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# A TAXONOMIC REVISION OF XEROSPERMUM (SAPINDACEAE)

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## XEROSPERMUM

*Xerospermum* Blume, Rumphia 3 (1847) 99; Radlk. in Engl., Pflanzenr. 98 (1932) 936–950. – *Xerospermum* sect. *Tetrasepalum* Radlk. [in Th. Dur., Index Gen. Phan. (1887) 76, nom. nud.] in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1895) 331, nom. illeg. (I.C.B.N. ed. 1978, art. 22.1). – Type: *X. noronhianum* Blume.

*Xerospermum* sect. *Pentasepalum* Radlk. [in Th. Dur., Index Gen. Phan. (1887) 76, nom. nud.] in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1895) 331. – Syntypes: *X. acuminatum* Radlk., *X. laevigatum* Radlk.

Medium-sized trees or rarely shrubs. Axillary buds solitary, those in the lower axils developing into vegetative shoots, those in the upper axils into inflorescences. The uppermost axillary inflorescence often takes a seemingly terminal position by shifting aside and suppressing the terminal bud. The terminal bud itself may also develop into an inflorescence. Both the pseudo terminal and the terminal position of the inflorescence will lead to a sympodial pattern of branching. *Indumentum* consisting of solitary simple hairs; neither gland hairs nor glandular scales present. *Branchlets* terete, mostly only in the 1st and 2nd season canaliculate or finely ribbed, afterwards smooth, from the 2nd season on mostly black, usually only the youngest parts brownish tomentellous or -puberulous; lenticels many, scattered, pustular but mostly inconspicuous; wood cylinder and pith in cross section compact, reddish brown. *Leaves* spirally arranged, paripinnate, mostly 1- or 2-jugate, exceptionally either unifoliolate or 3-jugate, without stipules; petiole semiterete to terete, at the base slightly swollen and above hollowed; neither petiole nor rachis winged; leaf axes glabrous or variably hairy. *Leaflets* opposite, neither papillose nor glaucous beneath, either puberulous above on the midrib, beneath on midrib and nerves, glabrescent, or glabrous, mostly on the lower side with few to several orbicular flat glands above the nerve axils and/or scattered all over the leaf surface, mainly in the basal half (fig. 1c); no domatia; base symmetrical or nearly so; margin entire. *Inflorescences* in the lower leaf axils and the terminal ones mostly solitary, those in the upper leaf axils tufted; these tufts consist of a central axis and two to several branches in the axils of bud scales at or slightly above the base; the more branches to a cluster the shorter and

the more equal they are; the central axis of such a cluster may end in a vegetative terminal bud and develop later in a vegetative branch; bracts deltoid to lanceolate, up to 1.5 mm long, sparsely hairy, mostly caducous; the whole inflorescence thin-puberulous and glabrescent to glabrous. *Flowers* actinomorphic, 4- or 5-merous, unisexual, plant dioecious. *Sepals* free or slightly connate, either all about equal or the outer two slightly smaller, the outer mostly with a narrow, the inner with a broad membranaceous margin to the latter nearly completely membranaceous, entire to fringed, ciliolate, glabrous to hairy on both sides. *Petals* about equal to or slightly shorter than the sepals, sessile to variably clawed, without a scale, woolly ciliate, out- and inside often partly or completely woolly. Disk complete or interrupted, not lobed, without appendages, glabrous or exceptionally hairy, in ♀ flowers rather inconspicuous. *Stamens* 8 (exceptionally 7 or 9), hardly to distinctly exserted in ♂ flowers; filament nearly always at least partly woolly; anther attached dorsally at the base, dehiscence lateral lengthwise, glabrous or with a few hairs, sometimes ciliolate. *Pistil* 2- or exceptionally 3-merous, possibly very rarely also 1-merous; the ovary deeply lobed, warty with on top of each wart a stiff brown hair; style apical, columnar, broadened to the apex, relatively short, with a few hairs or glabrous; stigma arched in a plane perpendicular to the lobes of the ovary, elliptic, with a longitudinal groove, sometimes in fruit deeply cleft. Ovules 1 per locule, nearly basally attached, camptotropous, apotropous. *Fruits:* one or less frequently two lobes developed, in the latter case lobes widely spreading, the lobes about ellipsoid to nearly globular, slightly asymmetrical to bulging at the base on the side towards the flower axis, capsular, probably finally loculicidally dehiscent; the fruit wall outside spiny, warty, or colliculate to granular, soon glabrous, inside smooth or slightly colliculate, glabrous. *Seed* conform to the locule, hilum basal, the further part completely covered by a thin sarcotesta, testa with a pocket in which the rootlet fits (fig. 2e). Embryo transverse, the plumule lateral with a relatively big rootlet pointing downwards. *Chromosomes* n = 16 (Löve, Taxon 18, 1969: 219; Mehra et al., Sylvae Genetica 21, 1972: 99).

Distribution. Bangla Desh, Assam, Burma, the Indochinese Peninsula, the Malay Peninsula, Sumatra, Java, and Borneo. Two species.

Ecology. Often common in the middle and lower stories of the lowland and lower montane rain forests. The fruits are said to be eaten by birds, monkeys, and bats.

Uses. The thin yellow sarcotesta is eaten, but is not of importance. The opinions on the timber quality are rather divergent: fire wood, inferior timber, or a good, tough, and durable timber. See Heyne, Nutt. Pl. ed. 3 (1950) 997; Burkill, Dict. 2 (1966) 2313.

Notes. 1. In the older literature there is some confusion regarding the sarcotesta. With Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 686, the description reads: 'testa .... fleshy, pilose, simulating an aril.'. This became with Kurz, Forest Fl. Burma 1 (1877) 295: 'Seeds without arillus, the testa pilose, fleshy outside and arillus-like.'. Even with U.N. & P.C. Kanj., Das & Purkay., Fl. Assam 1 (1936) 323, it still reads: 'Seeds exarillate; testa pilose.'. I do not understand how the aril can be called pilose.

2. There exists a fairly great resemblance between *Xerospermum* and *Nephelium*, which may lead to wrong identifications. Still, there are clear differences in easily available characters between these two genera. The twigs of *Xerospermum* are mostly slender, terete, and black, those of *Nephelium* are thicker, more angular, and brown to grey. The leaves of *Xerospermum* are few-jugate, with the leaflets strictly opposite, and accordingly the leaf is terminated by a pair of leaflets; in *Nephelium* the number of leaflets may be greater, they are rarely opposite, and the leaf is often terminated by a single leaflet with the minute point of the rachis shifted aside. In *Nephelium* the lower side of the leaflets is nearly always distinctly glaucous-waxy, more or less sparsely covered with appressed straight minute hairs (just visible at 10 × enlargement if the light is good), and glands are restricted to the axils of the nerves, hence resembling domatia; on the upper side the midrib is mostly ± clearly sunk. *Xerospermum* has the lower side of the leaflets never glaucous-waxy and not minutely appressed hairy, whereas the glands are scattered over the lower side like in other genera of the Sapindaceae; on the upper side of the leaflets the midrib is more or less raised. In *Xerospermum* the sepals are free, imbricate, and partly membranous (like in *Guioa*); in *Nephelium* they are ± connate, hardly or not imbricate, and not membranous.

## KEY TO THE SPECIES

1a. Flowers 5-merous. Pedicels in fruit not much swollen, 1.5–2.5(–3.5) mm thick **1. X. laevigatum**

b. Flowers 4-merous. Pedicels in fruit distinctly swollen, (3.5–)5–7 mm thick **2. X. noronhianum**

### 1. Xerospermum laevigatum Radlk.

*X. laevigatum* Radlk., [Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 8 (1878) 305, nom. nud.] Sapind. Holl.-Ind. (1879) 23, 25; in Engl., Pflanzenr. 98 (1932) 949; Burkill, Dict. (1935) 2272; Wyatt-Smith & Kochummen, Malayan Forest Rec. 17 (1965) 364. – Type: *Griffith KD 1006/1*, Burma, Mergui Arch., fl. (K).

*X. acuminatum* Radlk., Sapind. Holl.-Ind. (1879) 7, 25; in Engl., Pflanzenr. 98 (1932) 948. – Type: *Beccari PB 3468* (not *3408* as given by Radlk., 1879), W. Borneo, Danas Lamadgian, -5-1867, fl. & fr. (FI; iso in K, P).

*X. unijugum* Radlk., Rec. Bot. Surv. India 3 (1907) 351; in Engl., Pflanzenr. 98 (1932) 948. – Type: *F. Kehding 090*, Mal. Pen., Selangor, Klang, 2-2-1879, y. fr. (FI).

*X. noronhianum auct. non* Blume: Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 686, p. min. p.

*X. muricatum auct. non* Radlk.: J.A.R. Anders., Gard. Bull. Singapore 20 (1963) 169.

Tree, up to 36 m high and 1 m d.b.h., rarely a shrub. Twigs 1–5 mm thick, glabrous. *Leaves:* petiole 0.4–7 cm long; petiolules 0.3–1.5 cm long; leaf axes glabrous. *Leaflets* 4.5–18 × 1.75–10 cm, 1.75–3.75 times as long as wide, widest in to somewhat below the middle, coriaceous, glabrous, (without or) with few to several glands; base acute to rounded, decurrent; apex (rounded to acute or) variably acuminate; at least the few upper nerves, sometimes the greater part of the nerves ± distinctly join-

ed; intercalated veins variable; veinlets rather finely reticulate, prominulous at both sides, sometimes beneath more so than above. *Inflorescences* up to 20 cm long if solitary, no more than 5 cm if tufted; well developed axes with scattered, either patent and short or erecto-patent and long, sidebranches, these as well as the main axis (in its upper part) bearing several lax and often several-flowered cymes, the lower long-stalked, consisting of a central flower and two sometimes long and many-flowered monochasial branches, the upper sessile and monochasial, often, if the axis is short, together forming a dense cluster of branches and flowers; pedicels 1.5–5 mm long. *Flowers* 5-merous. *Sepals* free, all about equal or the outer two distinctly smaller, ovate, obovate, or transversely elliptic to orbicular, especially the outer two concave, 1.6–2.8 × 1.4–2.5 mm, ciliolate to rarely woolly-ciliate, glabrous or nearly so (in Sumatra exceptionally outside and sometimes also inside thinly puberulous). *Petals* obovate to spathulate, 1–3 × 0.5–1.2 mm, bigger in ♂ than in ♀ flowers, whitish, variably woolly. Disk complete or interrupted, yellow. *Stamens* (7 or) 8; filament 2–5 mm, woolly in the lower half to all over but for the apex; anther 0.6–0.9 mm, glabrous. Pedicels in fruit only slightly swollen, 1.5–2.5(–3.5) mm thick. *Fruit lobe(s)* globular to oblong-ellipsoid, 2.5–3.75 × 1.5–2.5 cm, densely aculeate, from green turning via yellow and orange to pinkish; wall coriaceous, c. 0.5 mm thick (fig. 2d).

Distribution. Burma (Mergui Arch.), the Malay Peninsula, Sumatra, and Borneo.

## KEY TO THE SUBSPECIES

1a. Disk complete. Leaflets mostly oblong to elliptic, not or slightly acuminate (fig. 1a) . . . . . **a.** subsp. **laevigatum**

b. Disk in ♀ flowers nearly always, in ♂ flowers sometimes interrupted. Leaflets broad-elliptic, distinctly acuminate (fig. 1b) . . . . . **b.** subsp. **acuminatum**

### **a.** subsp. **laevigatum**

*X. laevigatum* Radlk. – *X. unijugum* Radlk. – *X. noronhianum auct.*

Tree, up to 36 m × 1 m d.b.h., exceptionally a shrub; buttresses up to 2.5 m high, up to 2.3 m spreading, thick, sometimes branching; bole up to 12 m high, deeply irregularly fluted; crown very narrow; bark either smooth, or sometimes coarsely fissured, or often with large scales, or with many small lenticels, or very rough and dippled, brown, sometimes reddish, to grey; bark 7–15 mm thick, outer brittle, red in section, inner thin, firm, fibrous, pinkish to redbrown to pale cream; sapwood 2.5 cm thick, yellow to cream; heartwood pale brown, hard. Twigs rather slender, up to 4 mm diam. *Leaves* up to 2-jugate; petiole up to 4.5 cm; rachis semiterete to angular above, 2–3 cm long. *Leaflets* up to 8.5 cm wide, mostly oblong to elliptic, flat to slightly dorsiventrally curved, apex mostly either not acuminate, or tapering to a short acumen, midrib beneath prominent to angular and rounded, only upper nerves ± looped and joined, intercalated veins mostly inconspicuous. *Inflorescences* in the

axils of the upper 3 or 4 leaves, the uppermost one often pseudo-terminal, all tufted, up to 12 cm long, thin-puberulous, glabrescent. *Sepals* all nearly equal, mostly rather thin and petaloid, not always glabrous. *Petals* up to 2 × 0.8 mm. Disk complete.

Distribution. As the species.

BURMA. Mergui Arch.: Griffith KD 1003, Collis Palon; 1006/1, type of *X. laevigatum.*

MALAY PENINSULA. KEP 74826. – Thailand: Kerr 16355, Kraburi, Ranawng; 16390, Lamlieng, Ranawng; 17341, Kaw Yao Yai, Pang-nga. – Perak: 8 collections. – Dindings: 5 collections, all from South Pangkor F. R. – Trengganu: Whitmore KEP FRI 20589, mountains near boundary Sg. Trengganu, path along big rapids. – Pahang: Ridley 2641, Jahan R. near Kwala Tenok. – Selangor: Kehding 090, type of *X. unijugum*; KEP 81436, Kuala Lumpur; Kiai KEP 8275, Sungei Buloh Res. – Negri Sembilan: Zainudding b. Sohadi KEP FRI 14628, G. Angsi F. R. – P. Penang: Curtis 846, The Spout; 1575, Miri Rd.; Haniff 224, Government Hill; Nur SF 1252, Western Hill Rd. – Singapore: Sinclair SF 40698, S. side of McRitchie Reservoir.

SUMATRA. East Coast: Beguin 580, Bengkalis; Panglong 31, Sg. Missigit (L). – Indragiri: Buwalda 6745, Kuala Belilas; NIFS bb 27542, Danau Mengkoeang; 27609, Kwala Belilas; 28514, Belimbing. – Djambi: NIFS bb 12840, near Pidjoean. – Palembang: Grashoff 1047, Rawas.

BORNEO. Sarawak: Asah S 12719, Kuching Dist., Semengoh F. R., Arboretum tree 1303; Galau S 15621, ditto, tree 3459; Ashton S 18096, Ulu Stirau, Labang, Bintulu. – SE. Kalimantan: NIFS bb 2138, Subdist. Boentok, Lela Tani F. R., Sei Pamatang Lajang. – E. and NE. Kalimantan: Kostermans 13625, Sangkulirang Dist., Karangan R., NW. of Sangkulirang; NIFS bb 10182, Subdist. Poeroektjahoe, near Diroeng Silaroeng. – Sabah: 10 collections.

Ecology. Primary and sometimes secondary forests, on dryland, crests, etc., on sandy clay or sandstone, up to 700 m alt. Fl. Febr.–March, Sept.; fr. July, Aug., Dec.

b. subsp. **acuminatum** (Radlk.) Leenh., *nov. stat.*

*X. acuminatum* Radlk. – *X. muricatum auct.*

Tree, up to 20 m × 24 cm d.b.h., exceptionally a shrub; rarely with slight buttresses or with stiltroots; bole up to 9 m high; bark smooth, dark brown or grey to black; outer bark thin, hard, inner bark fibrous, medium hard, brownish, reddish, or exceptionally orange; cambium whitish; sapwood whitish to yellowish; heartwood rather hard and heavy, finegrained, darker than sapwood, pinkish with black linear blotches. Twigs 1.5–5 mm thick. *Leaves* normally 2-jugate; petiole up to 7 cm; rachis terete to flat above, up to 7 cm long. *Leaflets* up to 10 cm wide, mostly broad-elliptic, fairly strongly dorsiventrally curved, apex mostly distinctly acuminate, acumen usually cuneate and acute, up to 3 cm long, midrib beneath flat and ribbed to angular, at least the few upper nerves, sometimes the greater part more or less distinctly looped and joined, intercalated veins variable. *Inflorescences* sometimes terminal and in the axils of the upper 2 or 3 leaves, often the uppermost axillary one pseudoterminal, axillary ones ± tufted, 2 cm long or more, glabrous or rarely very sparsely hairy. Outer *sepals* distinctly smaller than inner ones, all ± fleshy or inner partly petaloid, glabrous but for the margin. *Petals* up to 3 × 1.2 mm. Disk in ♀ flowers nearly always interrupted in front of the inner sepal lying in between the two outer ones (in Sara-

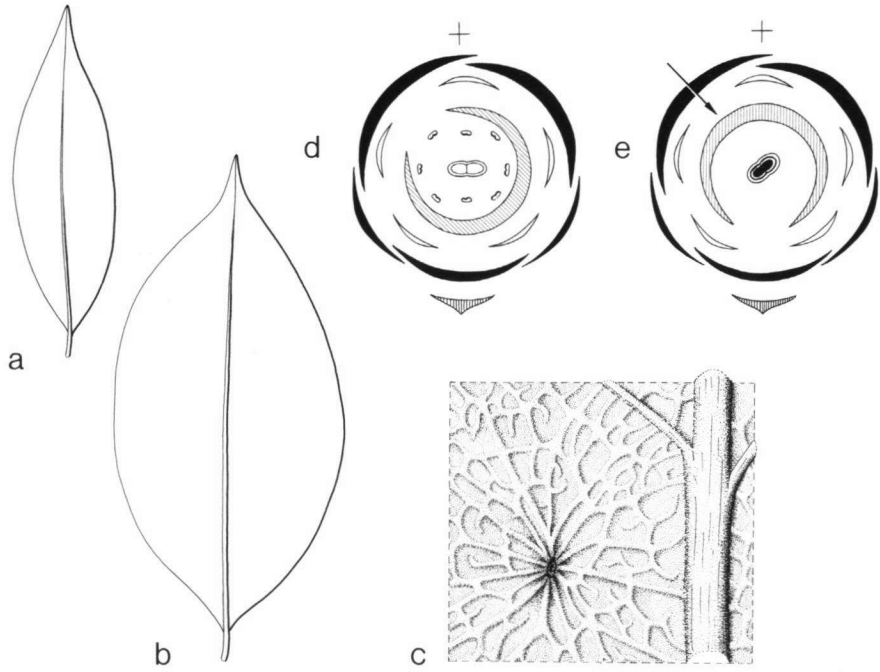


Fig. 1. a & b. Leafshapes of *Xerospermum laevigatum* subsp. *laevigatum* and subsp. *acuminatum* resp., both x 0.5 (a from *KEP FRI 14628*; b from *NBFD SAN 27301*). – c. Gland on the lower side of a leaflet (*FRI Ja 6185*, x 6). – d & e. Flower diagrams of *X. laevigatum* subsp. *acuminatum*, male and female resp., mainly to show the different places of interruption of the disk (in e the staminodes are omitted; the arrow points to the other possible but more rare position of the interruption).

wak For. Dept. *S 9007*, however, at the same place as in ♂ flowers), in ♂ flowers either complete, or slightly interrupted in front of the outermost one of the three inner sepals (fig. 1 d & e).

Distribution: Western Borneo.

BORNEO. Sarawak: 28 collections. – Brunei: Smythies, Wood & Ashton S 5897, Seria (K, L, SING). – West Kalimantan: Beccari PB 3468, type of *X. acuminatum*; NIFS bb 7871, Sanggau, S. Labai (L). – Sabah: 9 collections, from Jesselton, Papar, and Beaufort Dists.

Ecology. Peat swamp forest at up to 30 m alt. Flowering apparently throughout the year; ripe fruits are known from March and April.

## 2. Xerospermum noronhianum Blume

*Euphoria noronhiana* Blume, Bijdr. (1825) 234, comb. illeg. – *Nephelium noronhianum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. – *X. noronhianum* Blume, Rumphia 3 (1847) 100;

Radlk. in Engl., Pflanzenr. 98 (1932) 946; U.N. & P.C. Kanj., Das & Purkay., Fl. Assam 1 (1936) 322; Backer & Bakh. f., Fl. Java 2 (1965) 137. – Lectotype (present author): *Blume s.n.* in herb. L sh. 908.272–748, Java, fr.

*Euphoria xerocarpa* Blume, Bijdr. (1825) 234 p.p., comb. illeg. (fruiting material only; see Blume, Rumphia 3, 1847: 100). – *Nephelium xerocarpum* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30 p.p. – *Arytera xerocarpa* Adelb., Blumea 6 (1948) 324, nom. illeg. superfl. – Type: unknown (described from Nusa Kembangan I. near Java).

[*Sapindus glabratus* Wall., Cat. (1847) nr. 8095, nom. nud.]

*Cupania glabrata* Kurz, J. Asiat. Soc. Bengal 41, ii (1872) 303; non Fern.-Vill., Nov. App. (1883) 349 (= *Guioa perrottetii*). – *X. glabratum* Radlk., Sitzungsber. Math.-Phys. Cl. Königl. Bayer. Akad. Wiss. München 8 (1878) 300; Craib, Fl. Siam. 1 (1926) 329; Radlk. in Engl., Pflanzenr. 98 (1932) 946; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 957. – Type: *Kurz 2058*, Burma, Pegu Yomah, 6-4-1871, fl. (iso in K, M).

*X. lanceolatum* Radlk., Sapind. Holl.-Ind. (1879) 7, 25; in Engl., Pflanzenr. 98 (1932) 943. – Type: *Beccari PB 1031*, Sarawak, Kutein, -11-1865, fr. (FI; iso in K, M, P).

*X. microcarpum* Pierre, Fl. For. Cochinchine (1894) pl. 320 B; Radlk. in Engl., Pflanzenr. 98 (1932) 945; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 958. – Type: *Pierre 2067*, Indo-China, Phu Quoc I., -3-1877, fl., y.fr. (P).

*X. microcarpum* Pierre var. *ellipticum* Pierre, Fl. For. Cochinchine (1894) text with pl. 320 B; Radlk. in Engl., Pflanzenr. 98 (1932) 945. – Syntypes: *Pierre 714 and 4119*, together at least 7 different collections, all from southern Indo-China (Saigon prov., Bao Ching near Bien Hoa, Gia Dinh near Baria, Giang Dong on Phu Quoc I.), the dates varying from -2-1866 to -7-1877, represented in K, L, M, P, and SING.

[*Nephelium muricatum* Griff., Cat. (1865) nr. 1004, nom. nud. – ] *X. muricatum* Radlk., [Sapind. Holl.-Ind. (1879) 23, 69, nom. inval.;] in Engl. & Prantl, Nat. Pflanzenfam. 3, 5 (1895) 331, fig. 168; in Engl., Pflanzenr. 98 (1932) 940, fig. 23; Corner, Ways. Trees (1940) 596, fig. 215; non J.A.R. Anders., Gard. Bull. Sing. 20 (1963) 169 (= *X. laevigatum*). – Type: *Griffith KD 1004*, Malay Peninsula, fl., fr. (M; iso in K, L, P).

*X. macrophyllum* Pierre, Fl. For. Cochinchine (1895) pl. 321 B; Radlk. in Engl., Pflanzenr. 98 (1932) 941. – Type: *Pierre 876*, Cambodia, prov. Thepong, Mt. Tamir, -5-1870, fr. (P; iso in K, L, M, SING).

*Nephelium maingayi* Hiern in J.D. Hook., Fl. Brit. India 1 (1875) 688 p.p., excl. type; see Radlk. in Engl., Pflanzenr. 98 (1933) 964.

[*X. glabratum* Pierre, Fl. For. Cochinchine (1895) pl. 322 A, non Radlk. (1879), hence invalid. – ] *X. glabrum* Pierre, Fl. For. Cochinchine (1895) text with pl. 322 A; Radlk. in Engl., Pflanzenr. 98 (1932) 947; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 956. – Type: *Harmand in herb. Pierre 3688*, Indo-China, Attopeu on the R. Mekong, fl. and y.fr. (P).

*X. wallichii* King, J. Asiat. Soc. Bengal 65, ii, Nat. Hist. (1896) 432; Radlk. in Engl., Pflanzenr. 98 (1932) 943; Burkill, Dict. (1935) 2272; M.R. Henderson, J. Malayan Branch Roy. Asiat. Soc. 17 (1939) 42; Chin, Limestone Fl. Malaya (1973) 483. – Lectotype (present author): *King's coll. 8725*, Malay Peninsula, Perak, near Ulu Kerling, -3-1886, fr. (prob. CAL, not seen; iso in K).

*X. brachyphyllum* Radlk., Rec. Bot. Surv. India 3 (1907) 348; in Engl., Pflanzenr. 98 (1932) 942. – Type: *Forbes 452*, W. Java, Bantam, -12-1879, fr. (G, not seen; iso in BO, L).

*X. cylindrocarpum* Radlk., Rec. Bot. Surv. India 3 (1907) 348; in Engl., Pflanzenr. 98 (1932) 942. – Type: *Forbes 2715*, Sumatra, Palembang, Tandjong Ning, 1881, fr. (B, not seen; iso in FI, L, P, SING).

*X. intermedium* Radlk., Rec. Bot. Surv. India 3 (1907) 349; Craib, Fl. Siam. 1 (1926) 329; Radlk. in Engl., Pflanzenr. 98 (1932) 944; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 958. – Syntypes: *Curtis 3436*, Malay Peninsula, Dindings, Lumot, -2-1900, young fr. (K, SING); *Helfer KD 1005*, Burma, King's I., 2-12-1838, young fr. (FI, K, L, M, P); *Helfer 143 = KD 1006*, Tenasserim and Andamans, 30-11-1839, fl. (FI, K, L, M); *Kehding 90*, Malay Peninsula, Klang, fl. (FI).

*X. echinulatum* Radlk., Rec. Bot. Surv. India 3 (1907) 350; in Engl., Pflanzenr. 98 (1932) 944. – Syntypes: *King's coll. 8637*, Malay Peninsula, Perak, near Ulu Kerling, -3-1886, y. fr. (K, L).

*X. tonkinense* Radlk., Not. Syst. Paris 1 (1910) 303; in Engl., Pflanzenr. 98 (1932) 945. – Type: *Balansa 3419*, Vietnam, Tonkin, Vallée de Lankok, M! Bavi, 25-7-1888, fr. (G, not seen; iso in K, P).

*Mischocarpus fuscescens* Blume var. *bonii* Lecomte, Fl. Indo-Chine 1 (1912) 1029. – *X. bonii* Radlk., Feddes Repert. Spec. Nov. Regni Veg. 18 (1922) 341; in Engl., Pflanzenr. 98 (1932) 948; Gagnepain, Fl. Indo-Chine Suppl. 1 (1950) 957; Ming in Wu, Fl. Yunnan. 1 (1977) 273, pl. 64: fig. 4–6. – Type: *Bon 5222*, Vietnam, W. Tonkin, 6-3-1892, fl. (P).

*X. fallax* Radlk., Feddes Repert. Spec. Nov. Regni Veg. 18 (1922) 340; in Engl., Pflanzenr. 98 (1932) 942. – Type: *Blume in herb. Martens*, Java, fl. and fr. (M).

*X. testudineum* Radlk., Feddes Repert. Spec. Nov. Regni Veg. 18 (1922) 340; in Engl., Pflanzenr. 98 (1932) 941. – Syntypes: *Bogor Botanic Gardens III.H.17 = Sutrisno 1 = Teijsmann 6676*, Sumatra, Lampongs, fl. (BO, L, M, P); *Bogor Botanic Gardens III.I.28 = Diepenhorst s.n.*, Sumatra West Coast, Priaman, fl. (BO, L, M); *Forbes 1216a*, Java, 1880–1882, st. (B, not seen); *Jelinek*, Java, fr. (W, not seen).

*X. xanthophyllum* Radlk., Flora 118–119 (1925) 400; in Engl., Pflanzenr. 98 (1932) 941. – Type: *Bogor Botanic Gardens III.I.50a*, fl. and fr. (M; iso in BO, L, P).

*X. donnaiense* Gagnepain, Notul. Syst. Paris 13 (1947) 70; Fl. Indo-Chine Suppl. 1 (1950) 955. – Syntypes: Vietnam, Annam, Haut Douai Prov., near Djiring, Mt. Braïan: *Poilane 24122*, 6-2-1935, fl. (P); *24472*, 22-2-1935, fl. (P); *24489*, 22-2-1935, fl. (P); *24682*, 1-3-1935, fl. (P).

*X. poilanei* Gagnepain, Notul. Syst. Paris 13 (1947) 71; Fl. Indo-Chine Suppl. 1 (1950) 958, fig. 120: 1–7. – Syntypes: *Poilane 1770*, Vietnam, Annam, Thanh hoà Prov., Hôi xuân, 24-8-1920, fr. (P); *23598*, Vietnam, Cochinchine, Arboretum de Trang, 15-4-1934, fr. (P).

Tree, up to 25 (exceptionally to 30) m high by up to 30(–75) cm d.b.h. Twigs 1.5–6 mm thick, variably densely short-hairy, mostly early glabrescent. *Leaves:* petiole 1–7 cm long; petiolules 1–12 mm long; leaf axes either thinly to fairly densely brownish to fulvous puberulous, glabrescent, or glabrous from the start. *Leaflets* up to 50 × 30 cm, 1.5–2.5(–6.5) times as long as wide, widest above to below the middle, pergamentaceous to coriaceous, glabrous to puberulous above on the midrib, beneath on midrib and nerves, glabrescent, with few to many glands; base acute to rounded; apex rounded, blunt, acute, or tapering to fairly abruptly variably acuminate; nerves ending free but for the few uppermost ones; intercalated veins variably developed; veins and veinlets finely to laxly reticulate, either about equally raised on both sides, or less so to smooth on the upper side, veins sometimes even slightly impressed above. *Inflorescences* up to 25 cm long if solitary, much shorter if tufted; axes simple or with some short patent branches in the lower part, all branches bearing few to many sessile to subsessile, very condensed, few- to several-flowered cymes, to the apex reduced to solitary flowers; pedicels 1–2 mm long. *Flowers* 4-merous. *Sepals* free to connate for up to c. 25%, the outer two mostly slightly smaller than the inner ones, orbicular to ovate or obovate, 1–2(–3) × 1–2.4 mm, out- and inside glabrous or hairy (at least nearly always inside at the base), ciliolate. *Petals* obovate to broadly spathulate to short- to long-clawed with an ovate to transversely elliptic plate, in total 0.7–2.8 × 0.4–1.7 mm, variably woolly, outside at the base nearly always glabrous, inside often sparsely hairy to glabrous. Disk complete. *Stamens* (6–)8 (exceptionally 9); filament 1.5–4 mm long, from woolly with the excep-

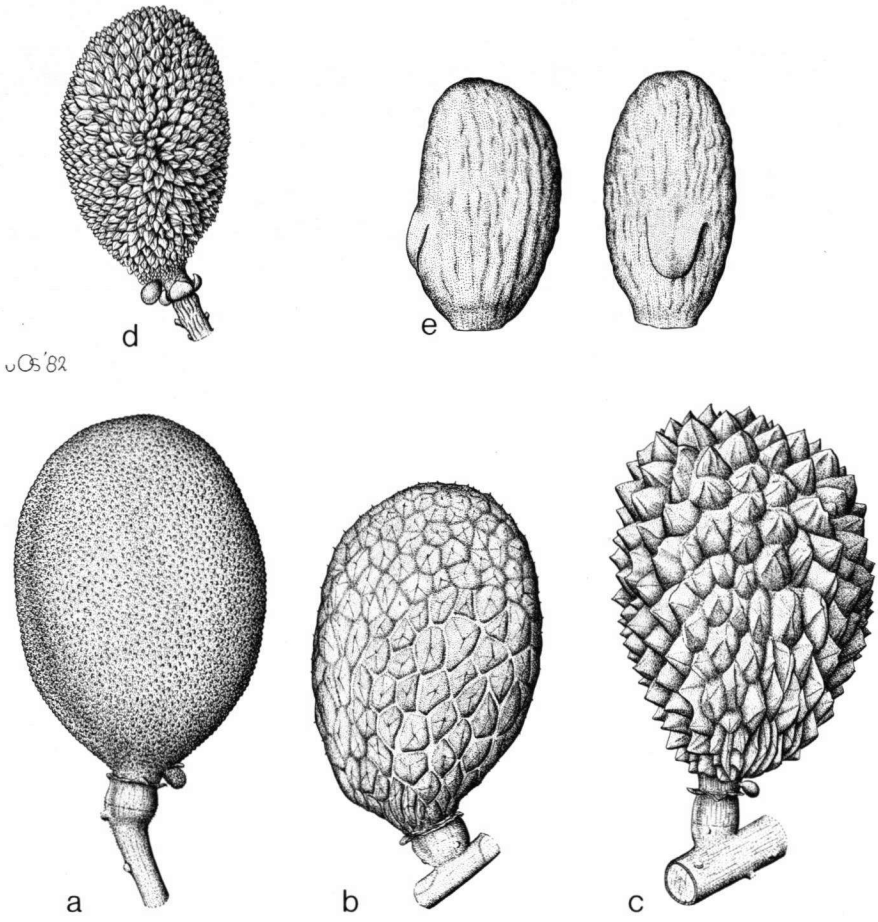


Fig. 2. a–c. Fruits of *Xerospermum noronhianum*, showing the differences in sculpture (a: *KEP FRI 10748*, representing the *wallichii* type; b: *Stone & Sidek 12523*; c: *KEP 29472*). – d. Fruit of *X. laevigatum* subsp. *acuminatum (NBFD SAN 27301)*. – e. Seeds of *X. noronhianum*, clearly showing the rootlet pocket (Sarawak For. Dept. *S 19706*). All x 1.5.

tion of base and apex only through woolly in the upper half to rarely glabrous; anther 0.3–1.5 mm long, glabrous or with a few hairs, sometimes ciliolate. Pedicels in fruit mostly strongly swollen, (2.5–)5–7 mm thick. *Fruit lobes* ellipsoid to subglobular or sometimes obovoid, 1.75–5 × 1.25–5 cm, aculeate, tuberculate, colliculate, or granulate, from green maturing over yellow to red or darkbrown; wall coriaceous, corky, or woody, c. 0.65–2.5 mm thick.

Distribution. As the genus.

BANGLA DESH. Griffith KD 992; Lister 308, Chittagong Hill Tracts, Burkul (FI, K, L).
INDIA. Assam: 8 collections from the Garo- and Khasi Hills and Sylhet.
BURMA. 15 collections, from Upper (Myitkyina, Pegu) and Lower Burma, incl. also the Mergui Archipelago.
THAILAND. 23 collections from different parts of the country.
INDO-CHINA. 59 collections.
MALAY PENINSULA. 152 collections from all over the peninsula.
SUMATRA. 19 collections from different parts.
JAVA. 50 collections from West and Central Java and Nusa Kambangan.
BORNEO. 49 collections from all over the island, incl. also the Anambas I.
Cultivated at Bogor (Indonesia, Java: Botanic Garden, under the numbers III.E.12, III.H.21 and 21a, and III.I.50 and 50a.

Ecology. Primary and secondary rain forest, sometimes in peat forest, heath forest, or bamboo forest, on plains as well as on slopes and crests, in dry places but also on riverbanks, along marshes, or in periodically flooded places, on different kinds of soil (sand, sandy clay, fertile volcanic loam, peat; subsoil granite, sandstone, or limestone). Alt. 0–300(–1500) m. Especially in continental SE. Asia (Thailand, Indo-China, the Malay Peninsula) locally often common. Fl. all through the year but mainly Jan.–April and also rather frequently Aug.–Dec.; fr. mainly Jan.–Aug. The fruits are eaten by birds and monkeys. For a more detailed study especially on reproductive biology see Yap, Malaysian Forester 45 (1982) 21–35.

Notes. 1. The variation of the present species is wide but continuous. This regards not only the leaf characters, which is not uncommon, but also the flowers and in particular the fruits (fig. 2a–c). At first sight it is difficult to imagine that a rough fruit without any appendages could belong to the same species as a fairly densely spiny fruit. However, the rough fruit often shows a basic pattern corresponding with the groups of spines in the aculeate fruit, and fruits with short spines are still rough in the grooves between the groups of spines. As to the flowers, the widest variation is in the hairiness of the sepals and the petals. The only entity that is reasonably well characterized is *X. wallichii*. It has the leaflets relatively broad and with a laxly reticulate venation; the sepals are glabrous on both sides, the petals are inside glabrous, and the fruits are rough and without spines. The only one of these characters that seems to be exclusive is that of the petals; all other characters are just extremes in a continuous series. Typical *X. wallichii* is only known from the Malay Peninsula where it appears to be rather common. In my opinion it has not much sense to oppose such a local, morphologically rather extreme but hardly sharply delimited form on some infraspecific level to the more widespread and variable further part of the species.

2. The two combinations under *Euphoria*, viz. *E. noronhiana* and *E. xerocarpa*, are illegitimate as *Euphoria* is illegitimate; see Leenh., Blumea 19 (1971) 116.

3. Blume's *Euphoria xerocarpa* was based upon both flowering and fruiting material. The importance Blume attached to the fruit characters in the Sapindaceae in general as well as the specific epithet used in this case point to the fruiting part as the most logical choice for a lectotype. This is in full accordance with Blume's own choice: in 1847 (Rumphia 3: 100) he included the fruiting part in his new genus *Xerospermum* in the synonymy of *X. noronhianum*. The flowering part became the

basis of a new species under a new genus, *Arytera litoralis*. A century later, Adelbert (Blumea 6, 1948: 324) made a different choice. Whereas the fruiting part remained under *X. noronhianum* he typified *Euphoria xerocarpa* with the flowering part. Accordingly, *Euphoria xerocarpa* and *Arytera litoralis* were now based upon the same type and as the epithet *xerocarpa* was older than *litoralis* a new combination had to be made, viz. *Arytera xerocarpa*. This name is illegitimate, being contrary to Blume's own much earlier choice as well as to all evidence available (ICBN 1978, art. 53.1 and 67.1).

4. The 1879 publication of *X. muricatum* was invalid as it was actually a *nomen nudum*. The few characters mentioned were only intended to differentiate between the genera *Nephelium* and *Xerospermum* and lead to the conclusion that the present species belongs to *Xerospermum*. Also the references given to older publications do not validate the name as these regard either *nomina nuda* or mixtures. See Radlk., Sapind. Holl.-Ind. (1879) 69–70.

## DUBIOUS NAME

*Dimocarpus informis* Lour., Fl. Cochinch. (1790) 234; Leenh., Blumea 19 (1971) 128. – *Scytalia informis* Raeuschel, Nomencl. ed. 3 (1797) 113, nom. illeg. – *Euphoria informis* Poiret, Enc. Suppl. 3 (1812) 478, nom. illeg. – *Nephelium informe* Cambess., Mém. Mus. Hist. Nat. 18 (1829) 30. – Type: unknown.

The interpretation of this name remains mysterious. The short description seems reasonably well in accordance with the alliance of *Nephelium*. However, the note '*Baccae .... inedules*' seems to exclude *Dimocarpus, Litchi* and *Nephelium*. Radlkofer (in Engl., Pflanzenr. 98, 1932: 945) suggested *Xerospermum*, but this seems contrary to the character '*Baccae .... tuberculis multis circumdatae, quasi ex multis aggregatae*'. The latter character reminds of *Paranephelium*, but this is not in accordance with the character '*Baccae carnosae*'. Finally, Pierre (Fl. For. Cochinchine 4, 1894: text with plate 318) with his great knowledge of the forest flora of Indo-China may be right when suggesting that it may be not at all a Sapindacea.

## EXCLUDED TAXA

[*Xerospermum cochinchinense* Pierre, Fl. For. Cochinchine 5 (1895) pl. 321: A, nom. inval. –] *Nephelium cochinchinense* Pierre, ditto, text with pl. 321: A = **Nephelium hypoleucum** Kurz acc. to Radlk. in Engl., Pflanzenr. 98 (1933) 975.

The combination under *Xerospermum* is invalid as it was mentioned under the plate only, changed in the accompanying text.

*Xerospermum ferrugineum* C.E.C. Fischer, Kew Bull. (1927) 82 = **Dimocarpus longan** Lour. var. **malesianus** Leenh., Blumea 19 (1971) 123, 126.

*Xerospermum laoticum* Gagnepain, Notul. Syst. (Paris) 13 (1947) 69; Fl. Indo-Chine Suppl. 1 (1950) 959, f. 120: 8–10 = **Nephelium sp.**

[*Xerospermum ? thorelii* Pierre, Fl. For. Cochinchine 4 (1894) pl. 320: A, nom. invalid. –] *Chemidiscus thorelii* Pierre, ditto, text with pl. 320: A = **Glenniea thorelii** Leenh., Blumea 22 (1975) 412.

The combination under *Xerospermum* is invalid as it was mentioned under the plate only, changed in the text.

*Xerospermum topengii* Merr., Philip. J. Sci. 23 (1923) 250; Radlk. in Engl., Pflanzenr. 98 (1932) 949. – *Nephelium lappaceum* L. var. *topengii* How & Ho, Acta Phytotax. Sin. 3 (1955) 395. – *Nephelium topengii* Lo in Anon., Fl. Hainan. 3 (1974) 85, 574, f. 583. – *Nephelium chryseum* Blume var. *topengii* C.Y. Wu, Fl. Yunnan. 1 (1977) 274.

At least, this is a **Nephelium sp.**

*Xerospermum yunnanense* W.T. Wang, Acta Phytotax. Sin. 6 (1957) 287, pl. 49: 13. – **Dimocarpus yunnanensis** Wu & Ming, Fl. Yunnan. 1 (1977) 269, pl. 63: 7 & 8.

Probably very close to *Dimocarpus fumatus* Leenh. subsp. *indochinensis* Leenh.

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INDEX TO SCIENTIFIC NAMES

New names are in **bold type**, accepted names in normal type, synonyms in *italics*; the numbers refer to the species, 'Dubious' to dubious names, 'Excl.' to excluded taxa.

(Xerospermum)
*brachyphyllum* Radlk.: 2
*cochinchinense* Pierre: Excl.
*cylindrocarpum* Radlk.: 2
*donnaiense* Gagnep.: 2
*echinulatum* Radlk.: 2
*fallax* Radlk.: 2
*ferrugineum* Fischer: Excl.
*glabratum* Radlk.: 2
*glabratum* Pierre: 2
*glabrum* Pierre: 2
*intermedium* Radlk.: 2
laevigatum Radlk.: 1
subsp. **acuminatum** Leenh.: 1b
subsp. laevigatum: 1a
*lanceolatum* Radlk.: 2

(Xerospermum)
*laoticum* Gagnep.: Excl.
*macrophyllum* Pierre: 2
*microcarpum* Pierre: 2
var. *ellipticum* Pierre: 2
*muricatum* Radlk.: 2
noronhianum Blume: 2
*poilanei* Gagnep.: 2
*testudineum* Radlk.: 2
*thorelii* Pierre: Excl.
*tonkinense* Radlk.: 2
*topengii* Merr.: Excl.
*unijugum* Radlk.: 1a
*wallichii* King: 2
*xanthophyllum* Radlk.: 2
*yunnanense* Wang: Excl.