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MARGARITARIA (EUPHORBIACEAE) IN MALESIA

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SUMMARY

The genus Margaritaria is revised for Malesia. Two species are recognised, one of these including two forms.

Key words: Euphorbiaceae, Margaritaria, Malesia.

INTRODUCTION

Linnaeus filius established the genus Margaritaria in 1781, based on the species M. nobilis L.f. from Surinam. A confused taxonomic history followed. De Jussieu (1824) suggested a possible relationship between Margaritaria and Cicca L. Baillon (1858) placed species of Margaritaria not only into four different sections of Cicca but also into another genus Zygospermum Thwaites ex Baill. Müller Argoviensis (1866), agreeing that Cicca and Margaritaria were related, moved one species of Cicca to subsect. Cicca and three species to subsect. Margaritaria in Phyllanthus sect. Cicca. Furthermore, Müller Argoviensis realised that Old World taxa described under Prosorus Dalzell (Dalzell, 1852; Thwaites, 1856) and Zygospermum Thwaites ex Baill. were related to New World Margaritaria and placed them into a third subsection, Prosorus, of Phyllanthus sect. Cicca. Bentham & Hooker (1880) rejected Margaritaria as being established on a mixture of two taxa and included Prosorus in *Phyllanthus* sect. *Cicca*, though with reservations. *Prosorus* was eventually recognised as a separate section of *Phyllanthus* by Hooker (1887). Pax (1896) and Pax & Hoffmann (1931) reverted to Müller's interpretation and put both Cicca and Margaritaria into Phyllanthus sect. Cicca. In 1957 Webster resurrected Margaritaria at generic level, followed by Airy Shaw (1966). Webster revised the genus fully in 1979.

Webster (1994) included *Margaritaria* in subfamily Phyllanthoideae Asch. tribe Phyllantheae Dumort. subtribe Flueggeinae Müll.Arg. together with 8 other genera. *Margaritaria* is widely recognised as being distinct from *Phyllanthus* (including *Cicca*) by having the following combination of characters: a lack of phyllanthoid branching; an annular rather than lobed disc in its staminate flower; seeds with fleshy exotesta and thick bony endotesta; fruits with a brittle, irregularly dehiscing papery endocarp. Within its subtribe it most closely resembles *Flueggea* from which it is distinguished by the lack of a pistillode in its staminate flower and the presence of four instead of five sepals.

MARGARITARIA

Margaritaria L.f., Suppl. Pl. (1781) 66; Airy Shaw, Kew Bull. 20 (1966) 386; Kew Bull. Add. Ser. 4 (1975) 175; Webster, J. Arnold Arbor. 60 (1979) 403; Airy Shaw, Kew Bull. Add. Ser. 8 (1980) 173; Webster, Ann. Missouri Bot. Gard. 81 (1994) 44. — Type: Margaritaria nobilis L.f.

Prosorus Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4 (1852) 345. — Type: Prosorus indicus Dalzell, as 'indica' [= Margaritaria indica (Dalzell) Airy Shaw].

Zygospermum Thwaites ex Baill., Étude Gén. Euphorb. (1858) 620. — Type: Zygospermum zeylanicum Thwaites ex Baill. [= Margaritaria cyanosperma (Gaertn.) Airy Shaw].

Calococcus Kurz ex Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 27 (1864) 48. — Type: Calococcus sundaicus Kurz apud Teijsm. & Binn. [= Margaritaria indica (Dalzell) Airy Shaw].

Dioecious shrubs or trees, usually deciduous, new leaves appearing with the flowers. *Bark* lenticellate. *Leaves* distichous, shortly petiolate, simple, entire, penninerved, usually chartaceous; stipules entire or denticulate, caducous or subpersistent. *Flowers* in clusters near the axils of young leafy branches, males several per cluster, females few or solitary. *Staminate flower*: pedicels capillary; calyx lobes 4, biseriate, unequal, the outer pair often smaller; petals absent; disc annular, entire, adnate to base of calyx; stamens 4, filaments free, anthers blunt, extrorse, dehiscing longitudinally; pistillode absent. *Pistillate flower*: pedicel terete; calyx, corolla and disc as in the male; ovary 2–6-locular (3-locular in Malesia), ovules 2 per locule, hemitropous; styles free or connate at the base, bifid or bipartite. *Fruits* subglobose, capsular, usually 3- or 4-lobed, dehiscing irregularly, the exocarp usually separating from the hyaline, brittle, papery endocarp. *Seeds* usually coherent in pairs in each locule, plano-convex, ecar-unculate; sarcotesta fleshy, glistening bluish purple; sclerotesta thick, woody or bony, smooth or rugose, invaginated at the chalazal end; endosperm copious; embryo straight or slightly curved; cotyledons thin, flat, much larger than the radicle.

Distribution — 14 species of which 2 occur in Malesia. Pantropical excluding the Pacific Islands.

Habitat — Deciduous forest, riparian forest, evergreen forest and dry forest, usually in secondary vegetation, or in scrub vegetation; occasionally on limestone; altitude up to 1000 m.

Ecology — Flowers visited by bees (*Podzorski SMHI 2036*). The fleshy seeds with their distinctive glistening bluish purple sarcotesta are probably dispersed by birds.

Note — The precocious flowering behaviour of *Margaritaria* may help to explain why so few flowering specimens are collected. They may possibly simply be overlooked until the distinctive fruits appear. Consequently the distribution of the species could be wider than that deduced from herbarium specimens.

KEY TO THE SPECIES

la.	Leaves large, up to 17 cm long; petiole channelled adaxially. Fruits 9–12 mm
	diam., thinly crustaceous; endotesta of seed usually distinctly rugose
b.	Leaves small, up to 4 cm long; petiole not channelled adaxially. Fruits 6-8 mm
	diam., firm in texture; endotesta of seed smooth 2. M. luzoniensis

1. Margaritaria indica (Dalzell) Airy Shaw — Fig. 1

Margaritaria indica (Dalzell) Airy Shaw, Kew Bull. 20 (1966) 387; 25 (1971) 492. — Prosorus indicus Dalzell, Hooker's J. Bot. Kew Gard. Misc. 4 (1852) 345. — Phyllanthus indicus (Dalzell) Müll. Arg., Linnaea 32 (1863) 52. — Type: Dalzell s. n. (holo K), India, Deccan.

Calococcus sundaicus Kurz ex Teijsm. & Binn., Natuurk. Tijdschr. Ned.-Indië 27 (1864) 48. — *Phyllanthus sundaicus* (Kurz ex Teijsm. & Binn.) Müll.Arg. in DC., Prodr. 15, 2 (1866) 1272. — Diasperus sundaicus (Kurz ex Teijsm. & Binn.) Kuntze, Revis. Gen. Pl. 2 (1891) 599. — Type: Teijsmann s.n. (holo ?BO n.v.; iso ?G n.v.), Java, Karimonjava Isl.

Tree up to 30 m, bole up to 15 m, up to 45 cm diam.; buttresses few, up to 1.2 m upwards, up to 15 cm outwards and up to 25 cm thick. Outer bark brown, red-brown or orange-brown, smooth, finely cracked, flaking in places or peeling strongly; inner bark pink, white or pale brown; sapwood yellow, cream or white. Twigs with reddish tinge when young and covered with elongate white lenticels. Stipules lanceolate, up to 4.5 mm long, membranaceous, apex acuminate. Leaves: petiole 3.5-7(-11) mm long, glabrous, channelled adaxially; blade elliptic to obovate, often narrowly so, up to 17 by 8.3 cm; base attenuate to rounded and decurrent with the petiole; margin entire sometimes incurved or finely undulate; apex acuminate, occasionally apiculate or obtuse to rounded; midrib channelled above, concave below; secondary veins 6-12 pairs, slightly raised above, pinnate, looped; tertiary veins reticulate, prominulous on both surfaces. Staminate flowers minute, in clusters of 2-28; pedicels up to 7 mm long; sepals: the inner pair obovate, 1.2–1.6 by 1–1.4 mm wide, the outer pair ovate, 0.8-1.3 by 0.8-1 mm wide; disc large, flattened, slightly lobed, 0.6-1.3 mm diam.; stamens: filaments 0.8–1.5 mm long, anthers oblong, 0.7–0.8 mm long. Pistillate flowers in clusters of 1-7; pedicels up to 2.2 cm long; sepals: the inner pair obovate to oblong, c. 2 by 1.8 mm, the outer pair c. 1.5 by 1 mm; disc 1.8-2.6 mm diam.; styles spreading, 1.5-2 mm long, bifid. Fruits (6-)9-12 mm diam., drying ochreous brown, very shallowly 3-lobed with a fine suture running longitudinally along the centre of each lobe, surface reticulate; styles persistent, columella occasionally persistent. Seeds 3.8-4.8 by 2.8-3.8 mm wide.

Distribution — India, Sri Lanka, China (one collection: Kwangtung), Thailand, Vietnam (Tonkin), Australia (N Queensland: Cook District); *Malesia*: Peninsular Malaysia (two collections only, both from islands east of the Peninsula: Tioman Island, Berhala Island; not found on the mainland), Sumatra, Java, Borneo, Philippines (Luzon, Palawan, Mindanao, Sulu Islands), Lesser Sunda Islands (Sumba), Moluccas (Sula Islands: Mangoli; Tanimbar Island), New Guinea (Aru Islands only, not the mainland).

Habitat & Ecology — Rare, very scattered in primary forests, in riverine forests and peat swamps. Frequently on limestone, also on sand, clay; up to 650 m altitude. Flowering in July and August in Borneo and Java (though one specimen was seen from Sarawak which had flowered in April) and in April and May in the Philippines. Fruiting throughout the year, most commonly from July to November.

Uses — Poisonous (Burkill, 1935). The wood has been reported to be very hard (*PNH* (Sulit) 12478).

Note — Some specimens from the Philippines, Lesser Sunda Islands and Moluccas have the large leaves of *M. indica* but rather smaller (c. 6 mm diam.), firmer fruits than typical (e.g. *FB* (*Alejandro*) 27438 (Luzon), *FB* (*Natividad*) 23361 (Palawan),



Fig. 1. — a-f. Margaritaria indica (Dalzell) Airy Shaw forma indica. a. Habit; b. staminate flower; c. pistillate flower; d. fruit; e. seed; f. fruit column. — g. M. indica forma vestita (J.J. Sm.) C. Barker. Leaf (a: Korthals s. n., barcode L 0273332; b: Elmer 13132; c: PNH (Sulit) 12478; d, e: W.A.P. de Boer 6596; f: Koorders 27242; g: Koorders 2661; all L).

Weber 1195 and FB (Miranda) 22943 (Mindanao), McDonald & Sunaryo 4314 (Sumba), Buwalda 4215 and bb 24268 (Tanimbar Island)). Perhaps dimorphism of the fruits occurs or possibly some intergradation with M. luzoniensis has taken place.

KEY TO THE FORMS

- Plant completely glabrous. Fruiting pedicels c. 0.3 mm diam. and up to 2 cm long. Leaf apex acuminate to apiculate; leaves drying dark brown ... a. forma indica

a. forma indica — Fig. 1a-f, Map 1

For references see under species.

Leaves drying dark brown; petiole 3.5-7(-11) mm long, glabrous; blade elliptic to obovate, often narrowly so; apex acuminate to apiculate; midrib glabrous. Fruiting pedicel up to 2 cm long by c. 0.3 mm diam., glabrous. *Fruits* (6–)9–12 mm diam., glabrous.

Distribution — As for the species.

b. forma vestita (J.J. Sm.) C. Barker - Fig. 1g, Map 1

Margaritaria indica (Dalzell) Airy Shaw forma vestita (J.J. Sm.) C. Barker, Kew Bull. 53 (1998) 755. — Phyllanthus indicus (Dalzell) Müll. Arg. forma vestitus J.J. Sm., Koord. & Valeton, Bijdr. Kennis Boomsoorten Java 12 (1910) 87, as 'vestita'. — Margaritaria indica auct. non Airy Shaw: G.L. Webster, J. Arnold Arbor. 60 (1979) 425. — Type: Koorders 2660 (holo BO), Java, Gunung Watudodol.

Leaves drying olive-green; petiole 3.5-7(-11) mm long, very sparsely pubescent; lamina elliptic to obovate: apex obtuse to rounded; midrib abaxially very sparsely pubescent on proximal half. Fruiting pedicel up to 2.8 cm long by c. 1 mm diam., sparsely pubescent. *Fruits* c. 9 mm diam., very sparsely pubescent.

Distribution — East Java.

Notes — 1. The short, straight, spreading, multicellular hairs are clearly visible through a hand lens. They are most obvious on the fruiting pedicel, but are also found, though more sparsely, on the underside of the leaf, the petiole and the fruit.

2. Although no collector's number was given in the original description of form *vestita*, the specimen cited as holotype has the correct locality information and is assumed to be the specimen to which Smith was referring.

3. Only two specimens of form vestita have been seen.



Map 1. Distribution of *Margaritaria indica* (Dalzell) Airy Shaw forma *indica* (\bullet) and forma *vestita* (J.J. Sm.) C. Barker (O) in Malesia.

2. Margaritaria luzoniensis (Merr.) Airy Shaw — Map 2

Margaritaria luzoniensis (Merr.) Airy Shaw, Kew Bull. 20 (1966) 387. — Phyllanthus luzoniensis Merr., Philipp. J. Sci., Bot. 7 (1912) 404. — Prosorus luzoniensis (Merr.) Airy Shaw, Kew Bull. 16 (1963) 343. — Type: FB (Curran) 17698 (lectotype A; isolectotype K, L), Philippines, Luzon, Prov. Pampanga.

Tree up to 10 m high. *Twigs* with scattered brown hairs when young, glabrous with age, lenticellate. *Stipules* lanceolate, up to 1.3 mm long, membranaceous. *Leaves*: petiole 3–6.5 mm long, hirtellous, not channelled adaxially; blades narrowly obovate to elliptic, up to 4 by 2.2 cm; base narrowly cuneate and slightly decurrent with the petiole; margin entire, slightly incurved; apex rounded to obtuse; upper and lower surface sparsely hirsute, glabrescent, slightly paler beneath; midrib narrowly grooved above, concave below; secondary veins 4 or 5 pairs, pinnate, looped; tertiary veins reticulate, prominulous on both surfaces. *Staminate flowers* minute, several per axillary cluster; pedicels up to 5.2 mm long, minutely hirtellous with multicellular hairs; sepals: minutely hirtellous, the outer pair ovate, 1.1–1.5 by 0.7–0.9 mm, the inner pair obovate, 1.3–1.8 by 1.1–1.4 mm; disc thin, 0.5–0.7 mm diam.; stamens: filaments up to 1.5 mm long, anthers oblong, c. 0.6 mm long. *Pistillate flowers* not seen; fruiting pedicels up to 12 mm long. *Fruits* 6–8 mm diam., columella usually persistent after dehiscence with remnants of 3 hyaline septa. *Seeds* 4.2–4.8 by 2.5–3 mm.

Distribution — Malesia: Philippines (Luzon). Endemic.

Habitat & Ecology — Dry hills up to 50 m altitude. Flowering: April to June. Fruiting: August to September.

Note — In the early 1900s this species was reported to be one of the dominants over considerable areas of Bataan, Pampanga and Nueva Ecija Provinces (Merrill, 1912). However, only 4 collections have been seen, with 5 others being mentioned in literature (Merrill, 1912). Details of female flowers are unavailable.



Map 2. Distribution of *Margaritaria luzoniensis* (Merr.) Airy Shaw.

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IDENTIFICATION LIST

Material of Margaritaria examined:

- 1 = M. indica (Dalzell) Airy Shaw forma indica
- 2 = M. indica (Dalzell) Airy Shaw forma vestita (J.J. Sm.) C. Barker
- 3 = M. luzonensis (Merr.) Airy Shaw

Ambriansyah & Arifin AA 441: 1; W979:1 — Ampuria 40765: 1 — Anderson 12740: 1. bb series 2530: 1; 15058: 1; 18816: 1; 18880: 1; 24268: 1; 24366: 1; 29901: 1 — Beumée 5095: 1

- Brooke 9796: 1 - BS series 15589: 1; 17834: 3; 26282: 3; 44303: 1 - Buwalda 4215: 1.

De Boer 6596: 1 — De Vogel 1219: 1 — Duthie 23839: 1. Elmer 13132: 1 — Endert 2022: 1.

FB series 13225: 3; 17698: 3; 22655: 1; 22943: 1; 23361: 1; 27438: 1; 28004: 1; 29209: 1; 29210: 1 — Forbes 2733: 1 — Ford 166: 1.

Gibot 55473: 1.

Haines 4108: 1 — Hallier 1100: 1 — Horsfield 49: 1; 51: 1; 157: 1.

Jacobs 8491: 1.

Keßler et al. PK 1623: 1 — Koorders 2638: 1; 2639: 1; 2640: 1; 2641: 1; 2643: 1; 2645: 1; 2646: 1; 2647: 1; 2650: 1; 2651: 1; 2652: 1; 2653: 1; 2654: 1; 2656: 1; 2657: 1; 2658: 1; 2660: 2; 2661: 2; 14233: 1; 22554: 1; 25465: 1; 25521: 1; 26178: 1; 27239: 1; 27240: 1; 27242: 1; 27357: 1; 28096: 1; 29962: 1 — Kostermans 5455: 1; 21346: 1 — Kostermans et al. KK & SS 413: 1.

Lace 3034: 1.

- McDonald & Sunaryo 4314: 1.
- PNH series 12478: 1 Podzorski SMHI 2036: 1.
- RHT 24429: 1 Ritchie 1343: 1.
- S series 33717: 1; 40160: 1; 41810: 1 Saldanha 13263: 1 SAN series 77784: 1; 80315: 1; 82042: 1; 103307: 1; 114872: 1; 120662: 1; 123843: 1; 126494: 1; 127283: 1 SF series 29829: 1.
- Talbot 1173: 1 Tsang 29583: 1; 30219: 1.
- Van Balgooy 6803: 1 Vidal 1729: 1.
- Weber 1195: 1 --- Wight 2599: 1.