ovate, 1.1–1.5 by 1.2–1.5 mm, 0.9–1.1 times as long as wide, apex rounded, sometimes slightly retuse, entire. *Stamens* inserted at 1.9–2.1 mm from base, 0.87–0.95 of the length of the corolla tube; filaments filiform, 0.5 mm long; anthers cordate to narrowly cordate, 1–1.1 by 0.2–0.3 mm, 3.3–5 times as long as wide, apex cuspidate, often thin and rather delicate, glabrous. *Disc* cup-shaped, 0.7–1 by 0.7–0.8 mm, 0.7–0.8 times as long as the ovary, serrate. *Pistil* mostly glabrous; ovary syncarpous, broadly ovoid, 1 mm long, with some longitudinal ridges; style filiform, 1–1.3 mm long; pistil head 0.6–0.8 mm long, of three distinct parts: the apical part bilobed, 0.2–0.3 by 0.2–0.3 mm; the central part cylindrical, 0.1–0.3 by 0.2–0.3 mm, puberulous; the basal part cylindrical, 0.2–0.4 by 0.3–0.4 mm, puberulous, with a very short membranous collar at the base. *Fruits* bluish-black when mature, syncarpous or partly so, broadly ovoid, subglobose, or trapezoid, often cleft at the apex, 7–9.2 by 7–10.2 mm, 0.85–1.1 times as long as wide, connate for 5–8 mm, or 0.6–0.9 of fruit length when cleft, distance between apices 2–7.5 mm, 0.3–0.8 of fruit length, or 0.3–1.35 of connate part, apices acute, base thickened, sometimes only one carpel developing, glabrous; endocarps brownish-white, ovoid, obtuse or acute, thickened at the base, rugose, hard. *Seeds* whitish, one in each endocarp, ovoid, acute, 3–5.5 by 2–2.7 mm, 1.5–2.25 times as long as wide, glabrous.

Distribution — Malesia: Indonesia (S Sulawesi, E Nusa Tenggara and Maluku), Philippines (Luzon, Mindoro, Marinduque, Masbate and Mindanao).

Habitat — In open areas, scrub, or secondary forests. Sometimes also found at the edge of coconut plantations. On rocky soil. Altitude mostly from 0–500 m. It also occurs at the altitude of 2500 m on Mt Badyang in primary forest, E Mindoro, Philippines.

Selected specimens:

INDONESIA. S Sulawesi: Saluang, *Walangitang 65* (BO, L); Selayar Is., *Docters van Leeuwen 1867* (U), *Zollinger 3322* (BM, G, GH, L); Tanah Jampea Is., *Docters van Leeuwen 1628* (U). E Nusa Tenggara: Kegemenanu, Timor, *De Voogd 2314* (BO, L). Maluku: Yamdena, *Pleyte 5* (L); Kei, *Jensen 184* (A, L); Tanimbar, *Van Borssum Waalkes 3139* (A, L).

PHILIPPINES. Luzon: Cagayan, *Cuming 1249* (BM, FR, G, K, L, type); Penablanca, *Adduru 39* (A, K), *102* (A). Isabela: Santiago, *Clemens 1900* (UC); Cabagan, *Vidal 3269* (K). Nueva Ecija: *Alvarez 22111* (BM), *Ramos & Edaño 26484* (A, GH). Quezon: Pollilo Is., *Fox 9156* (A). Batangas: *Sulit 37497* (L). Albay: *Cuming 1133* (BM, G, K). Mindoro: W Mindoro: Urilan, *Sulit 22482* (BM, BO, K, L). E Mindoro: Mansalay, *Ebalo 141* (A). Marinduque: Santa Cruz, *Duenas 23103* (L). Masbate: *Clark 992* (BM). Mindanao: Bukidnon, *Rola 26526* (BO).

2. **Rauvolfia javanica** Koord. & Valeton

Rauvolfia javanica Koord. & Valeton, Bijdr. Kennis Boomsoorten Java 1 (1894) 91; Koord., Meded. Lands Plantentuin 11 (1894) 81; Exk. Fl. Java 3 (1912) 74; Fl. Tjibodas 3, 3 (1918) 57; Boerl., Handl. 2 (1899) 393; Koord.-Schum., Syst. Verz. 1 (1912) 174; Rendle, J. Bot. 63 (1925) suppl. 67; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2 (1927) 1285; Backer & Bakh.f., Fl. Java 2 (1965) 231; Markgr., Blumea 30 (1984) 164. — Type: *Koorders 151* (lecto L, designated here; iso A, BO), Java, Cibodas.

Tree 3–15 m high. Branches lenticellate, often strongly angled; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.4–1.8 cm long, glabrous; blades coriaceous when dried, sometimes subcoriaceous, elliptic, narrowly elliptic, obovate, or narrowly obovate, 6.5–21 by 1.4–4.9 cm, 2.6–5.3 times as long as wide, entire to slightly undulate, apex acute to acuminate, base slightly decurrent, adaxial side usually dark brown in dried leaves, abaxial side brownish-green, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side, conspicuous; secondary veins conspicuous and slightly prominent on abaxial side only, sometimes not, straight to rather arcuate-ascending, forming an angle of 50–85° with the midrib, not reaching the margin, joining near the margin, forming a submarginal vein, (10–)19–26 pairs, 0.3–1 cm spaced; tertiary venation not prominent, conspicuous on abaxial side only, reticulate. *Inflorescences* 3–11.5 cm long, in whorls of 3 or 4, usually on the top of a short and robust (leafy) twig, 24–more than 35-flowered; peduncle 2.5–7.5 by 0.15–0.25 cm, often robust, glabrous; first branch of inflorescence 1–2.9 cm long, glabrous; pedicels 0.15–0.4 cm long, glabrous. *Sepals* ovate, rarely broadly ovate or subtriangular, 1.6–1.9 by 1.6–1.8 mm, 0.9–1.2 times as long as wide, apex obtuse to rounded, entire, connate at base for 1 mm, glabrous on both sides. *Corolla* white, 3.2–4.5 mm long in the mature bud and forming a broadly ovoid head of 1–1.8 by 1.8–2 mm, with an obtuse to rounded apex, usually indistinct from the tube, glabrous outside, villose from just around the mouth downwards for 1.5 mm; tube cylindrical, 3.1–4.2 mm long, 1.8–2.2 times as long as calyx, 1.82–2.1 times as long as lobes, straight, wider towards the apex; lobes ovate to broadly ovate, 1.7–2 by 1.5–2.1 mm, 0.9–1.1 times as long as wide, apex obtuse, entire. *Stamens* inserted at 1.6–3 mm from the base, 0.63–0.86 of the length of the corolla tube; filaments filiform, 0.5–0.6 mm long; anthers narrowly cordate, 9–17 by 2–4 mm, 3.75–5 times as long as wide, apex cuspidate, sometimes rather thin and delicate, glabrous. *Disc* cup-shaped, 1.2–1.8 by 0.8–1 mm, 0.65–0.75 times as long as the ovary, crenate. *Pistil* mostly glabrous; ovary of two carpels which

are fused at the base, ovoid 1.1–1.4 mm long, with some distinct longitudinal ridges, notched at the apex; style filiform, 1.3–1.8 mm long, broader at the apex; pistil head 0.7–1 mm long, of three distinct parts: the apical part bilobed, 0.2–0.4 by 0.2–0.5 mm; the central part annular, 0.1–0.2 by 0.2–0.3 mm, sometimes indistinct from the apical part; the basal part cylindrical, 0.4–0.7 by 0.4–0.7 mm, puberulous, basal collar very short, or sometimes inconspicuous. *Fruits* black or purplish-black when mature, obversely trapezoid, 7–11 by 8.5–15 mm, 0.7–1 times as long as wide; mericarps connate for 6–7.3 mm, 0.6–0.85 of their length, apices widely spreading, acute, distance between apices 6.5–13 mm, 0.9–1.2 of mericarp length, 1.1–2 of connate part, very narrow but thickened at the base, glabrous, sometimes only one carpel developing; endocarp brownish-white or whitish when dried, ovoid, with 2 distinct thickenings at the base, rugose. *Seeds* whitish when dried, one in each endocarp, ovoid or narrowly ovoid, 5–8.5 by 1.8–2.7 mm, 2.5–3.7 times as long as wide, apex acute or obtuse, glabrous.

Distribution — Malesia: Indonesia (S Sumatra, Java, and Nusa Tenggara).

Habitat — In very moist and old forests. Altitude 30–1400 m.

Selected specimens:

INDONESIA. Sumatra: S Sumatra: Palembang, *Forbes 2851* (BM, L). Java: W Java: Banten, *Koorders 144* (L); Cibodas, *Koorders 151* (A, BO, L, type); Pengalengan, *Junghuhn 114* (L); Mt Malabar, *Monterie 3* (K, L). C Java: Ambarawa, *Koorders 27643* (L); Magelang, *Koorders 27644* (L). E Java: Mt Arjuno, *Koorders 38157* (L). Nusa Tenggara: W Nusa Tenggara: Sumbawa, *Kostermans 18697* (A, L), *De Voogd 1612* (L); Lombok: Mt Rinjani, *Elbert 1804* (L). E Nusa Tenggara: Flores, *Verheijen 2830* (L), *3269* (L).

3. **Rauvolfia kamarora** Hendrian, *spec. nov.* — Fig. 1

Frutex foliis verticillatis laminis sicco tenuiter papyraceis glabris. Inflorescentiae pauciflorae laxae 3–7 cm longae. Pedunculus saepe gracilis glaber. Sepala ovata vel subtriangulata apice acuta vel obtusa. Corolla alba tubo intus villoso lobis tubo brevioribus. Fructus apocarpus globosus vel subglobosus ruber. — Typus: *Hendrian 42* (holo L; iso A, BM, BO, K), Indonesia, C Sulawesi, Lore Lindu National Park, Kamarora.

Shrub, 1.5–2 m high. Branches 0.8–1 cm diam., lenticellate; branchlets glabrous. *Leaves* usually in whorls of 3, rarely 4; petiole 0.3–1 cm long, glabrous; blade thinly papyraceous, narrowly elliptic or narrowly obovate, 8–25 by 1.6–4.1 cm, 3.5–7.6 times as long as wide, margin slightly undulate, apex acuminate to cuspidate, base decurrent or slightly so, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side; secondary veins not prominent on both sides, arcuate ascending, forming an angle of 45–85° with the midrib, not reaching the margins, sometimes joining near the margins, forming a submarginal vein, 8–11(–12) pairs, 0.3–2 cm spaced; tertiary venation not prominent, rarely conspicuous on abaxial side, conspicuous on adaxial side, reticulate. *Inflorescence* 3–7 cm long, usually in whorls of 2 or 3, rarely solitary, lax, 2–9-flowered; peduncle 1.8–4.5 by 0.1–0.15 cm, often delicate, glabrous; pedicels 1.0–1.8 cm long, glabrous. *Sepals* ovate, narrowly ovate, or subtriangular 1.7–3.1 by 0.8–1 mm, 2–3.7 times as long as wide, apex obtuse to acute, entire, glabrous on both sides, connate at base for 0.2–0.3 mm. *Corolla* pure white, 15–17 mm long in mature bud and forming an ovoid head of 2–2.2 by 5–5.1 mm, glabrous outside, villose from just around the mouth downwards for 3 mm; tube

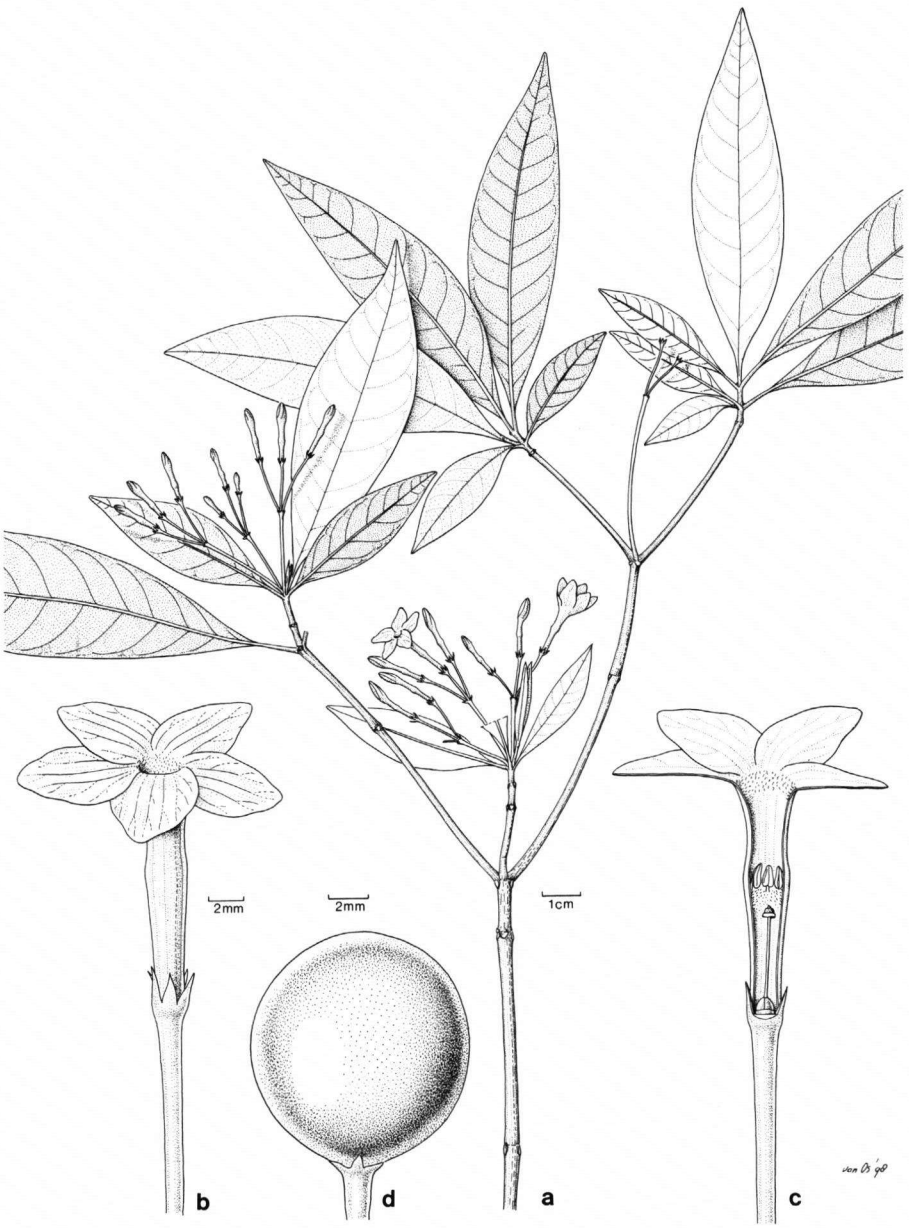

Fig. 1. *Rauvolfia kamarora* Hendrian. a. Habit; b. flower; c. flower dissection; d. fruit with only one carpel developed [all parts from *Hendrian 42* (L)].

cylindrical, 10–13 mm long, 4.5–5.9 times as long as calyx, 1.7–2.2 times as long as lobes, slightly twisted, swollen around the stamens; lobes obliquely ovate, 4–4.5 by 5.9–6.2 mm, 1.3–1.5 times as long as wide, rounded. *Stamens* inserted at 6–8 mm from the base, 0.6–0.7 of the length of the corolla tube; filaments filiform, 0.7–0.9

mm long; anthers cordate to narrowly cordate, 1.2–1.5 by 0.3–0.5 mm, 2.8–4.3 times as long as wide, apex obtuse, glabrous. *Disc* cup-shaped, 0.6–0.8 by 0.7–0.8 mm, 0.3–0.4 times as long as the ovary, undulate. *Pistil* glabrous; ovary ovoid, 1.5–1.7 mm long, consisting of two carpels which are free from each other; style filiform, 4–4.3 mm long; pistil head of two distinct parts, the apical part crown-shaped, 0.3–0.5 mm long, the basal part cylindrical, 0.2–0.4 mm long, puberulous, with a membranous collar at the base. *Fruits* red when mature, usually of paired mericarps free from each other, with a very short stalk, sometimes only one carpel developing, subglobose to globose, 11–13 by 10–11 mm, 1.1–1.3 times as long as wide, apex rounded; endocarp light brown to brownish-white, rugose, rather hard. *Seed* one, obliquely ovoid, 8–10 by 3–4 mm, 2–3.3 times as long as wide, acute at both ends, light brown, glabrous.

Distribution — Malesia: Indonesia (C Sulawesi).

Habitat — In relatively open areas, light woods, and secondary forests. Altitude 500–700 m.

Note — The name is derived from the collecting locality for the type specimen. This species is allied to *R. verticillata* (Lour.) Baill. The shape, size and colour of the young fruit of *R. kamarora* is very similar to that of *R. verticillata.* The flowers do not show any significant differences in shape and size. However, the species differ in leaf blade (thinly papyraceous vs. papyraceous), inflorescence (in whorls of 2 or 3 vs. 3 or 4), flower number (fewer than 10 vs. 8–more than 35), fruit shape (subglobose to globose vs. ovoid), and fruit colour when mature (red vs. whitish-purple).

Specimen examined:

INDONESIA. Sulawesi: C Sulawesi: Lore Lindu National Park: Kamarora, *Hendrian 42* (A, BM, BO, K, L, type).

4. **Rauvolfia moluccana** Markgr.

Rauvolfia moluccana Markgr., Blumea 30 (1984) 163. — Type: *D. Sayers NGF 21949* (holo L), Papua New Guinea, New Britain, Kandrian, Pirilongi.

Tree, 3–15 m high. Branches lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 2–4.3 cm long, glabrous; blade coriaceous to subcoriaceous when dried, elliptic to narrowly elliptic, 9.5–20.5 by 4.4–9.5 cm, 1.8–3.5 times as long as wide, entire to slightly undulate, apex acuminate, base cuneate to slightly decurrent, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side; secondary veins conspicuous, slightly prominent on abaxial side only, straight to rather arcuate-ascending, forming an angle of 75–90° with the midrib, not reaching the margin, joining near the margin, forming a submarginal vein, in 15–23 pairs, 0.4–1.4 cm spaced; tertiary venation not prominent, conspicuous on abaxial side only, reticulate. *Inflorescences* 6–16.5 cm long, usually in whorls of 3 or 4, rarely solitary, usually on the top of a short and robust (leafy) twig, more than 35-flowered, glabrous; peduncle 4.6–11.3 by 0.15–0.25 cm, glabrous; first branch of inflorescence 1.5–4.6 cm long, glabrous; pedicels terete, 0.2–0.5 cm long, glabrous. *Sepals* broadly ovate, 1.5–1.8 by 1.6–1.7 mm, 0.95–1.05 times as long as wide, apex rounded, entire, glabrous on both sides, connate at base for 1 mm. *Corolla* white, glabrous outside, villose in a belt from just around the mouth downwards for 1.5 mm; tube cylindrical, 2.6–2.7 mm long, 1.5–1.7 times as long as calyx, 1.62–1.7 times as long as lobes, straight, wider towards the

apex; lobes broadly ovate, 1.6 by 1.7 mm, 0.94 times as long as wide, apex obtuse, entire. *Stamens* inserted at 2.4 mm from the base, 0.9 of the length of the corolla tube; filaments filiform, 0.4–0.6 mm long; anthers cordate, 10–17 by 3–4 mm, 3.3–4.25 times as long as wide, apex cuspidate, glabrous. *Disc* cup-shaped, very short, 1–1.2 by 0.3–0.5 mm, 0.27–0.42 times as long as the ovary, crenate. *Pistil* mostly glabrous; ovary of two carpels, which are subglobose, 1.1–1.4 mm long, with some inconspicuous longitudinal ridges, notched at the apex; style filiform, 1.3–1.8 mm long, broader at the apex; pistil head 0.8–1 mm long, of three distinct parts: the apical part bilobed, 0.2–0.4 by 0.2–0.5 mm; the central part annular, 0.2 by 0.2–0.3 mm, puberulous; the basal part cylindrical, 0.4–0.7 by 0.4–0.7 mm, puberulous, basal collar very short. *Fruits* black or purplish-black when mature, obversely trapezoid, 8.8–11.2 by 9–14 mm, 0.8–1.1 times as long as wide, mericarps connate for 6–11 mm, 0.65–0.95 of their length, apices widely spreading, acute, distance between apices 6–13.5 mm, 0.6–1.2 of mericarp length, 0.8–1.6 of the length of connate part, thickened at the base, sometimes trapezoid, truncate or shallowly cleft at apex, glabrous, sometimes only one carpel developing; endocarp brownish-white or whitish when dried, ovoid, thickened at the base, rugose. *Seeds* whitish when dried, one in each endocarp, ovoid or narrowly ovoid, 5–7.2 by 1.5–2.5 mm, 2.5–3.5 times as long as wide, apex acute or obtuse, glabrous.

Distribution — Malesia: Indonesia (Maluku and Irian Jaya), Papua New Guinea.

Habitat — In secondary and primary forests. On sandy soil, or limestone mixed with gravel and stones. Altitude 2–900 m.

Note — The disc/ovary ratio is a good character to distinguish the species from *R. javanica*. There is, however, no doubt that they are very closely related and this species could possibly be reduced to a synonym of *R. javanica*. However, we prefer to keep it as a separate species until further collections are made and the relationship becomes clearer.

Specimens examined:

INDONESIA. Maluku: Tanjung Baliha, *Bloembergen 4406* (A, L); Ambon, *Jaheri 523* (L); Seram, *Kornassi 1362* (L); Buru, *Van Balgooy 5091* (A, L), *Nooteboom 5380* (L). Irian Jaya: Manokwari, *Kostermans 354* (A, K, L).

PAPUA NEW GUINEA. Pirilongi, Kandrian, *D. Sayers NGF 21949* (L, type); Mt Lollo, Hoskins, *Lelean & Stevens 51151* (A, L); Mt Lollo, Talasea, *White 10846* (A, K, L).

5. **Rauvolfia oligantha** Hendrian, *spec. nov.* — Fig. 2

Frutex foliis verticillatis vel oppositis laminis sicco papyraceis glabris. Inflorescentiae pauciflorae apice ramuli minimi insertae. Pedunculus gracilis glaber. Sepala ovata apice acuta vel acuminata. Corolla tubo intus pro parte superiore villoso lobis fere tubo aequilongis. Fructus syncarpus ovoideus lateraliter compressus drupis duabus ovoideis. — Typus: *Koorders 38049* (holo BO; iso L), Indonesia, C Java.

Shrub, 2–5 m high. Branchlets 0.2–0.25 cm diam., slightly lenticellate. *Leaves* in whorls of 3, or opposite; petiole 0.4–2 cm long, glabrous; blade papyraceous when dried, elliptic, rarely narrowly elliptic, 5–16 by 2.6–5.7 cm, 1.5–3.1 times as long as wide, apex acuminate, very rarely obtuse, base cuneate or abruptly decurrent, entire, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side, conspicuous, glabrous; secondary veins not prominent, conspicuous on abaxial side

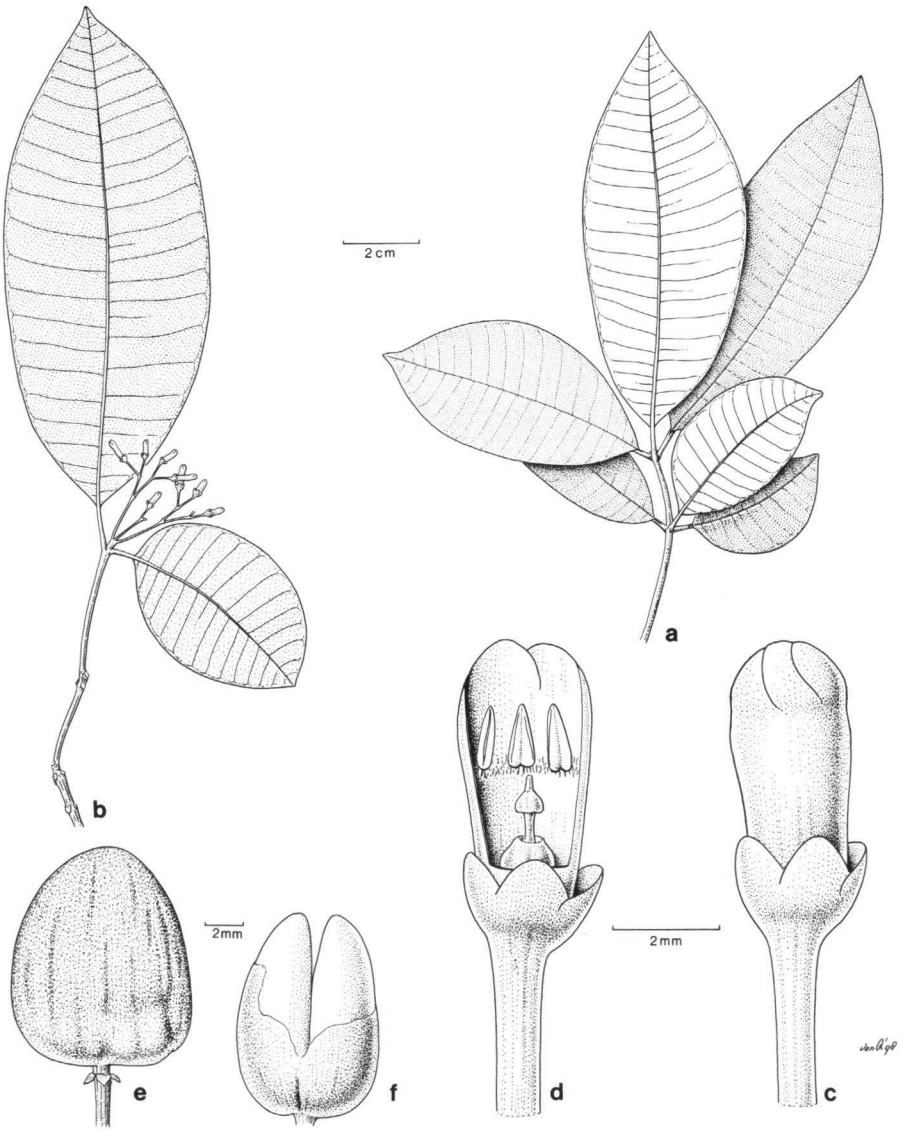

Fig. 2. *Rauvolfia oligantha* Hendrian. a. Habit; b. habit with inflorescence; c. flower bud; d. flower dissection; e. fruit; f. fruit showing paired endocarps [all from BO; habit & flowers: *Koorders 38397*; fruits: *Koorders 38049*].

only, in 8–17 pairs, 0.3–1.1 mm spaced, straight, rather arcuate-ascending near the margin, forming an angle of 75–90° with the midrib, not reaching the margin, joining near the margin, forming a submarginal vein; tertiary venation not prominent, conspicuous on abaxial side only. *Inflorescence* 3–4 cm long, terminal, repeatedly branched into 2–4 branches, usually at the apex of a very short brownish-black branchlet, lax, 5–8-flowered. Peduncle 2.3 by 0.07 cm, thin, delicate, glabrous; first branch of inflores-

cence 0.6 cm long, glabrous; pedicels 0.3–0.4 cm long, glabrous, bracteoles few or absent. *Sepals* ovate, 1.5–1.6 by 1–1.1 mm, 1.45–1.5 times as long as wide, apex acute to acuminate, margin very thin and translucent, entire, glabrous on both sides, connate at base. *Corolla* 6 mm long in mature bud, forming a broadly ovoid head of 1.1 by 2 mm with obtuse apex, glabrous outside, with a villose belt inside from just around the mouth downwards to the insertion of the stamens; tube cylindrical, 5.1–5.3 mm long, 3.3–3.4 times as long as calyx, 3.9–4.1 times as long as lobes, straight, slightly swollen around the stamens; lobes ovate, 1.3 by 1.2 mm, 1.08 times as long as wide, apex obtuse to rounded, entire. *Stamens* inserted at 5 mm from base, 0.94 of the length of the corolla tube; filaments filiform, 0.5 mm long; anthers cordate, 1.4 by 0.5 mm, 2.8 times as long as wide, apex cuspidate, glabrous. *Disc* cup-shaped, 1.2 by 1 mm, c. 0.65 times as long as the ovary, broader upwards, crenate. *Pistil* mostly glabrous; ovary syncarpous, ovoid, 1.5 mm long, notched at apex, glabrous; style filiform, 3 mm long, glabrous; pistil head 1 mm long, of two distinct parts: the apical part ovoid, 0.5 by 0.3 mm, obtuse, puberulous; the basal part subglobose, 0.5 by 0.5 mm, puberulous, with a very short membranous collar at the base. *Fruit* syncarpous, ovoid, 11–11.5 by 10 mm, 1.1–1.15 times as long as wide, laterally compressed, consisting of two mericarps, sometimes only one carpel developing, glabrous, apex rounded; endocarps brownish-white, obliquely ovoid, apex acute, base rather rounded or truncate, with distinct thickening, rugose, hard. *Seeds* whitish, one in each endocarp, narrowly ovoid, 8–8.2 by 2–2.3, 3.6–4 times as long as wide, acute, glabrous.

Distribution — Malesia: Indonesia (C Java).

Habitat — Altitude 800–1000 m.

Note — The name is derived from the Greek for few-flowered. This species is allied to *R. rostrata* Markgr. Both species have very few flowers (fewer than 8 flowers in a single cyme) and delicate peduncles. They also show a similarity in having papyraceous leaves. However, they differ particularly in the inflorescence branches (with or without few bracteoles vs. many bracteoles), the length of the corolla tube (more than 5 mm long vs. less than 4.1 mm long), and fruit shape (ovoid vs. obversely trapezoid).

Specimens examined:

INDONESIA. Java: C Java: Pringombo, Banjarnegara, *Koorders 143* (BO, K), *31600* (BO), *33800* (BO), *38049* (BO, L, type), *39001* (L).

6. **Rauvolfia rostrata** Markgr.

Rauvolfia rostrata Markgr., Bot. Jahrb. 61 (1928) 188; Kaneh. & Hatus., Bot. Mag. Tokyo 55 (1941) 504; Markgr., Blumea 30 (1984) 163. — Type: *Beccari 392* (holo FI, n.v.), Indonesia, Irian Jaya, Ramoi.

Rauvolfia amsoniifolia auct. non. DC.: Markgr., Bot. Jahrb. 61 (1928) 188.

Shrub or small tree, 1–7 m high. Branches sparsely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.3–0.5(–1) cm long, glabrous; blade papyraceous to thinly so, sometimes subcoriaceous, elliptic to narrowly elliptic, 7–14.5 by 1.8–4.2 cm, 2.6–3.8(–5.2) times as long as wide, entire, apex cuspidate, rarely acuminate, base cuneate to slightly decurrent, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side; secondary veins not prominent, conspicuous on abaxial side only, in 12–23 pairs, 0.1–0.5 mm spaced, straight to rather arcuate-ascending, forming an angle of 50–80° with the midrib, not reaching the margin, joining near the

margin, forming a submarginal vein; tertiary veins conspicuous on abaxial side only. *Inflorescences* 3–9.5 cm long, repeatedly branched 2 or 3 times, lax, 5–8-flowered, glabrous; peduncle, 2.3–6 by 0.1 cm, thin, delicate, glabrous; first branch of inflorescence 1–1.2 cm long, glabrous, usually with many bracteoles; bracteoles broadly ovate, 0.6–0.8 by 0.4–0.6 mm, 0.65–0.75 times as long as wide, apex obtuse, sometimes acuminate, densely arranged on the branch of inflorescence; pedicels 0.2–0.5 cm long, glabrous. *Sepals* ovate or subtriangular, 1–1.4 by 0.8–1.3 mm, 1.1–1.25 times as long as wide, apex obtuse, entire, glabrous on both sides, connate at base. *Corolla* white, glabrous outside, villose in a belt from just around the mouth downwards to the insertion of the stamens, 4–4.5 mm long in the mature bud and forming a broadly ovoid head of 1–1.1 by 1.3–1.4 mm with obtuse apex, usually indistinct from the tube; tube cylindrical, 3.7–4 mm long, 2.85–3.7 times as long as calyx, 2.7–3.1 times as long as lobes, straight, broader at base and slightly swollen around the stamens; lobes broadly and obliquely ovate to suborbicular, 1.2–1.5 by 1–1.4 mm, 1–1.2 times as long as wide, apex rounded, entire. *Stamens* inserted at 3.5–3.7 mm from base, 0.9–0.95 of the length of the corolla tube; filaments filiform, 0.5 mm long; anthers narrowly cordate, 1–1.1 by 0.3 mm, 3.3–3.7 times as long as wide, apex cuspidate, glabrous. *Disc* cup-shaped, 1.1–1.2 by 0.5–0.6 mm, 0.4–0.6 times as long as the ovary, crenate. *Pistil* mostly glabrous; ovary syncarpous, globose, 1–1.2 mm long, notched at apex; style filiform, 2–2.2 mm long, broader at the apex; pistil head 0.8 mm long, of two distinct parts: the apical part obtusely conical, 0.4 by 0.2 mm, puberulous; the basal part subglobose or broadly ovoid, 0.4 by 0.4–0.5 mm, puberulous, with a very short membranous collar at the base. *Fruits* bluish-black when mature, partly syncarpous, obversely trapezoid, 10.8–13 by 14.8–20 mm, 0.65–0.75 times as long as wide, connate for 6–7 mm, 0.55 of mericarp length, with two acute apices, distance between apices 8.8–14.5 mm, 0.7–1.3 of mericarp length, or 1.3–2.4 of connate part, narrowed but thickened at the base, sometimes only one carpel developing, glabrous; endocarps brownish-white, ovoid, obtuse or acute, thickened at the base, rugose, hard. *Seeds* one in each endocarp, ovoid, acute.

Distribution — Malesia: Indonesia (Maluku and Irian Jaya), Papua New Guinea.

Habitat — Primary forests. On limestone soil. Altitude 100–1100 m.

Specimens examined:

INDONESIA. Maluku: Seram: sin. loc., *Kornassi 488* (L, U), *Rutten 1894* (L, U), *2226* (L, U). Irian Jaya: Nabire, *Kanehira & Hatusima 11544* (A), *11768* (A); Waobu, *Satake & Niimura 709* (L), *714* (L); Wati, *Ijiri & Niimura 659* (L); Rumabatu, *Ijiri & Niimura 345* (L); Sorong, *Pleyte 660* (K, L); Ayawasi, *Avé 4145* (L), *Ridsdale 2423* (L); Mt Perimeles, *Pulle 468* (K, L, U).

PAPUA NEW GUINEA. New Britain, Pomio, *Lelean & Stevens 58724* (M).

7. **Rauvolfia serpentina** (L.) Benth. ex Kurz

Rauvolfia serpentina (L.) Benth. ex Kurz, For. Fl. Br. Burma 2 (1877) 171; Hook. f., Fl. Brit. India 3 (1882) 632; Boerl., Handl. 2 (1899) 393; Koord., Exk. Fl. Java 3 (1912) 74; Koord.-Schum., Syst. Verz. (1912) 175; Merr., Int. Rumph. (1917) 430; Enum. Born. (1921) 499; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2 (1927) 1286; Kerr, Fl. Siam. Enum. 2 (1939) 430; Bakh. f., Blumea 6 (1950) 386; Monach., Econ. Bot. 8 (1954) 349; Backer & Bakh. f., Fl. Java 2 (1965) 231; Markgr., Blumea 30 (1984) 161. — *Ophioxylon serpentinum* L., Sp. Pl. (1753) 1043. — Type: *Hermann 398* [Herb. Hermann 4: 77] (lecto BM, n.v., designated by Leeuwenberg in Jarvis et al., 1993), Sri Lanka, sin. loc.

Ophioxylon trifoliatum Gaertn., Fruct. 2 (1791) 129, t. 109. — *Rauvolfia trifoliata* (Gaertn.) Baill., Hist. Pl. 10 (1891) 171, in adnot. — Type: icon. cit.

Ophioxylon album Gaertn., Fruct. 2 (1791) 129. — Type: Rumphius, Herb. Amb. 7 (Auctuarium) t. (1755) 16.

Ophioxylon obversum Miq., Fl. Ind. Bat. 2 (1856) 405. — *Rauvolfia obversa* (Miq.) Baill., Hist. Pl. 10 (1891) 171, in adnot. — *Rauvolfia obversa* (Miq.) Koord., Nat. Tijdschr. Ned. Ind. 60 (1900) 243, superfl. comb. — *Rauvolfia serpentina* var. *obversa* (Miq.) Bakh.f., Blumea 6 (1950) 386. — Type: *Horsfield s.n.* (lecto K, designated here; iso BM, U), Indonesia, E Java, Blambangan.

Shrub 0.3–1.5 m high, unbranched or rarely branched. Branches terete to weakly angled, 0.3–0.4 cm diam., slightly rough, rather densely lenticellate; branchlets glabrous. *Leaves* confined to the apex of the branchlets, in whorls of 3 or 4 (or 5), very rarely opposite; petiole 0.3–2.4(–3) cm long, glabrous; colleters in the axils few, narrowly ovate, 0.8–1 by 0.2 mm, obtuse, rather thick; blade papyraceous, ovate, elliptic, obovate, or narrowly obovate, 5–19.5 by 1.6–7.3 cm, 1.7–4.6 times as long as wide, entire, apex acute, acuminate, or slightly obtuse, base cuneate to slightly decurrent, glabrous on both sides; midrib prominent on both sides; secondary veins prominent on both sides, conspicuous, arcuate-ascending, forming an angle of 45–50(–60)° with the midrib, often rather straight at base, not reaching the margin, not joining, in 5–10 pairs, 0.4–3.3 cm spaced; tertiary veins usually inconspicuous. *Inflorescences* 3.8–9 (–14.1) cm long, terminal cymes, sometimes also axillary, usually solitary, congested, 20–more than 35-flowered; peduncle 2.6–9.6 by 0.1–0.2 cm, rather robust, glabrous; first branch of inflorescence less than 0.3 cm long, glabrous; pedicels 0.1–0.4 cm long, glabrous; bracteoles narrowly ovate, 1–1.2 by 0.2–0.3 mm, 4.3–5 times as long as wide, sepal-like, apex acute, translucent at margin, with inconspicuous longitudinal veins, on rachis and pedicels, or rarely on apex of peduncle, both on the terminal and axillary cymes. *Sepals* narrowly ovate, 1.3–3.5 by 0.4–0.8 mm, 3.2–4.8 times as long as wide, apex acute, entire to slightly undulate, glabrous on both sides, connate at base for 0.2–0.3 mm. *Corolla* white or rather pinkish, 8–16 mm long in the mature bud and forming an ovoid head of 1.5–2.9 by 1–2 mm, glabrous outside, with two belts of indumentum inside, one pilose c. 1 mm wide around the insertion of the stamens and one from c. 2–3 mm below the mouth to the mouth; tube cylindrical, 9–18 mm long, 3–6.9 times as long as calyx, 3.6–6 times as long as lobes, slightly twisted and swollen around the stamens; lobes obliquely ovate, 2–3 by 1.2–2.1 mm, 1.3–1.8 times as long as wide, obtuse or rarely retuse, entire. *Stamens* inserted at 7.5–12 mm from base, 0.6–0.8 of tube length; filaments filiform, 0.8–1 mm long; anthers cordate to narrowly cordate, 1.1–1.5 by 0.3–0.4 mm, 2.5–4.5 times as long as wide, apex acute, glabrous. *Disc* cup-shaped, 0.8–1 by 0.6–1 mm, 0.45–0.65 times as long as the ovary, slightly crenate. *Pistil* mostly glabrous; ovary ovoid, 1.3–1.9 mm long, consisting of two carpels which are connate at the base; style filiform, 6.2–9.1 mm long; pistil head of three distinct parts: the apical part crown-shaped, 0.1 mm long; the central part cup-shaped, cylindrical or globose, 0.3–0.4 mm long; the basal part annular, 0.1 mm long, with a membranous collar at the base, the apical part sometimes obscure and fused with the central part. *Fruits* black to reddish-black when mature, syncarpous, cordate, mericarps connate at the base for 3–4 mm, or 0.55–0.65 of their length, sometimes only one carpel developing; each mericarp obliquely ovoid or subglobose,

5–6 by 4–4.5 mm, 1.2–1.3 times as long as wide, apex obtuse; endocarp white or brownish-white, rugose, very hard. *Seeds* whitish, one in each half, obliquely ovoid, 3–4 by 2.2–3 mm, 1.2–1.4 times as long as wide, acute, glabrous.

Distribution — India, Sri Lanka, Nepal, Burma, Thailand, Laos, Cambodia, Vietnam. In Malesia: Malaysia (Peninsular Malaysia); Indonesia (Java and Nusa Tenggara).

Habitat — In rather dry open areas, light woods, disturbed primary forests, or deciduous forests. Often found in specific vegetation types: in Java as an undergrowth in teak forest; in India under mango stand; in Thailand (Kanchanaburi and Saraburi) in bamboo dominated forest. Often on limestone rock or deep coral sand. Altitude 0–500 m. In Cherrapunjee, Khasi Hills, India, it also occurs at the altitude of 1330 m.

Note — According to Markgraf (1984) *Hermann s.n.* (BM), Sri Lanka, is the neotype of *R. serpentina* (L.) Benth. ex Kurz, proposed by Monachino (1954: 353). The statement is incorrect as there is no such statement in Monachino's publication. However, one of Hermann's specimens has been validly designated as a lectotype (see Jarvis et al., 1993).

Selected specimens:

INDONESIA. Java: W Java: Preanger, *Backer 815* (BO). C Java: Jepara, *Koorders 29* (BO). E Java: Blambangan, *Horsfield s.n.* (BM, K, U, type). Nusa Tenggara: E Nusa Tenggara: Sokrutung, Flores, *Schmutz 1885* (L); Lalian, N Belu, Timor, *Kooy 53* (L).

8. Rauvolfia sumatrana Jack

Rauvolfia sumatrana Jack, Mal. Misc. 1, 5 (1820) 22; G. Don, Gen. Hist. 4 (1838) 99; A.DC., Prod. 8 (1844) 337; Hassk., Flora 28 (1845) 263 (= 295); Forbes, Wand. (1885) 510; Koord. & Valeton, Bijdr. Kennis Boomsoorten Java 1 (1894) 93; Boerl., Handl. 2 (1899) 393; King & Gamble, J. As. Soc. Beng. 74, 2 (1907) 424; Koord., Exk. Fl. Java 3 (1912) 75; Koord.-Schum., Syst. Verz. 1 (1912) 176; Ridl., Fl. Mal. Pen. 2 (1923) 336; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2 (1927) 1287; Hend., J. Mal. Br. Roy. As. Soc. 17 (1939) 57; Kerr, Fl. Siam. Enum. 2 (1939) 431; Markgr., Blumea 30 (1984) 167. — *Cyrtosiphonia sumatrana* (Jack) Miq., Fl. Ind. Bat. 2 (1856) 401; Fl. Ind. Bat., Suppl. 1 (1861) 228. — Type: *Diepenhorst s.n.* (neotype K, designated by Markgraf, 1984), Indonesia, W Sumatra, Pariaman.

Rauvolfia sumatrana var. *longifolia* Blume, Bijdr. (1826) 1034; Koord. & Valeton, Bijdr. Kennis Boomsoorten Java 1 (1894) 94. — Type: not found.

Rauvolfia reflexa Teijsm. & Binn., Nat. Tijd. Ned. Ind. 3 (1852) 329; Koord. & Valeton, Bijdr. Kennis Boomsoorten Java 1 (1894) 89; Koord., Meded. Lands Plantentuin 11 (1894) 81; Boerl., Handl. 2 (1899) 393; Koord.-Schum., Syst. Verz. 1 (1912) 175; K. Heyne, Nutt. Pl. Ned. Ind., ed. 2 (1927) 1286; Bakh.f., Blumea 6 (1950) 386; Backer & Bakh.f., Fl. Java 2 (1965) 251; Whitmore, Mal. For. Rec. 26 (1971) 26; Tree Fl. Mal. 2 (1973) 21; Markgr., Blumea 30 (1984) 164. — *Cyrtosiphonia reflexa* (Teijsm. & Binn.) Miq., Fl. Ind. Bat. 2 (1856) 402, syn. nov. — Type: *Teijsmann s.n.*, 1867 (lecto L, designated by Markgraf, 1984), Indonesia, Hortus Buitenzorg (= Bogor), Java.

Cyrtosiphonia spectabilis Miq., Fl. Ind. Bat. 2 (1856) 402; Fl. Ind. Bat., Suppl. 1 (1861) 228. — *Rauvolfia spectabilis* (Miq.) Boerl., Handl. 2 (1899) 393; Backer & Bakh.f., Fl. Java 2 (1965) 231. — Type: *Teijsmann 995* (lecto U, designated here; iso BO, L), Indonesia, W Sumatra, Padang.

Cyrtosiphonia madurensis Teijsm. & Binn., Cat. Hort. Bog. (1866) 125. — *Rauvolfia madurensis* (Teijsm. & Binn.) Boerl., Handl. 2 (1899) 393. — *Rauvolfia madurensis* (Teijsm. & Binn.) Burck ex Koord.-Schum., Syst. Verz. 1 (1912) 174, superfl. comb. — Type: *Teijsmann s.n.* (lecto BO, designated here), Indonesia, E Java, Madura.

Rauvolfia samarensis Merr., Philipp. J. Sci., Bot. 4 (1900) 316, syn. nov.; Enum. Philipp. Flow. Pl. 3 (1923) 329; Pl. Elm. Born. (1929) 254; Markgr., Bot. Jahrb. 61 (1928) 189; Blumea 30 (1984) 165. — Type: *Merrill 5233* (holo PNH†; lecto L, designated here; iso BO), Philippines, Samar.
Rauvolfia palawanensis Elmer, Leafl. Philipp. Bot. 4 (1912) 1462. — Type: *Elmer 12591* (holo PNH†; lecto BM, designated here; iso A, G, GH, K, L, U), Philippines, Palawan.

Tree (2.5–)5–20(–27) m high. Branches rather densely lenticellate; branchlets glabrous. *Leaves* in whorls of 3 or 4; petiole 0.6–5 cm long, glabrous; blade coriaceous when dried, elliptic, narrowly elliptic, obovate, or narrowly obovate, 7–28 by 2–9.3 cm, 1.5–4.8(–6) times as long as wide, entire to slightly undulate, apex variable, acute, acuminate, rarely rounded, retuse, or emarginate, base cuneate to decurrent, glabrous on both sides; midrib prominent on abaxial side, impressed on adaxial side; secondary veins more or less prominent, conspicuous, straight, or slightly arcuate-ascending, forming an angle of 45–90° with the midrib, not reaching the margins, joining near the margin, forming a submarginal vein, in 9–32 pairs, 0.15–1(–1.5) cm spaced; tertiary venation not prominent, conspicuous. *Inflorescences* variable in size, (2.5–)5–21.5 (–27) cm long, in whorls of 3–5(–6), 26–more than 35-flowered; peduncle 1.8–14 by 0.2–0.25 cm; first branch of inflorescence 1–4.5(–6) cm long; pedicels 0.1–1.2 cm long, glabrous. *Sepals* variable in shape, slightly rhomboid, broadly ovate, or suborbicular, rarely subtriangular, 1–2 by 1.4–2 mm, 0.5–1.3 times as long as wide, apex obtuse to rounded, rarely acute, entire to undulate, glabrous on both sides, connate at base for 1 mm. *Corolla* white, glabrous outside, villose in a belt of 1.5–2 mm wide just at the mouth, and gradually turning sparsely so downwards, 3.5–5 mm long in the mature bud and forming a broadly ovoid to subglobose head of 1–2.2 by 1.3–2 mm, usually indistinct from the tube; tube cylindrical, 3.4–4.9 mm long, 2.4–3.4 times as long as calyx, 1.95–3.3 times as long as lobes, broader towards the apex; lobes obliquely and broadly ovate, or suborbicular, 1.3–2.1 by 1.3–2.1 mm, 0.7–1 times as long as wide, rounded, rarely retuse, entire. *Stamens* inserted at 2.5–4.5 mm from base, 0.68–0.95 of the length of the corolla tube; filaments filiform, 0.5–0.8 mm long; anthers cordate to narrowly cordate, 0.9–1.5 by 0.25–0.7 mm, 1.6–4 times as long as wide, apex cuspidate, glabrous. *Disc* cup-shaped, 1–1.8 by 0.7–1.4 mm, or 0.6–0.9 times as long as ovary, crenate. *Pistil* glabrous; ovary ovoid, syncarpous, 1–1.75 mm long; style filiform, 1.2–2.5 mm long, not thin, broader at the top; pistil head 0.6–1 mm long, of three distinct parts: the apical part ovoid or rhomboid, bilobed, 0.1–0.4 by 0.2–0.5 mm; the central part annular, 0.2–0.3 by 0.3–0.5 mm, puberulous, sometimes obscure; the basal part cylindrical, 0.3–0.6 by 0.4–0.7 mm, puberulous, with a very short membranous collar at the base. *Fruits* bluish-black or purplish-black when mature, syncarpous, variable in shape, globose, rounded, sometimes truncate, retuse or slightly cleft at apex, rarely ovoid or ellipsoid, 6.5–21 by 7–18 mm, 0.9–1.8 times as long as wide, connate for 6–11.7 mm, 0.9–1 of its length, distance between apices 2–3 mm, 0.15–0.3 of fruit length, or 0.17–0.3 of the length of the connate part, glabrous; endocarps brownish-white, two, sometimes only one developing, ovoid, obtuse or acute, with one or two distinct thickenings at the base, rugose, hard. *Seeds* whitish, one in each endocarp, ovoid, acute, 3–9(–12) by 1–3.2 mm, 2.2–4 times as long as wide, glabrous.

Distribution — Burma, Thailand. In Malesia: Malaysia (Peninsular Malaysia and Borneo), Indonesia (Sumatra, Java, Nusa Tenggara, Kalimantan, Sulawesi and Maluku), Philippines (Luzon, Samar, Leyte, Panay, Mindanao and Palawan).

Habitat — In relatively open areas, scrub, secondary forests, coastal forests, swamps (fresh water, seasonal, or peat swamps), lowland rain forests, and montane rain forests. Also in rather specific vegetation types: in dipterocarp forests, teak forests, and *Agathis damara* dominated forests. On sandy loam, wet clay soil, red to black soil, or coral-limestone hill. Mostly occurs at the altitude of 0–100 m, but also found at the altitude of 100–1600 m.

Notes — The so-called *R. sumatrana* group is complex and very difficult to subdivide. In the original description of *R. samarensis* it was mentioned that the species is well characterized by its many-nerved leaves. However, this character can also be found in specimens identified as *R. sumatrana* (*Lajangah 44652*) and *R. reflexa* specimens (*Prawiroatmodjo & Maskuri 1499*; *Dewol & Rahman 89977*). The fruit of *R. samarensis* is quite variable in shape, from ovoid (*Agama 9291*), ellipsoid and obovate (*Sulit 21612*), to globose (*Agama & Kadir 2820*; *Enggoh 10515*), which is quite similar to the globose shape of *R. sumatrana* and *R. reflexa*. These three species also show similarities in flower characters. In an attempt to subdivide the group, Markgraf (1984) proposed the disc/ovary proportion to distinguish *R. sumatrana* and *R. samarensis* from *R. reflexa*. However, the disc of all three species is more than half the length of the ovary (0.57–0.87) and show no significant differences. We have concluded, therefore, that *R. samarensis* and *R. reflexa* cannot be separated from *R. sumatrana*.

Specimens from Flores, Indonesia, tend to have a very short inflorescence, shorter than elsewhere. However, they show no significant differences in any other characters.

Selected specimens:

MALAYSIA. Peninsular Malaysia: Perak: Tambun, *Burkill 6280* (K). Borneo: Sarawak: Kuching, *Chew Wee Lek 689* (A, G, K, L). Sabah: Sabah National Park, *Lajangah 44652* (K, L).

INDONESIA. Sumatra: Aceh: Kluet Nature Reserve, *De Wilde & De Wilde-Duyfjes 20832* (L). N Sumatra: Simeulue Is., *Achmad 248* (L, U). W Sumatra: Padang, *Teijsmann 995* (BO, L, U, type); Pariaman, *Diepenhorst s.n.* (K, type). Jambi: Sungai Kering, Kerinci, *Alston 14128* (BM, L). Java: W Java: Ujung Kulon, *Wirawan 369* (A, L); Hortus Buitenzorg (= Bogor) *Teijsmann s.n.* (L, type). C Java: Banjarnegara-Banyumas, *Koorders 159* (L). E Java: Jember, *Koorders 20361* (BO, K, L); Madura, *Teijsmann s.n.* (BO, type). Nusa Tenggara: W Nusa Tenggara: Sumbawa, *Elbert 3708* (L), *3760* (L), *3927* (L). E Nusa Tenggara: Flores, *Schmutz 1313* (L), *1544* (L), *1715* (L). Kalimantan: W Kalimantan: Mt Ranai, *Van Steenis 1241* (L). S Kalimantan: Muara Uya, *Kuswata 985* (A, L). E Kalimantan: Sangkulirang Is., *Kostermans 4862* (A, K, L). Sulawesi: N Sulawesi: Minahasa, *Koorders 16053* (BO, L). C Sulawesi: Poso, *Leeuwenberg et al. 14564* (A). SE Sulawesi: Buton Is., *Elbert 2647* (L), *2758* (L). S Sulawesi: Malili, *Boschproefstation 19695* (A, L). Maluku: Morotai, *Kostermans & Soegeng 996* (L), *Tangkilisan 206* (A, K); Halmahera, *De Vogel 3197* (L); Aru Is., *Buwalda 5244* (A, L).

PHILIPPINES. Luzon: Mt Buluran, *Elmer 15363* (A, BM, G, GH, K, L, U, UC), *15582* (A, BM, G, GH, K, L, U), *Sulit 2802* (A, L). Samar: Laoang, *Merrill 5233* (BO, L, type); Mt Sohoton, *Gutierrez 631* (L). Leyte: Cabalian, *Ramos 41547* (BO, L); Biliran Is., Mt Suiro, *Sulit 21612* (L). Panay: Capiz, Jamindan, *Ramos & Edaño 30985* (A, K). Mindanao: Mt Urdaneta, *Elmer 13302* (BM, G, GH, K, L, U, UC), *13921* (A, BM, G, GH, K, L, U, UC); Mt Apo, *Elmer 11235* (BM, G, L). Palawan: Addison Peak, *Elmer 12591* (A, BM, G, GH, K, L, U, type); Mt Beaufort, *Podzorski 521* (L).

9. Rauvolfia verticillata (Lour.) Baill.

Rauvolfia verticillata (Lour.) Baill., Bull. Mens. Soc. Linn. Paris 1 (1888) 768; Tsiang, Sunyatsenia 2 (1934) 109; Merr., Trans. Am. Phil. Soc. n.s. 24 (1935) 312; Monach., Econ. Bot. 8 (1954) 358; Whitmore, Tree Fl. Mal. 2 (1973) 21; Markgr., Blumea 30 (1984) 160. — *Dissolena verti-*

cillata Lour., Fl. Cochinch. (1790) 137. — *Cerbera chinensis* Spreng., Syst. 1 (1825) 642, nom. illeg. — Type: *Loureiro s.n.* (lecto BM, designated here; iso P), China, Canton (= Guangzhou).

Ophioxylon maius Hassk., Flora 28 (1845) 263 bis (= 265). — *Rauvolfia maior* (Hassk.) G. Nicholson, Dict. Gard. 3 (1886) 279. — Type: *Teijsmann s.n.* (lecto L), Indonesia, W Java, Hortus Botanicus Bogoriensis.

Hunteria sundana Miq., Fl. Ind. Bat. 2 (1856) 409. — Type: not found.

Hunteria sundana var. *minor* Miq., Fl. Ind. Bat. 2 (1856) 409. — Type: *Horsfield s.n.* (lecto K, designated here; iso BM), Indonesia, E Java, Pacitan.

Ophioxylon chinensis Hance, J. Bot. 3 (1865) 380. — *Rauvolfia chinensis* (Hance) Hemsl., J. Linn. Soc. Bot. 26 (1889) 95. — Type: *Sampson s.n.* (holo K), China, Guangzhou.

Rauvolfia serpentina (L.) Benth. ex Kurz var. *gracilis* Stapf, Trans. Linn. Soc. II, Bot. 4 (1894) 207. — Type: *Haviland 1346* (holo K), Malaysia, N Kalimantan, Kinabalu-Penokok.

Rauvolfia perakensis King & Gamble, Mat. Fl. Mal. Pen. 19 (1907) 424; Ridl., Fl. Mal. Pen. 2 (1923) 335. — Type: *Scortechini 8410* (lecto K, designated here), Malaysia, Perak.

Rauvolfia membranacea Merr., Philipp. J. Sci. 14 (1919) 449. — Type: *Ramos 33214* (holo PNH†; lecto K, designated here; iso A, BM, BO, L), Philippines, Luzon, Ilocos Norte.

Rauvolfia loheri Merr., Philipp. J. Sci. 27 (1925) 50. — Type: *Loher 12500* (holo PNH†; lecto K, designated here; iso M, UC), Philippines, Rizal-Luzon.

Tabernaemontana cylindraca Steud., Nom. ed. 2, 2 (1841) 658, nom. nud., based on *Wallich 4451* (K-W).

Rauvolfia serpentina auct. non Benth. ex Kurz: Ridl., Trans. Linn. Soc. II, Bot. 3 (1893) 319.

Shrub, 0.5–5 m high. Branches slightly rough, slightly lenticellate; branchlets glabrous. *Leaves* confined to the apex of the branchlets, usually in whorls of 3 or 4, sometimes also opposite; petiole 0.2–2 cm long, glabrous; colleters narrowly ovate, 0.8–1 by 0.2 mm, obtuse, rather thick, at the base of petioles, usually arranged in a row; blade papyraceous, obovate, elliptic, narrowly obovate, or narrowly elliptic, 5–25 by 2.2–10 cm, 2–4.5(–6.5) times as long as wide, entire, apex acuminate to cuspidate, base cuneate to slightly decurrent, glabrous on both sides; midrib prominent on both sides; secondary veins prominent on both sides, arcuate-ascending, rarely straight, forming an angle of (45–)55–85° with the midrib, not reaching the margins, sometimes joining near the margin, forming a submarginal vein, in 6–13 pairs, 0.5–2.5 cm spaced; tertiary venation not prominent, sometimes conspicuous, reticulate. *Inflorescences* 3–12 cm long, usually in whorls of 3 or 4, rarely solitary, lax, 8–24(–more than 35)-flowered; peduncle 3–7.7 by 0.1–0.2 cm, rather delicate, glabrous; first branch of inflorescence 0.5–3 cm, glabrous; pedicels 0.2–1.2 cm long, glabrous; bracteoles narrowly ovate, 0.5–1.5 by 0.1–0.3 mm, 4–8 times as long as wide, sepal-like, apex acute, translucent at margin, on branches of inflorescence and pedicels. *Sepals* ovate to narrowly ovate, rarely subtriangular, very variable in size, even within a single cyme, 2–5.5 by 0.8–1 mm, 2–7 times as long as wide, apex acute to acuminate, entire to slightly undulate, glabrous on both sides, connate at base for 0.2–0.3 mm. *Corolla* white or slightly pinkish, 11–19 mm long in the mature bud and forming an ovoid to narrowly ovoid head of 1–2 by 2–5 mm, glabrous outside, villose from just below the mouth to about 3 mm below the insertion of the stamens; tube cylindrical, 9–17 mm long, 2.5–8 times as long as calyx, (2–)3.5–5 times as long as lobes, straight to slightly twisted, swollen around the stamens; lobes suborbicular to obliquely ovate, 2–4.5(–6.5) by 2–3.5(–6) mm, 1–1.5 times as long as wide, obtuse to rounded. *Stamens* inserted at 6–10 mm from base, 0.4–0.7 of the length of the corolla tube; filaments filiform, 0.8–1 mm long; anthers cordate to narrowly cordate, 1–1.5 by 0.3–0.6 mm, 2.2–4.3 times

as long as wide, apex acute, glabrous. *Disc* cup-shaped, 0.8–1.4 by 0.6–1 mm, 0.4–0.6 times as long as the ovary, slightly crenate, sometimes thicker at the edge. *Pistil* mostly glabrous; ovary ovoid, 1.2–2.1 mm long, consisting of two carpels which are free from each other; style filiform, 4–6.5 mm long; pistil head of two distinct parts: the apical part crown-shaped, 0.2–0.5 mm long; the basal part globose or cylindrical, 0.4–0.6 mm long, puberulous, with a membranous collar at the base. *Fruits* whitish-purple when mature, usually of paired mericarps free from each other, with a very short stalk, sometimes only one carpel developing, ovoid, sometimes rather straight on one side and convex on the other side, 9–14 by 4.5–7 mm, 1.7–2.5 times as long as wide, apex acute to obtuse; endocarp brown to brownish-white, rugose, rather hard. *Seed* one, obliquely ovoid, 7–11 by 4–5 mm, 1.7–2.5 times as long as wide, acute at both ends, brownish, glabrous.

Distribution — India, Sri Lanka, Laos, Burma, Thailand, China (type), Taiwan, Laos, Cambodia, Vietnam. In Malesia: Malaysia (Peninsular Malaysia and Borneo); Indonesia (Sumatra, Java, Bali, Kalimantan, Sulawesi and Nusa Tenggara); Philippines (Luzon).

Habitat — In open areas, low land and montane rain forests. Also found in dipterocarp forests and bamboo-dominated forests. On clay, black soil, or limestone rock. Commonly found at a very wide range of altitudes, from 30–2000 m. In Nuwara-Eliya, Sri Lanka, the species even occurs in montane forest at 2400 m.

Note — *Cerbera chinensis* Spreng. and *Ophioxylon chinensis* Hance are heterotypic. Therefore, as *Rauvolfia chinensis* Hemsl. was clearly a new combination based on *O. chinensis* Hance, the correct authority is *R. chinensis* (Hance) Hemsl., not (Spreng.) Hemsl.

Selected specimens:

MALAYSIA. Peninsular Malaysia: Kedah: Gunung Geriang, *Ridley 14948* (BM, K). Perak: *Scortechini 8410* (K, type). Kelantan: Kota Baharu, *Corner 33405* (A, K). Pahang: Cameron Highlands, *Nur 32601* (A, K, L). Selangor: Gentings, *Saw Leng Guan 34299* (K). Negeri Sembilan: Ladang-Bahau, *Carrick 683* (K). Borneo: Sabah: Kinabalu National Park, *Stevens et al. 663* (A, L).

INDONESIA. Sumatra: Aceh: Kutacane, *De Wilde & De Wilde-Duyfjes 18226* (K, L), *18344* (L). N Sumatra: Toba, *Sibuea 5719* (A, L), *5747* (A, L). W Sumatra: Payakumbuh, *Meijer 5640* (L), *5642* (A, L). Java: W Java: Hortus Botanicus Bogoriensis, *Teijsmann s.n.* (L, type). C Java: Rembang, *Koorders 29156* (L), *42534* (L); Ungaran, *Horsfield s.n.* (L, U, type). E Java: Pacitan, *Horsfield s.n.* (BM, K, type). Bali: Candi Kuning, *McDonald & Ismail 4944* (A, K). Kalimantan: E Kalimantan: Long Bawan, *Kato et al. 11262* (L). Sulawesi: C Sulawesi: Sopu Valley, *Van Balgooy 3082* (A, L). Nusa Tenggara: W Nusa Tenggara: Mt Rinjani-Lombok, *Elbert 943* (L), *1014* (L), *1538* (L), *2444* (L).

PHILIPPINES. Luzon: Ilocos Norte: Mt Nagapatan, *Ramos 33214* (A, BM, BO, K, L, type). Benguet: Agno River, *Ramos & Edaño 45063* (UC). Bataan: Mt Marivales, *Whitford 290* (K). Rizal: *Loher 12500* (K, M, UC, type).

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SPECIMENS STUDIED

Only those specimens with a clearly identified collector and collection number are listed.

Rauvolfia

1. *amsoniifolia*
2. *javanica*
3. *kamarora*
4. *moluccana*
5. *oligantha*
6. *rostrata*
7. *serpentina*
8. *sumatrana*
9. *verticillata*

Aban 30635: 8; 32432: 8; 32931: 8; 81149: 8 — Aban & Patrick 73667: 8 — Achmad 248: 8 — Adduru 39: 1; 102: 1 — Afriastini Bl 1: 9; Bl 66: 9; 546: 9 — Agama 9291: 8 — Agama & Kadir 2820: 8 — Agama & Valera 9443: 8 — Alston 14118: 2; 14128: 8 — Alvarez 22111: 1 — Amdjah 181: 8 — Amin 90409: 8; 106815: 8 — Amin & Francis 116147: 8 — Amin & Jarius 114285: 8 — Ampuria 32838: 8; 33317: 8; 36527: 8; 36599: 8 — Anderson 19120: 8 — Apostol 3442: 8 — Arsat 1063: 8; 1207: 8; 1267: 8 — Arshid 88631: 8; 89181: 8 — Avé 4145: 6.

Bacani 16505: 1 — Backer 815: 7; 8293: 7; 24261: 8; 36503: 7; 37081: 9; 37098: 9; 37242: 7 — Badak 32332: 9 — Bailes & Birb 864: 9 — Bartlett 8540: 9 — Bartlett & La Rue 63: 9; 94: 9; 193: 9; 198: 9; 393: 9 — Beaman 7215: 9; 7367: 9; 7436: 9; 7523: 9; 8494: 9; 8699: 9; 9015: 9; 9187: 9; 9249: 9 — Beumée 1533: 9; 4846: 8 — Bisset 756: 8; 760: 8; 763: 8; 764: 8; 779: 9 — Bloembergen 628: 7; 4196: 9; 4406: 4 — Boschproefstation 3011: 8; 5947: 8; 17155: 8; 19695: 8; 24262: 1; 25403: 4 — Bouman-Houtman 35: 1 — Brand 39977: 8 — Bunchuai 59: 7 — Bünnemeijer 9062: 8 — Burkill 6280: 8 — Burkill & Haniff 12625: 9 — Buwalda 5244: 8; 7245: 9 — Buysman 440: 9.

Carrick 683: 9 — Chand 1688: 7; 3080: 7; 5767: 7 — Chew & Corner 4018: 9; 4342: 9; 4565: 9; 6019: 9 — Chew et al. 1239: 9; 1277: 9; 2965: 8 — Chew Wee Lek 689: 8 — Clark 992: 1 — Clason 115: 7 — Clemens 1900: 1; 5170: 9; 10377: 9; 17559: 1; 26182: 9; 27196: 8; 28110: 9; 28200: 9; 29656: 9; 30328: 9; 30768: 9; 35008: 9; 51155: 9 — Cockburn 85064: 8 — Coert 1422: 9 — Colfs 173: 8 — Condon 19: 7 — Conklin 37945: 1 — Corner 33405: 9 — Cuming 1133: 1; 1249: 1; 1269: 1.

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