# A REVISION OF DIMOCARPUS (SAPINDACEAE)

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Rijksherbarium, Leiden

## DIMOCARPUS

*Dimocarpus* Lour., Fl. Coch. (1790) 233. — Lectotype: *D. lichi* Lour. *(= D. longan).*

*Euphoria Auct. non* Comm. *ex* Juss., Gen. (1789) 247, *nom. illeg.:* Gmel., Syst. Nat. 2 (1791) 611; Radlk., Pfl. R. Heft 98 (1932) 894—910.

*More* Gaertn., Fruct. 2 (1791) 487, t. 180 f. 5, *nom. inval.*

*Pseudonephelium* Radlk., [Sapind. Holl-Ind. (1878) 71, *nom. inval.;* in Durand, Ind. Gen. (1888) 76] Sitz. Ber. K. Bayer. Ak. Wiss. M.-Ph. Kl. Münch. 20 (1890) 288; Pfl. R. Heft 98 (1932) 912—914. — Type: *P. fumatum* (Bl.) Radlk. *(= D. fumatus).*

Trees or shrubs. Indumentum often mainly consisting of dense hair tufts, sometimes, and primarily on the less hairy parts, tufts less dense and intermingled with solitary hairs, or hairs mainly solitary; glandular-capitate hairs exceptionally present along the petals of *D. fumatus;* sessile papillae (glands?) often present inside on the apical part of the petals if this is glabrous; no glandular scales as part of the indumentum, hence young parts not sticky resinous. *Leaves* spiral, paripinnate, rarely unifoliolate, 1—7-jugate, without stipules, axial parts variably hairy; petiole slightly swollen and somewhat hollowed at the base, the scar cordate, neither petiole nor rachis winged. *Leaflets* (opposite to) alternate, stalked, widest about the middle, in the lowest pair often slightly lower, in the uppermost pair somewhat higher, papyraceous to thin-coriaceous, glabrous or variably hairy, beneath smooth or finely papillose, lower side often with naked glands or sometimes with hair tufts in (part of) the nerve axils, if the margin is incised also naked glands scattered over the lower surface, mainly near the margin, or along the margin; base equalsided to more or less oblique; margin entire, repandous, or serrate-dentate; apex blunt to acuminate, often mucronate; midrib slightly prominent to sunk above, prominent and rounded to angular beneath; nerves mostly opposite or nearly so, especially the lower ones, at least lower and central ones free; intercalary veins rarely developed, veins either well differentiated, transverse, above inconspicuous to grooved, or hardly distinguishable from the veinlets, together finely reticulate and mostly prominulous on both faces. *Inflorescences* terminal, often with the lower 1—3 strong branches in the upper leaf axils (these may be stronger developed than the main inflorescence, in which case they may be called axillary), thyrsoid, sparsely branched, the lower branches often sparsely rebranched, all branches oblique-erect, spicoid, with scattered, distinctly stalked (lowermost) to sessile cymules, the latter mostly 5—7-flowered cincinni in the lower, 3-flowered dichasia or rarely solitary flowers in the upper part, variably hairy, especially the rachis and the stronger branches more or less glabrescent when in fruit; pedicels slender, 2—4 mm; bracts triangular-lanceolate to subulate, up to 4 mm, patent to reflexed.

*Flowers* unisexual, probably mostly monoecious. *Calyx* cupular, in bud characteristically depressed semi-globular, 5-(exceptionally 6-)merous, the lobes confluent at base to *(D. fumatus)* for up to ⅓ connate, equal, imbricate, ± ovate, slightly concave, outside densely short-hairy, inside short-hairy at least in the upper part, not ciliate, entire. *Petals* 0—5 (exceptionally 6), if well developed longer than calyx, apert, ± oblanceolate, entire, outside variably long-hairy mostly the base and the upper half excepted, inside (mostly except the base) and the margin thin-woolly to furlike hairy, sometimes apical part excepted which then may be papillose; no scale. *Disk* complete, slightly 5-lobed, without appendage, densely hairy. *Stamens* (6—)8(—10), usually equal, sometimes more or less distinctly alternating long and short, slightly or not exserted; filament threadlike, mostly variably patent-hairy, the hairs often partly tufted; anther basifixed, emarginate at base, emarginate, blunt, or sometimes apiculate at apex, glabrous, dehiscing latero-extrorse lengthwise. *Pistil* 2- (exceptionally 3-) merous; ovary sessile, broadly cordate, tuberculate, hairy (usually each wart crowned by a tuft of hairs); style apical, slender, about as long as the ovary, variably hairy at least in the lower half, hairs mostly tufted; stigma lobes spreading; ovules 1 per cell, attached axillary near the base, anatropous, ascendens, apotropous. *Pistillode* small, densely pilose. *Infructescences* with thickened and sometimes lengthened pedicels; calyx still present under the fruit, slightly or not accrescent. *Fruit:* usually only 1 lobe developed, this globular to broad-ellipsoid, not dehiscent, usually warty, sometimes either nearly smooth or *(D. longan* var. *echinatus)* densely long-spiny, often granular, mostly glabrescent, inside smooth and glabrous, reddish, purplish, or brownish when ripe. *Seed* about globular, hilum about basal, at first transverse-elliptic, later nearly orbicular, big, testa shining blackish brown; around the hilum a sarcotestal ring finally growing out into a thinfleshy, translucent, white arilloid enveloping the whole seed.

*Distr.* 5 species in S. and SE. Asia from Ceylon and India to eastern Malesia.

*Ecology.* Mainly substage or understorey trees of primary or sometimes secondary forests under mostly everwet tropical conditions. The flowers, small but arranged into fairly big inflorescences, with a green calyx and often white petals, are sweet-scented and will probably be pollinated by insects. The fruits, though indehiscent and protected by a hard, sometimes spiny wall, may be eaten by mammals because of the fresh, sweet arilloid.

*Uses. D. longan*, mainly ssp. *longan*, is often planted as a fruit tree. The wood seems to be of a good quality, but is only occasionally used. One reason may be that sizeable stems often seem to be hollow.

*Notes.* 1. I have combined the genera *Euphoria* and *Pseudonephelium* as distinguished by Radlkofer (1932). Apparently, his separation was primarily based upon a comparison between the extremes to both sides, *D. longan* ssp. *malesianus* on the one hand, *D. fumatus* ssp. *fumatus* and ssp. *philippinensis* (together his *Pseudonephelium fumatum*) on the other, the by far most common representatives of their respective genera. The usual differences, based upon these extremes, are: *Euphoria* with mainly tufted hairs, entire leaflets with hardly domatia and no further glands, and well-developed, inside densely hairy petals, whereas *Pseudonephelium* has mainly solitary hairs, often mixed up with tufts of a few hairs only, repandous to slightly dentate leaflets with naked glands as well in the nerve axils as near or along the margin, and lacks petals. These differences fade away, however, when the other species or forms are included in the comparison. *D. foveolatus*, a rare endemic of the Philippines, included in *Euphoria* by Radlkofer doubtless because of its flowers, agrees vegetatively completely with *Pseudonephelium* with the exception only of its tufted hairs. The leaves of *D. dentatus* (a common endemic of Borneo, unknown to

Radlkofer) and *D. gardneri* (a rare endemic of Ceylon) are even far more clearly dentate than those of *Pseudonephelium*, and show also naked glands on the lower side. *D. gardneri* has even only solitary hairs. In *D. longan* ssp. *longan* the petals are all present, but rather strongly reduced, rarely exceeding the calyx in length, and thin-hairy only; on the other hand, *D. fumatus* ssp. *fumatus* has sometimes 1 rudimentary petal, and ssp. *javensis* (another rarity, only 1 flowering specimen known) showed 4 rudimentary petals. Hence, depending on the character used several divisions are possible, but none seems natural.

2. The *mutual relationships* within *Dimocarpus* are not very clear. The main morphological hold is provided by the reduction of the corolla, which is well-developed in *D. longan* ssp. *malesianus*, *D. foveolatus*, *D. dentatus*, and *D. gardneri*, slightly reduced in *D. longan* ssp. *longan*, somewhat more so in *D. fumatus* ssp. *javensis*, and (nearly) completely suppressed in the other subspecies of *D. fumatus*. As to the vegetative parts, three groups can be distinguished: *D. longan* with entire leaflets, *D. foveolatus* and *fumatus* with repandous, and *D. dentatus* and *gardneri* with dentate ones. Geographically, the youngest center seems to be Borneo, with 3 species and where *D. longan* shows its greatest diversity. *D. longan* may have reached continental Asia from Malesia; the apparently more primitive ssp. *malesianus* comes as far as Burma, but the slightly more derived ssp. *longan* is the usual form. The area of the latter is doubtless partly not natural; it may have reached the Malay Peninsula, and has developed a few vague varieties in the Indochinese Peninsula. *D. fumatus* is fairly widely distributed, subdivided in mutually only slightly different subspecies, the most primitive of which is restricted to Sumatra and Java, and is common only in Borneo and the Philippines but even here it shows hardly any variation. *D. dentatus* is hardly variable and shows a coherent area of distribution. *D. foveolatus* seems intermediate between *Euphoria* and *Pseudonephelium* (but there is no reason to accept it as a probable hybrid, and it did not play a decisive part in the combination of the two genera). *D. gardneri* is morphologically as well as geographically fairly isolated and may be old.

An attempt to reach systematic conclusions on palynological grounds can be found in the paper by J. Muller in this same issue (Blumea 19, p. 133) on the pollenmorphology of *Dimocarpus*.

3. The only genus that seems closely related to *Dimocarpus* is *Otonephelium* Radlk., Sitz. Ber. K. Bayer. Ak. Wiss. M.-Ph. Kl. Münch. 20 (1890) 253, 288; Pfl. R. Heft 98 (1932) 911. It differs from *Dimocarpus* only in the presence of pseudo-stipules and in the glabrous disk. It has solitary hairs like *D. gardneri*, glands only in the nerve axils as in *D. longan*, a repandous leaf margin as *D. foveolatus* and *fumatus*, and the corolla is strongly reduced to, mostly, completely lacking like in *D. fumatus*. Its only species, *O. stipulaceum* (Beddome) Radlk. in E. & P., Nat. Pfl. Fam. 3, 5 (1895) 329 (*Nephelium stipulaceum* Beddome, Trans. Linn. Soc. 25, 1865, 212) is restricted to southern India (Madras).

To the wider relationship of *Dimocarpus* belong *Cubilia* and *Litchi* which seem to be further derived, possibly *Pometia*, whereas *Dimocarpus* itself may have been derived from *Nephelium* or *Xerospermum*.

4. *Nomenclature*. For a long time (and still in the Index Nominum Genericorum), *Dimocarpus* was considered a later nomenclatural synonym of *Litchi* Sonnerat (1782), and hence illegitimate. Doubtless, this opinion is based upon the fact that the first of Loureiro's four species bears the name *D. lichi* and was considered by him as representing the Chinese *Li-Chi*, which vernacular he cited. To me there is no doubt that Loureiro intended to describe the same species that was the type of *Litchi* Sonnerat, but as he did not cite nor refer to the latter, formally *Dimocarpus* can not be treated as a superfluous name.

Loureiro characterized his new genus by a rather detailed description of the flower and some general remarks on the fruit; the first of the four species mentioned is accom-

panied by a description of the vegetative parts and the fruits and a few general remarks on inflorescence and flower. The last sentence of this specific description reads '*Descriptio praecedens Generis huic speciei imprimis convenit*'. The descriptions of the other three species are shorter, and characters differing from the generic description are given. So it is clear that *D. lichi* is the type of the genus.

The description of the flower under the genus is quite clear, and can only refer to *Euphoria sensu* Radlkofer, still more precisely to the taxon named *D. longan* ssp. *malesianus* by the present author. This form occurs wild in Indo China, and differs in some of the flower characters mentioned from the cultivated *D. longan* ssp. *longan*, Loureiro's second species. The description of *D. lichi* can partly refer to *Euphoria* as well as to *Litchi*, some characters, however, to the latter only. Moreover, two specimens in BM sent by Loureiro and named *D. lichi* represent without any doubt *Litchi chinensis* Sonn. So *D. lichi* is a mixtum, mainly based upon *Litchi chinensis*, for a small part only on *D. longan* ssp. *malesianus*. As, however, it is the type of *Dimocarpus*, and as the flowers are the important part in the generic description, I am of the opinion that *D. lichi* has to be lectotypified by this flowering part.

Of the three further species mentioned by Loureiro, the first, *D. longan*, is also *Euphoria* in the sense of Radlkofer; *D. crinita* is doubtless a *Nephelium*, probably *N. lappaceum* L., the type of that genus, but as he does not at all refer to that name it does not affect the legitimacy of *Dimocarpus*. The fourth species, *D. informis*, is not yet clear to me, and neither was it to Radlkofer.

*Euphoria*, as originally described by (Commerson *ex*) Jussieu, agrees completely and exclusively with *Litchi*, which was also cited. Gmelin (1791) differentiated between these two names, reserving *Euphoria* for the *longan*, but this was contrary to the original description. Still, this has been the conception of *Euphoria* since that time, also with Radlkofer.

*More* Gaertn. is invalid as it was not intended as a scientific name at all. It was included in the Appendix '*Barbarae*' which gives only vernacular names (see also the different way of printing in the Index). It is a Ceylonese name and refers to *D. longan*.

5. For the present revision I could make use of material from the following herbaria: A, BM, BO, FI, K, L, M, NY, P, SAR, SING, UC, W, Z. My sincere thanks are due to the directors of these institutes for enabling me to study this material.

KEY TO THE SPECIES

1a. Glands on lower side of leaflets exclusively in the nerve axils *(domatia)*, sometimes absent; leaflets entire . . . . . **D. longan**
b. Glands on lower side of leaflets in the nerve axils and elsewhere, usually near or along the margin; leaflets mostly repandous or dentate. . . . . 2
2a. Leaflets distinctly serrate-dentate . . . . . 3
b. Leaflets mostly repandous, sometimes either entire or in the apical part slightly serrate-dentate. 4
3a. Twigs and leaves long remaining hairy, hairs mainly distinctly tufted; leaves 4—7-jugate. *Borneo.* **D. dentatus**
b. Twigs and leaves early glabrescent or glabrous, hairs not tufted; leaves 2- or 3-jugate. *Ceylon.* **D. gardneri**
4a. Petals 5, well-developed; disk velvety. Leaflets blunt. Twig greyish white, faintly 5-grooved. **D. foveolatus**
b. Petals mostly 0, rarely up to 4 rather strongly reduced ones; disk woolly. Leaflets acuminate. Twig brown, terete . . . . . **D. fumatus**

**Dimocarpus dentatus** W. Meijer *ex* Leenh., *sp. nov.* — *Euphoria nov. sp.* Meijer, Bot. News Bull. 9 (1967) 73. — Type: *Agam Ambullah SAN 37193*, N. Borneo, Lahad Datu Dist., Sg. Taliwas, 60 m alt., 22-11-1963, fl. & y. fr. (L; iso in K).—**Fig. 1.**

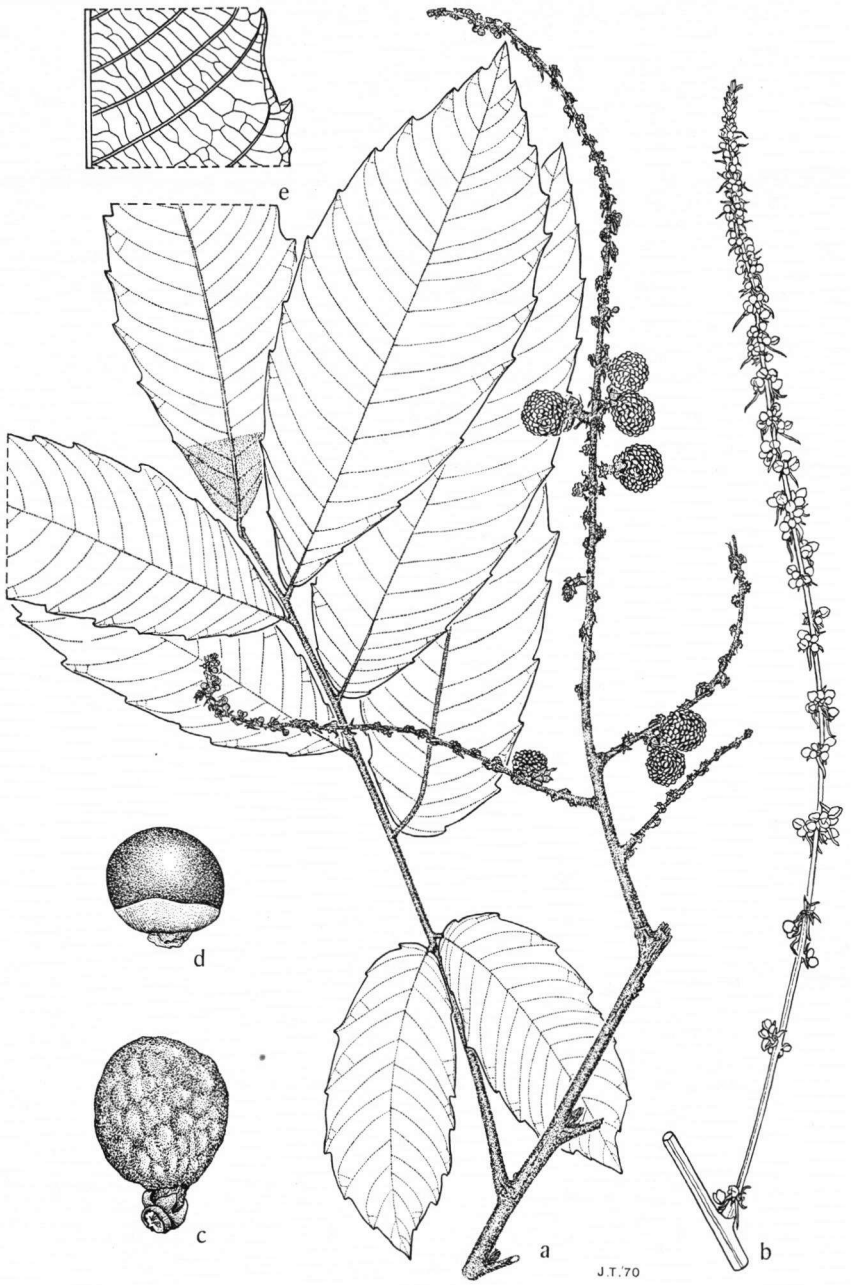


Fig. 1. *Dimocarpus dentatus* Leenh. — a. Habit, with flowers and young fruits (the indumentum on the lower side of the leaflets is shown in a small part only); b. part of inflorescence; c. mature fruit; d. young seed with only partly developed arilloid; e. detail of nervation. (a & e from *SAN 37193;* b. from *SAN 62966;* c & d. from *Kostermans 12654*. a × ½; b & e × 1; c & d × 1½).

Arbor 15 m alta, pilis fasciculato-stellatis tomentosa. *Ramuli* paulum 5-sulcati, 5 mm crassi, fusci, gradatim glabrescentes, dense verruculoso-lenticellati. *Folia* 4- vel 5-jugata, petiolo rhache petiolulisque tomentosis; petiolus 7—8 cm longus, teres; petioluli 1 mm longi, teretes. *Foliola* oblonga, 7—16 cm longa, 3½—7 cm lata, tenue coriacea, subtus pruinosa, supra in costam nervisque, subtus tota tomentella vel puberula, eglandulosa; basis obliqua, rotundata; margo serrato-dentatus; apex breve acuminatus, mucronatus; costa supra plana; nervi laterales inter sese ¾—1 cm distantes, a costa angulo 60—70° abeuntes, subcurvati; venae transversae, supra inconspicuae vel immersae. *Thyrsi* terminales, ca. 35 cm longi, tomentosi; cymuli 3—7-flori; pedicelli 1½ mm longi; bracteae patentes vel recurvatae, lanceolatae, 4 mm longae. *Lobi calycis* ad basem connati, 3 mm longi, 2 mm lati, intus in parte apicali sparse pilosi. *Petala* 5, extus sericea, intus dense lanata, 4 mm longa, 1 mm lata. *Discus* velutinosus. *Stamina* 8. *Stylus* dense pilosus. *Lobi fructus* globosi, ca. 1½ cm diam., granulati, aculeati.

Tree, to 15(—24) m × up to 40 cm d.b.h., sometimes with buttresses; hairs mainly tufted. *Twigs* 5—8 mm ⌀, faintly 5-grooved, brown, long remaining densely ferruginous-tomentellous, older branches warty-lenticellate. *Leaves* 4—7-jugate, axial parts densely tomentellous; petiole 6—18 cm, terete; petiolules 1—2 mm, terete. *Leaflets* 5½—24 × 3¼—9 cm, ratio 2½—3¾, widest about or sometimes slightly above the middle, thin-coriaceous to stiff-chartaceous, above tomentose on midrib and — scattered — on nerves, glabrescent, beneath rather densely to sparsely tufted hairy on midrib and nerves, between the nerves often with scattered tufts or pairs of hairs or with solitary hairs, beneath mostly with naked glands in the nerve axils and along the margin at the incisions; base equalsided or slightly oblique, subcordate to acute; margin scattered serrate-dentate; apex acute to rounded, sometimes tapering-acuminate; midrib flat above; nerves ¾—1½ cm distant along midrib, angle to midrib 50—70°, slightly curved to nearly straight, alternately ending in and between the marginal teeth, above grooved; veins transverse, above hardly visible, veinlets mostly prominulous on both sides. *Inflorescences* terminal, 25—55 cm, densely ferruginous-tomentellous; cymules up to 7-flowered; pedicels *c.* 1½ mm; bracts patent, later recurved, narrowly triangular, 4 mm long. *Calyx:* lobes confluent at base, 2½—3 × 1¾—2 mm, inside sparsely hairy in the upper part. *Petals* 5, outside sericeous except at base and sometimes in the upper half, along the margin and inside densely long-hairy except at base, 3½—4½ × 1 mm. *Disk* velutinous. *Stamens* 8; filament 2½—4 mm; anther ¾ mm. *Fruit:* lobe(s) subglobular, *c.* 1½ cm ⌀, granular, aculeate.

BORNEO. East: *Endert 5129*, W. Kutai, Kombeng, 20 m alt. (BO, L); *5414*, W. Kutai, near Djeloeai, 30 m alt. (BO, K, L); *Kostermans 5388*, E. Kutai, Sg. Menubar region, 60 m alt. (BO, K, L, SING); *6893*, Loa Haur (W. of Samarinda), 40 m alt. (BO, K, L); *12654*, W. Kutai, Melan on Kelindjau R., 20 m alt., vern. *sie-pos*, Modang Dajak dial. (A, BO, CANB, K, L, NY, P, SING); *13250*, G. Medadam (N. of Sangkulirang) 100 m alt., vern. *gêngguris* (A, BO, CANB, K, L, P, SING); *21239*, Berau, foot of Mt. Njapa, 20 m alt. (A, BO, CANB, G, K, L); *NIFS bb 12576*, E. Kutai, Takat (BO). — North: *Ahwing SAN 38200*, Sandakan Dist., Gomantong F. R. (K, L); *Ambullah SAN 37193*, type; *Gansau SAN 54466*, Semporna Dist., Mt. Pock F. R., 60 m alt. (L, SAN); *Meijer SAN 20740*, Lahad Datu Dist., Sugei Pengarawan, Kennedy Bay (L); *Puasa 1437*, Sapagaya, 30 m alt., vern. *rambutan munyit*, Kedayan dial. (K, L); *Sam SAN 21136*, Sandakan Dist., 1st ridge to Gomantong caves (K); *Sindin SAN 62966*, Mostyn Dist., Madai F. R., 30 m alt. (L, SAN); *Talip SAN 47663*, Lahad Datu Dist., Bagahak Range, Kenbay, 750 m alt. (L, SAN); *Wood SAN 16075*, 15 miles ESE. of Lahad Datu, 22 m alt. (A, BO, BRI, K, KEP, L, SING).

**Dimocarpus foveolatus** (Radlk.) Leenh., *nov. comb.* — *Euphoria foveolata* Radlk., Philip. J. Sc. 8 (1914) Bot. 457, *nom. illeg.*; Pfl. R. Heft 98 (1932) 904. — Type: *M. Ramos BS 7370*, Philippines, Luzon, Cagayan Prov., -3-1909, fl. (M).

Tree, 5 m. *Twigs* 4 mm ⌀, faintly 5-grooved, light grey, early glabrescent (hairs densely tufted, short), few conspicuous lenticels. *Leaves* 2-jugate, axial parts subglabrous; petiole 2—2½ cm, flat above; petiolules 5 mm, broadly grooved above. *Leaflets* 12½—15 × 6—7 cm, ratio 2, widest about or below the middle, coriaceous-chartaceous, glabrous, beneath with a naked gland in each nerve axil and some scattered glands along the margin;

base rounded, decurrent; margin repandous; apex blunt; midrib above slightly raised to hardly sunk; nerves 1—1½ cm distant along midrib, angle to midrib 70—75°, slightly curved, above prominulous; veins and veinlets hardly different, prominulous on both surfaces. *Inflorescences* terminal, 13—22 cm, short-velutinous (hairs in dense tufts mixed up with solitary hairs); cymules up to 7-flowered; pedicels *c.* 2 mm; bracts triangular-lanceolate, 3—4 mm. *Calyx:* lobes confluent at base, 4 × 3 mm, inside puberulous in upper ⅔. *Petals* 5, densely woolly, 5 × 1½ mm. *Disk* velutinous. *Stamens* 8; filament *c.* 3½ mm; anther 1 mm. ♀ *Flowers* and *fruit* unknown.

*Distr.:* Known only from the type.

**Dimocarpus fumatus** (Bl.) Leenh., *comb. nov.* — *Nephelium fumatum* Bl., Rumphia 3 (1849) 111. — *Pseudonephelium fumatum* Radlk., [Sapind. Holl.-Ind. (1879) 71, *nom. inval.*] in E. & P., Nat. Pfl. Fam. 3, 5 (1895) 329; Pfl. R. Heft 98 (1932) 912. — Type: *Korthals* (or *Müller?*) *s.n.*, SE. Borneo, bud (L sh. 908.270-102, 122, 142, 151 & 172).

*Pseudonephelium javanicum* Radlk., Flora 118—119 (1925) 399; Pfl. R. Heft 98 (1932) 913; Back. & Bakh. *f.*, Fl. Java 2 (1965) 137. — Type: *Koorders 11130*, Central Java, Res. Banjumas, Afd. Badjarnegara, Dist. Singomerto, Pringombo F. R., G. Kapol, alt. 700—900 m, 22-11-1891, fl. (M; iso in L).

*Nephelium intermedium* Auct. *non* Radlk.: Elm., Leafl. Philip. Bot. 10 (1939) 3808.

[*Euphoria chevalieri* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 962, f. 120 (11—15), *nom. inval.* (Edinburgh Code Arts. 36, 37)].

[*Euphoria bonii* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 963, *nom. inval.* (Edinburgh Code Art. 36)].

*Pseudonephelium confine* How & Ho, Acta Phytotax. Sin. 3 (1955) 390. — Type: *S. S. Sin 25096*, China, Kwangsi, Shang-Lin Hsien, Ta-Ming Shan, -5-1933, fl. *(n. v.)*.

Tree, up to 27 m × 1 m d.b.h., exceptionally a shrub, sometimes with buttresses; hairs partly in small tufts or pairs, partly solitary. *Twigs* 2—7½ mm ⌀, terete to 5-grooved, dark- to greyish-brown, early glabrescent or glabrous, lenticels inconspicuous. *Leaves* 1—5-jugate or exceptionally reduced to 1 pseudo-terminal leaflet, axial parts thin-hairy, mostly early glabrescent; petiole 1½—12 cm, above flat to sometimes slightly hollowed, exceptionally terete; petiolules 1—15 mm, above grooved, often with a median rib. *Leaflets* 6½—28 × 2½—10½ cm, ratio 2—4, widest about the middle, thin-coriaceous (to papyraceous), above glabrous, beneath glabrous to sparsely hairy, beneath with a naked gland in (nearly) all nerve axils and mostly some scattered along the margin (in the incisions if the margin is not entire); base equalsided to oblique, cuneate to rounded, decurrent or not; margin mostly repandous to (mainly in the apical part) sinuous or scattered dentate, sometimes entire; apex acuminate; midrib above prominulous to hardly sunk; nerves ¾—2¾ cm distant along midrib, angle to midrib 40—80°, nearly straight to moderately curved, above prominulous or rarely grooved; veins and veinlets mutually not much different, above mostly inconspicuous, beneath distinct. *Inflorescences* terminal or exceptionally axillary, up to 50 cm, rather sparsely hairy; cymules mostly many-flowered; pedicels 2—4 mm; bracts subulate, up to 3 mm. *Calyx:* lobes ⅕—⅓ connate, 2—3 × 1½—2½mm, inside tomentose. *Petals* 0(—4), spathulate, up to 1¼ × ⅓ mm, partly thin-woolly at both sides, sometimes sparsely glandular-ciliolate. *Disk* woolly. *Stamens:* (6—)8(—10); filament 1½—2½ mm, glabrous to densely hairy in lower ⅔; anther 0.6—0.8 mm. *Fruit:* lobe(s) subglobular, 2—2½ cm ⌀, granular or not, hardly warty to short-spiny.

KEY TO THE SUBSPECIES

1a. Twigs rarely more than 3 mm ∅. Leaves 1- or 2-(exceptionally 3-)jugate or sometimes 1-foliolate. *Philippines* . . . . . ssp. **philippinensis**
b. Twigs nearly always more than 3 mm ∅. Leaves (2- or) 3—5-jugate. . . . . 2
2a. Twigs distinctly 5-grooved. Glands on lower leaf face, apart from those in the nerve axils, in the axils of veins near the margin. *Indo China, SE. China*. . . . . ssp. **indochinensis**
b. Twigs terete. Glands on lower leaf face in the nerve axils and along the margin . . . . . 3
3a. Petals absent or sometimes 1 rudimentary one present; filaments glabrous. *Borneo* . . ssp. **fumatus**
b. Petals 4, rudimentary; filaments with some long hairs in the basal half. *Sumatra, Java* . ssp. **javensis**

ssp. **fumatus**. — *Nephelium fumatum* Bl.

Tree, up to 24 m × 1 m d.b.h., rarely a shrub, exceptionally with up to 1 m high buttresses. *Twigs* up to 7½ mm ∅, terete, early glabrescent. *Leaves* (2- or) 3- or 4-jugate; petiole up to 11½ cm long. *Leaflets* 6½—28 × 2¾—10½ cm, beneath mostly very sparsely short-hairy in the basal part on midrib and nerves, with a naked gland in nearly all nerve axils and some scattered along the margin or in the incisions; base cuneate to ± rounded. *Inflorescences* rather lax, up to 45 cm long. *Corolla* absent or rarely 1 strongly reduced petal present. *Filaments* glabrous. *Fruit* hardly warty.

BORNEO. Sarawak: *Chai & Seng S. 16180*, Kuching, Bau, Tai Ton, Bt. Kolong, 90 m alt.; *Clemens 20149*, Mt. Poi, 600 m alt. (SAR); *Sibat ak Luang S. 23271*, 4th Div., Marudi, Bok-Tisam, Bt. Mentagai, 120 m alt. — Southeast: *Korthals s.n.*, type; *NIFS bb 19182*, Berouw. — East: *Endert 5243*, W. Kutai, Kombeng, 30 m alt.; *Kostermans 13245(a)*, Sangkulirang region, Sg. Mandu; *21301*, Berau, Mt. Njapa on Kelai R., 100 m alt. — North: 13 collections. — P. Laut: *NIFS bb 12236*, Sei Taip, alt. 250 m.

ssp. **indochinensis** Leenh., *ssp. nov.* — *Euphoria bonii* Gagnep. — *Euphoria chevalieri* Gagnep. — *? Pseudonephelium confine* How & Ho. — Type: *F. Fleury in herb. Chevalier 30151*, Indo-Chine, Nord-Annam, Prov. de Nghê-An, Rés. Forest. de Cô-Ba, 8-5-1914, fr. (P).

*Ramuli* 5 mm crassi, 5-sulcati, tomentelli. *Folia* 3-jugata; foliola 11—24 cm longa, 4—6 cm lata, subtus sparse pubescentia, glandibus in axillis nervorum et prope marginem in axillis venarum suffulta. *Lobi fructus* breve echinati.

Tree, 12—15 m, or shrub. *Twigs* 5—7 mm ∅, 5-grooved, sparsely hairy to glabrous. *Leaves* 3—5-jugate; petiole 7—12 cm. *Leaflets* 8—24 × 4—10 cm, beneath variably hairy all over, with a naked gland in all nerve axils and near the margin in the axils of veins; base often oblique, cuneate to rounded, slightly decurrent. *Inflorescences* 25—45 cm. *Corolla* absent or a single reduced petal present. *Filaments* densely hairy in lower ⅔. *Fruit* short-spiny.

N. VIETNAM. *Bon 5422*, W. Tonkin, Tiên Thôn (P); *Eberhardt 4803*, Prov. Bac-Kan, Lang Chang (P); *Fleury in herb. Chevalier 30151*, type.
LAOS. *Kerr 20936*, Muang Garn, Chuang Thwang, 900 m alt. (K).
CHINA. Kwangsi: cited by How & Ho, l.c.

*Note.* I have described this subspecies as a new entity, homotypic with the invalid name *Euphoria chevalieri*, and not based upon the legitimately published *Pseudonephelium confine* as I saw neither the type, nor any of the two paratypes of the latter, whereas its description does not mention a few characters that are in my opinion of importance. However, I hardly doubt that the latter species is synonymous with my subspecies.

ssp. **javensis** (Radlk.) Leenh., *stat. nov.* — *Pseudonephelium javanicum* Radlk.

Tree, 27 m × 40 cm d.b.h. *Twigs* 5 mm ∅, terete with 5 faint grooves, early glabres-

cent. *Leaves* 3- or 4-jugate; petiole 9—12 cm. *Leaflets* 20—24 × 6—7 cm, beneath sparsely tufted-hairy along the midrib and in the nerve axils, on the nerves with some scattered hairs, glands in each nerve axil and some scattered ones along the margin; base cuneate. *Inflorescences* incompletely known. *Corolla* with 4 reduced petals. *Filaments* with some woolly hairs in the basal half. *Fruit* unknown.

SUMATRA. Bencoolen: *NIFS bb 1993*, Afd. Redjang, near dusun Tinggi, 300 m alt.
JAVA. Central: *Koorders 11130*, type.

ssp. **philippinensis** Leenh., *ssp. nov.* — Type: *H. G. Gutierrez PNH 78086*, Philippines, Luzon, Isabela Prov., San Mariano, Sierra Madre Mts., Bo. Disulap, 150 m alt., 26-4-1961, fr. (L; iso in K, PNH).

Arbor, 7 m alta, 14 cm crassa. *Ramuli* 3 mm crassi, teretes, glabri. *Folia* 2-jugata; petiolus c. 5 cm longus; foliola 6—15 cm longa, 2—7 cm lata, glabra, subtus glandibus in axillis nervorum et ad marginem suffulta, base aequalia, cuneata. *Lobi fructus* breve echinati.

Tree, 7 m × 14—35 cm d.b.h. *Twigs* 2—3(—5) mm ⌀, terete, glabrous. *Leaves* 1- or 2-jugate (exceptionally 1-foliolate or 3-jugate); petiole 1½—10 cm. *Leaflets* 6—24 × 2—9 cm, glabrous, beneath with a gland in each nerve axil and some scattered ones along the margin; base cuneate. *Inflorescences* up to 20(—50) cm. *Corolla* absent. *Filaments* glabrous. *Fruit* short-spiny.

PHILIPPINES. Mindoro: *Conklin PNH 37890*, Mt. Yagaw. — Luzon: 11 collections. — Samar: *Ramos BS 24337*, Catubig R. (K). — Panay: *Sandique FB 25432*, Iloilo (K).

*Ecol.* Up to 900 m alt. *Fl.* Febr.-April, July, Nov., *fr.* March-April.

*Notes.* 1. The name *Pseudonephelium fumatum* was not validly published in 1879 as the generic name was validated only in 1890.
2. The two specimens known from the Malay Peninsula, *King's coll. 7659* (Perak, G. Boobo Range) and *Cockburn KEP FRI 10575* (Trengganu, Bitu Biwa) are too incomplete to identify them up to a subspecies; they come nearest to ssp. *fumatus* and *philippinensis*.

**Dimocarpus gardneri** (Thw.) Leenh., *nov. comb.* — *Nephelium gardneri* Thw., En. Pl. Zeyl. (1858) 58; Hiern in Hook. *f.*, Fl. Br. Ind. 1 (1875) 690; Trim., Fl. Ceyl. 1 (1893) 309. — *Euphoria gardneri* Thw., En. Pl. Zeyl. (1864) 408, *nom. illeg.*; Beddome, Ic. Pl. Ind. Or. 1, 15 (1874) t. 285; Radlk., Pfl. R. Heft 98 (1932) 897. — Type: *Thwaites CP 1154*, Ceylon, Puttalam, fl. & fr. (K; iso in BM).

Middle-sized tree. Hairs all solitary. *Twigs* 2½—3 mm ⌀, slightly to hardly 5-grooved, creamy white, appressed short fulvous hairy, early glabrescent, lenticels inconspicuous. *Leaves* 2- or 3-jugate, axial parts sparsely puberulous to subglabrous; petiole 1½—4 cm, in the upper part terete to slightly hollowed above, towards the base above flat to hollowed; petiolules 1—3 mm, terete to ribbed above, narrowly winged by the decurrent leaf base. *Leaflets* 4—10 × 1—3½ cm, ratio 2½—3¾, widest about the middle, often slightly falcate, chartaceous to subcoriaceous, glabrous, beneath with some scattered glands near the margin halfway between the nerves and sometimes with hair-covered domatia in some nerve axils; base mostly oblique with the lower half much narrower than the upper, cuneate, slightly decurrent; margin coarsely serrate-dentate (up to 4 teeth per side); apex blunt to acutish, not or hardly acuminate; midrib above (prominulous to)

slightly grooved; nerves ½—¾(—1¼) cm distant along midrib, angle to midrib 55—65° on the broad, 60—70° on the narrow side, on the broad side straight to slightly curved, on the narrow side strongly curved, above hardly conspicuous; intercalary veins often well developed, further veins not much different from veinlets, visible on both sides. *Inflorescences* terminal and axillary, up to 20 cm, strigose; cymules up to 7-flowered; pedicels 2—3 mm; bracts linear-lanceolate, *c.* 2 mm. *Calyx:* lobes confluent at base, 2½—3 × 1¾ mm, inside densely appressed short-hairy. *Petals* 5, outside sparsely, inside densely hairy, 5 × 1½ mm. *Disk* velutinous. *Stamens* (7)8(—10); anther ¾ mm. *Pistil:* style strigose. *Fruit:* lobes subglobular, 1¼—1½ × 1—1¼ cm, granular, slightly warty.

*Distr.:* Ceylon, dry parts.

CEYLON. *W. Meijer 345* (L); *Rottler s.n.* (K); *N. D. Simpson 8175*, near Kalaeliya on Kurunegala Rd. -5-1931 (BM); *Thwaites CP 1154*.

**Dimocarpus longan** Lour., Fl. Coch. (1790) 233; ed. 2, 1 (1793) 288; J. Knight, Trans. Hort. Soc. 2 (1817/8) 400—402, t. 28 (bis). — *Euphoria verruculosa* Salisb., Prod. (1796) 280, *nom. illeg.* (Edinburgh Code Art. 55). — *Scytalia longan* Raeusch., Nomencl. ed. 3 (1797) 113, *nom. illeg.;* Roxb., Fl. Ind. ed. 2 (1832) 270. — *Euphoria longan* Steud., Nomencl. (1821) 328, *nom. illeg. ;* Lindl., Bot. Reg. 20 (1835) t. 1729; Merr., Comm. Lour. (1935) 248. — *Nephelium longan* Hook., Curtis Bot. Mag. (1844) t. 4096; Kurz, J. As. Soc. Beng. 44, ii (1876) 187. — *Nephelium long-yan* Bl., Rumphia 3 (1849) 108. — Neotype: *Liao & Kuo 1598*, Taiwan, Tafu, Miaoli, fr., 12-7-1965 (L; iso in TAI).

[*Linkeng* Rumph., Herb. Amb. 1 (1741) 157.]

*Dimocarpus lichi* Lour., Fl. Coch. (1790) 233 *p.p.; non* Ait., Hort. Kew. ed. 2, 2 (1811) 354 (= *Litchi chinensis* Sonn.). — *Scytalia litschi* Raeusch., Nomencl. ed. 3 (1797) 113, *nom. illeg.* — Type: unknown.

*Euphoria sinensis* Gmel., Syst. Nat. 2 (1791) 611, *nom. illeg.* — Type: unknown.

*Euphoria longana* Lamk, Encycl. 3 (1792) 574, *nom. illeg.;* Groff, Lychee and Longan (1921); Radlk., Pfl. R. Heft 98 (1932) 898; Kraemer, Trees West. Pacific Reg. (1951) 217, f. 77; Pételot. Pl. Médic. Cambodge, Laos, Viet-Nam 1 (1952) 199; Walker, Imp. Trees Ryukyu (1954) 194, f. 117; Liu, Illustr. Lign. Pl. Taiwan 2 (1962) 908, with fig.; Back. & Bakh. *f.*, Fl. Java 2 (1965) 136. — *Nephelium longana* Cambess., Mém. Mus. Hist. Nat. Paris 18 (1829) 30; Kanjilal & Das, Fl. Assam 1 (1936) 323; Desch, Mal. For. Rec. 15 (1954) 531. — Type: unknown.

*Sapindus longifolius* Vahl, Symb. 3 (1794) 53. — Type: *Schumacher in herb. Vahl* (C, photo seen).

*Nephelium bengalense* G. Don, Gen. Hist. 1 (1831) 670. — Type: '*Scytalia bengalensis* Roxb. in herb. Lamb.' *(n.v.).*

*Euphoria lit-chi Auct. non* Desfont.: Blco, Fl. Filip. (1837) 285; ditto, ed. 2 (1845) 199; ditto, ed. 3, 2 (1878) 8.

[*Dimocarpus pupilla* Moon, Cat. Ceyl. Pl. (1824) 31, *nom. nud.*] — *Nephelium pupillum* Wight, Illustr. 1 (1840) 141. — [*Euphoria pupillum* Steud., Nomencl. ed. 2, 2 (1841) 192, *nom. inval.* (Edinburgh Code Art. 34, 4)]. — Type: unknown.

*Nephelium malaiense* Griff., Notul. 4 (1854) 549; Corner, Ways. Trees (1940) 592, t. 179. — *Euphoria malaiensis* Radlk., Sapind. Holl.-Ind. (1879) 7, 26, 70—72, *nom. illeg.;* Pfl. R. Heft 98 (1932) 909; Back. & Bakh. *f.*, Fl. Java 2 (1965) 137. — *Euphoria malaiensis* Radlk. f. *genuina* Radlk., Sapind. Holl.-Ind. (1879) 71, *nom. illeg.* — Type: *Griffith KD 999*, Malay Pen., Malacca, Mali, fl. (K; iso in L, M, W).

*Sapindus cinereus* Turcz., Bull. Soc. Nat. Mosc. 31 (1858) 402. — *Euphoria cinerea* Radlk., Sitz. Ber. K. Bayer. Ak. Wiss. M.-Ph. Kl. Münch. 8 (1878) 299, *nom. illeg.;* Pfl. R. Heft

98 (1932) 905; Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 966. — Lectotype: *Cuming 1131*, Philippines, Luzon, Prov. of S. Ilocos, fl. (iso in BM, FI, K, L).

*Sapindus stellulatus* Turcz., Bull. Soc. Nat. Mosc. 31 (1858) 403. — *Euphoria stellulata* Radlk., Sitz. Ber. K. Bayer. Ak. Wiss. M.-Ph. Kl. Münch. 8 (1878) 303, *nom. illeg.;* Pfl. R. Heft 98 (1932) 908. — Type: *Cuming 1704*, Philippines, Samar, fl., 1841 (iso in FI, K).

*Euphoria elongata* Radlk., Sapind. Holl.-Ind. (1879) 7, 25, *nom. illeg.* — Type: *Beccari PB 2459*, Borneo, Sarawak, fl. (FI; iso in K, M).

*Euphoria malaiensis* Radlk. f. *decalvata* Radlk., Sapind. Holl.-Ind. (1879) 71—72, *nom. illeg.* — Syntypes: *Teijsmann 3548 HB*, Sumatra, Palembang, Muara duwa, st. (L, M); *Teijsmann 4367 HB*, Sumatra, Lampong Districts, Mangala, st. (BO).

[*? Euphoria sp.* Ceron, Cat. Pl. Herb. Manila (1892) 55].

*Nephelium longana* Cambess. var. *pallida* Trim., Fl. Ceyl. 1 (1893) 309. — Type: *Trimen*, Ceylon, Damballa Hill *(n.v.)*.

*Euphoria longana* Lamk var. *acuminata* Pierre, Fl. Coch. (1894) text with t. 318, *nom. illeg.* — Type: unknown.

*Euphoria longana* Lamk var. *obtusa* Pierre, Fl. Coch. (1894) t. 318 B, *nom. illeg.* — *Euphoria obtusa* Radlk., Pfl. R. Heft 98 (1932) 898, *nom. illeg.;* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 961. — Type: *Pierre 4115*, S. Vietnam, S. Cochin China, Thu drau mot, -1-1865, fr., cultivated (P; iso in L).

*Euphoria pallens* Pierre, Fl. Coch. (1894) t. 318 A, *nom. illeg.;* Radlk., Pfl. R. Heft 98 (1932) 908. — Syntypes: *Pierre 4114*, S. Vietnam, Prov. Bien hoa, Mt. Chiua Chang, -9-1865, st., cultivated (P); *Harmand 688 = herb. Pierre 5690*, S. Vietnam, P. Condore, alt. 15 m, -8-1876, fr. (P).

*Pometia curtisii* King, J. As. Soc. Beng. 65, ii (1896) 443. — Type: *Curtis 1668*, Malay Pen., Langkawi, -8-1888, y. fr. (iso in K, SING).

*Euphoria echinulata* Radlk., Rec. Bot. Surv. Ind. 3 (1907) 347, *nom. illeg.;* Pfl. R. Heft 98 (1932) 903. — *Nephelium echinulatum* Ridl., Fl. Mal. Pen. 1 (1922) 503. — Type: *Scortechini '4'*, Malay Pen., fr. (M).

*Euphoria setosa* Radlk., Rec. Bot. Surv. Ind. 3 (1907) 347, *nom. illeg.;* Pfl. R. Heft 98 (1932) 910. — *Nephelium setosum* Ridl., Fl. Mal. Pen. 1 (1922) 503. — Type: *King's coll. 7677*, Malay Pen., Perak, Larut, near Gundu Ponds, 450—600 m alt., -5-1885, fl. (M; iso in K).

*Euphoria cambodiana* Lecomte, Not. Syst. 2 (1911) 55, *nom. illeg.;* Fl. Gén. I.-C. 1 (1912) 1046, f. 131 (9). — Type: *Châtillon s.n.*, Cambodia, Prey Kdey, 19-7-1909, y. fr. (P).

*Euphoria gracilis* Radlk., Elm. Leafl. Philip. Bot. 5 (1913) 1606, *nom. illeg.;* Radlk., Pfl. R. Heft 98 (1932) 905. — Type: *Elmer 13482*, Philippines, Mindanao, Agusan Prov., Cabadbaran, Mt. Urdaneta, -8-1912, fl. (M; iso in BM, BO, FI, K, L).

*Euphoria nephelioides* Radlk., Philip. J. Sc. 8, Bot. (1914) 457, *nom. illeg.;* Pfl. R. Heft 98 (1932) 904. — Type: *W. Klemme FB 15218*, Philippines, Basilan, -8-1910, fr. (M).

*Nephelium schneideri* Merr., Philip. J. Sc. 13, Bot. (1918) 23. — Type: *Foxworthy, Demesa & Villamil FB 13775*, Philippines, Mindanao, Zamboanga Dist., Talisay, 20 m alt., -5/6-1912, fr. (PNH, lost; iso in L).

*Euphoria didyma Auct. non* Blco: Merr., Sp. Blanc. (1918) 240, and subsequent authors on the Philippines. — *Nephelium didymum* Craib, Fl. Siam. En. 1 (1926) 329, *pro specim.*

*Xerospermum ferrugineum* C. E. C. Fischer, Kew Bull. (1927) 82, 311; Radlk., Pfl. R. Heft 98 (1934) 1499. — Type: *C. E. Parkinson 1671*, Burma, S. Tenasserim, Kyeinchaung For., alt. 60 m, 6-2-1926, fl. (K).

[*Euphoria sclerocarpa* Radlk. in Merr., Pl. Elm. Born. (1929) 174, *nom. nud.*; Pfl. R. Heft 98 (1932) 910].

[*Euphoria succulenta* Radlk. in Merr., Pl. Elm. Born. (1929) 174, *nom. nud.*; Pfl. R. Heft 98 (1932) 910].

*Euphoria nov. sp.* Merr., Philip. J. Sc. 29 (1926) 388. — *Euphoria microcarpa* Radlk., Pfl. R. Heft 98 (1932) 907, *nom. illeg.* — Type: *Castro & Melegrito 1650*, Borneo, Banguey I., sea level, -7/9-1923, fr. (M; iso in BM, K).

*Nephelium hosei* Ridl., Kew Bull. (1933) 191, *p.p. typo excl.*

*Euphoria scandens* Winit & Kerr, Kew Bull. (1941) 8, *nom. illeg.* — Type: *Winit s.n.*, Thailand, Bangkok, cultivated, -6-1935, fl., & -7-1935, fr. (K).

[*Euphoria fragifera* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 964, f. 121 (5—7), *nom. inval.* (Edinburgh Code Art. 36)].

[*Euphoria morigera* Gagnep., Fl. Gén. I.-C. Suppl. 1 (1950) 964, f. 121 (1—4), *nom. inval.* (Edinburgh Code Art. 36)].

Tree, up to 40 m × 1 m d.b.h., sometimes buttressed, exceptionally a scandent shrub; hairs mainly tufted. *Twigs* terete with 5 faint grooves, (2—)3—11 mm ⌀, whitish to dark brown, mostly inconspicuously, sometimes warty lenticellate, rather densely ferruginous-tomentose, mostly glabrescent. *Leaves* 2—4(—6)-jugate, axial parts variably, mostly densely hairy; petiole 1—20 cm, (terete to) flattened above; petiolules ½—35 mm, mostly grooved above. *Leaflets* 3—45 × 1½—20 cm, ratio 1—5, widest about or rarely below the middle, chartaceous to coriaceous, above often tomentose in basal part of midrib, beneath thinly tufted tomentose mainly on midrib and nerves, between the nerves often with paired or solitary hairs, rarely (sub)glabrous, with or without a naked gland or a hairtuft in part of the nerve axils beneath; base equalsided to oblique, acute to rounded, rarely decurrent; margin entire; apex mostly tapering acute- (to blunt-)acuminate, sometimes acute to rounded or emarginate; midrib prominulous to sunk above; nerves ¼—3 cm distant along midrib, angle to midrib 45—90°, straight to slightly curved, above prominulous to slightly grooved; veins and veinlets variable. *Inflorescences* terminal and exceptionally in the upper leaf axils, 8—40 cm, densely tufted-tomentose; cymules (1—)3—5-flowered; pedicels 1—4 mm; bracts patent, oblong-ovate to narrowly lanceolate, 1½—5 mm long. *Flowers* yellowish brown. *Calyx:* lobes confluent at base, 2—5 × 1—3 mm, inside at least partly variably short-hairy. *Petals* 5 (exceptionally 6, acc. to Groff, 1921), 1½—6 × ⅔—2 mm, both sides for the greater part densely woolly (big ones) to subglabrous (small ones), especially inside apical part if not woolly covered with sessile glands. *Disk* velutinous. *Stamens* (6—)8(—10); filament 1—6 mm; anther ⅔—1½ mm. *Fruit:* lobe(s) broad-ellipsoid to globular, 1—3 cm ⌀, smooth to warty or sometimes up to 1 cm aculeate, sometimes granular, glabrescent.

KEY TO INFRASPECIFIC TAXA

1. Midrib nearly always distinctly sunk above, nerves above nearly always grooved, veins and veinlets clearly different. Petals well-developed, outside hairy, inside fur-like woolly. . ssp. **malesianus**
   2. Fruit smooth to warty . . . . . var. **malesianus**
   2. Fruit long-aculeate . . . . . var. **echinatus**
1. Midrib not sunk above, nerves above prominulous, veins and veinlets hardly different. Petals more or less reduced, outside mostly subglabrous, inside sparsely woolly . . . . . ssp. **longan**
   3. Apex of leaflets rounded, slightly emarginate . . . . . var. **obtusus**
   3. Apex of leaflets blunt to cuspidate.
      4. Petiolules 2—10 mm; leaflets relatively narrow (ratio 2½—4), base at least in upper leaflets distinctly oblique . . . . . var. **longan**
      4. Petiolules 8—10 mm; leaflets relatively broad (ratio *c.* 2), base equalsided. var. **longepetiolulatus**

ssp. **longan**

var. **longan**. — *Dimocarpus longan* Lour. — *Euphoria sinensis* Gmel. — *Euphoria longana* Lamk. — *Sapindus longifolius* Vahl. — *Nephelium bengalense* G. Don. — *Nephelium pupillum* Wight. — *Nephelium longana* var. *pallida* Trim. — *Nephelium longana* var. *acuminata* Pierre. — *Euphoria echinulata* Radlk. — *Nephelium didymum* Craib *pro specim.*

*Twigs* 3—7 mm ⌀, mostly dark brown, warty lenticellate, and long remaining hairy. *Leaves* (2—) 4- or 5-jugate; petiole 2—10 cm, about terete; petiolules 1½—10 mm, grooved or not; leaflets usually opposite, 3—19 × 1½—6½ cm, ratio (1—)2½—4(—5), stiff-chartaceous, mostly glabrous above, subglabrous beneath, naked glands in nerve axils beneath rare, base at least in upper leaflets distinctly oblique, acute, apex blunt to shortly, broadly, and bluntly acuminate, midrib nearly always flat to prominulous above, nerves ½—1¾ cm distant along midrib, angle to midrib 45—80°, usually prominulous above, veins and veinlets mutually hardly different, finely reticulate, prominulous on both sides. *Cymules* 1- or 3-flowered, distinctly stalked. *Flowers:* calyx lobes inside completely puberulous; petals often more or less reduced, not exceeding the calyx in length, outside subglabrous, inside sparsely woolly. *Fruit:* lobe(s) subglobular, *c.* 1¼—1½ cm ⌀, mostly pusticulate to granulate and nearly smooth, sometimes aculeate or colliculate.

CEYLON. *T. B. Worthington 5557* (BM).

INDIA. 18 collections from different parts, often very incompletely annotated.

BURMA. *Prazer 47, 89a.* — Upper Burma: *Brandis 485*, Thoungyen; *King's coll. 468*, Fort Stedman; *Prazer 68*, Kalay Hills. — Lower Burma: *Kurz 2034*, Pegu.

THAILAND. North: *Kerr 6186*, Chiengmai, Mê Tûn; *Winit 73*, Chieng Dao. — Central: *Noe 92*, Saraburi, Muak Lek.

CAMBODIA. *Pierre 4115*, Prov. Banteas Meas, Mt. Prel.

N. VIETNAM. *Balansa 3420*, near Hanoi; *Bon 1482*, W. Tonkin.

CHINA. Kwangsi: *H. B. Morse 569*, Lungchow (FI, K). — Kwangtung: *A. Loher s.n.*, Canton, cult.? (M); *To Kang Ping C.C.C. 13647*, Canton, cult.? (L, SING).

TAIWAN. *U. Faurie 31*, Maruyama (BM); *Liao & Kuo 1598*, Tafu, Miaoli; *R. Oldham 83/1* (BM); *Tanaka & Shimada 10979*, Shinten, Taihoku-shu (L, M, NY, SING).

HAINAN. 6 collections.

MALAY PENINSULA. *Scortechini s.n.*, type of *Euphoria echinulata*. — Perak: *Henderson SF 23812*, G. Pondok.

JAVA. West: *C. A. Backer 35215*, Preanger, Tjibadak. — East: *Altmann s. n.*, Pasoruan (BO). Doubtless both naturalized.

BORNEO. North: *Keith SAN A 1549*, Elopura For. Dist. (BO, K, L). Prob. naturalized.

PHILIPPINES. Luzon: *A. Loher 13272*, Rizal Prov., Montalban (M). Prob. naturalized.

NEW GUINEA. Vogelkop Peninsula: *BW 1157, 1888, 1889 & 2083*, Oransbari; *Schram BW 12424*, Warsamson Valley E. of Sorong. — Southeast: *Cavanaugh NGF 2072*, Northern Div., Dobodura area. — Northeast: *T. G. Hartley 12197*, near Butibum R. *c.* 7 miles N. of Lae (CANB, L); *Havel NGF 17203*, Lae Subdist., Gnalan Gumbun. Doubtless all naturalized.

Cultivated mainly in continental SE. Asia and Java.

*Ecol.* From sea-level up to 700 m alt. *Fl.* mainly March-May, *fr.* mainly July.

*Vern.* Chinese: *long-yan, long-yen.* Java: *lèngkèng, lingkeng.*

*Note.* It is difficult to draw the limits of the area of natural distribution as this variety is widely cultivated as a fruit tree, and as the dried fruits (but the seeds are then probably no longer viable) are exported, mainly from S. China.

var. **longepetiolulatus** Leenh., *var. nov.* — *Euphoria morigera* Gagnep. — Type: *Poilane 12305*, S. Vietnam, Prov. Phanrang, Ca Na, 13-10-1925, fr. (P).

*Ramuli* 7 mm crassi, grisei, inconspicue lenticellati, glabri. *Folia* 2- vel 3-jugata; petiolus c. 6—8 cm longus, applanatus; petioluli 8—10 mm longi, sulcati; foliola (sub)opposita, 4½—8 cm longa, 2—3½ cm lata, (ovato-) oblonga, chartacea, glabra, eglandulosa, basi equali, cuneata, attenuata, apice obtuso, costa supra applanata vel leviter sulcata, nervis secundaribus inter sese ½—1 cm distantibus, a costa angulo c. 50° abeuntibus, supra leviter prominentibus, venis venulisque dense reticulatis, supra minute prominentibus, subtus inconspicuis. *Lobi calycis* utrinque puberuli. *Lobi fructus* globosi, c. 1½ cm diam., pustulati, granulati, pericarpio crasso, duro.

*Twigs* 6—7 mm ⌀, greyish, variably lenticellate, glabrescent or glabrous. *Leaves* 2—4-jugate; petiole 4—8 cm long, flattened above; petiolules 8—10 mm, grooved; leaflets opposite to alternate, 4½—8 × 2—3½ cm, ratio *c.* 2, stiff-chartaceous, above glabrous, beneath (sub)glabrous, without glands, base equalsided, (obtuse to) cuneate in lower, acute in upper leaflets, apex blunt to shortly and broadly acuminate, sometimes slightly emarginate, midrib flat to slightly sunk above, nerves ½—1 cm distant along midrib, angle to midrib *c.* 50°, above prominulous, veins and veinlets not much different, finely reticulate, above prominulous, beneath hardly conspicuous. *Calyx lobes* inside completely puberulous; petals unknown. *Fruit:* lobe(s) globular, *c.* 1½ cm ⌀, coarsely pustulate, granulate, wall thicker and harder than in the other varieties.

S. VIETNAM. *Poilane 12305, 12382*, Prov. Phanrang, Ca Na (P).

*Ecol.* Forest on rocks, at 600—700 m alt. *Fr.* Oct.

var. **obtusus** (Pierre) Leenh., *comb. nov.* — *Euphoria longana* var. *obtusa* Pierre. — *Euphoria scandens* Winit & Kerr.

Tree or scandent shrub. *Twigs* 2—4 mm ⌀, ashgrey to brownish, glabrescent, rather densely but inconspicuously lenticellate. *Leaves* (2—)4- or 5-jugate; petiole 1—3½ cm, terete; petiolules 1—5 mm, not or hardly grooved; leaflets opposite to alternate, 2—12 × 1½—6 cm, ratio 1½—3½, chartaceous to subcoriaceous, above with scattered short hair tufts on midrib and nerves to glabrous, beneath rather densely pubescent (hairs, except on midrib, mainly paired or solitary) to subglabrous, beneath often with naked or exceptionally hair-covered glands in few of the nerve axils, base mostly equalsided and often rounded to blunt in lower, oblique and cuneate in upper leaflets, apex rounded, sometimes slightly emarginate, midrib above prominulous, nerves ¼—1 cm distant along midrib, angle to midrib *c.* 50—60°, above prominulous, veins and veinlets mutually not much different, finely reticulate, prominulous on both sides. *Flowers:* calyx lobes inside densely short-velutinous; petals strongly reduced, shorter than the calyx, outside above the base, along the margin, and inside in the lower half slightly long-hairy. *Fruit:* lobe(s) globular, 1¼ cm ⌀, areolate, not granular, late glabrescent.

S. VIETNAM. *d'Alleizette 1416*, near Bien Hoa (L); *Thorel 715*, Baloa.
INDO CHINA. Without further localities: *Poilane 127; Talmy s.n.* (P).
Cultivated, *Noe*, Thailand, Bangkok (K); *Pierre 4115*, type; *Winit s.n.*, type of *Euphoria scandens*.

ssp. **malesianus** Leenh., *ssp. nov.* — Basionym: *Sapindus cinereus* Turcz.
var. *malesianus*. — *Dimocarpus lichi* Lour. — *Nephelium longana Auct. males. non* Cambess. — *Nephelium malaiense* Griff. — *Sapindus cinereus* Turcz. — *Sapindus stellulatus* Turcz. — *Euphoria elongata* Radlk. — *Euphoria malaiensis* f. *decalvata* Radlk. — *? Euphoria sp.* Ceron. — *Euphoria pallens* Pierre. — *Pometia curtisii* King. — *Euphoria setosa* Radlk. — *Euphoria cambodiana* Lecomte. — *Euphoria gracilis* Radlk. — *Euphoria didyma Auct. non* Blco. — *Xerospermum ferrugineum* C. E. C. Fischer. — *Euphoria sclerocarpa* Radlk. — *Euphoria succulenta* Radlk. — *Euphoria microcarpa* Radlk. — *Euphoria fragifera* Gagnep.

*Twigs* mostly smooth and early glabrescent. *Leaves* 2—4(—6)-jugate; petiole (3—)6—10 (—20) cm, mostly flattened above; petiolules usually grooved above; leaflets beneath often with, sometimes hair-covered, glands in part of the nerve axils, mostly slightly hairy, base mostly equalsided, apex often acuminate, midrib nearly always sunk, at least in the basal part, nerves often grooved above, veins and veinlets mostly distinctly different, veins mostly transverse, above sometimes grooved, veinlets above often inconspicuous. *Flowers* rarely solitary, cymules often subsessile. *Petals* distinctly exceeding the calyx in

length, nearly always densely woolly, inside often fur-like. *Fruit:* lobe(s) 1—2½ × 1—2 cm, smooth to warty.

BURMA. Tenasserim: *R. N. Parker 2717*, Lenya Valley (K); *C. E. Parkinson 1671*, type of *Xerospermum ferrugineum; 1935*, Nyaungbinkwin (K).

LAOS. *Thorel 3045*, Me Kong R., Ile de Khong, resp. Vien Chang.

CAMBODIA. *Béjaud 415/416* (P); *Châtillon s.n.*, type of *Euphoria cambodiana; S. R. E. P. Xê 9*, Kompongalam (P).

S. VIETNAM. *Harmand 688 & Pierre 4114*, syntypes of *Euphoria pallens.*

MALAY PENINSULA. Perak: *M. R. Henderson SF 23885*, S. Kenenring; *King' s coll. 7677*, type of *Euphoria setosa.* — Dindings: *C. Curtis s.n.*, Lumot (SING sh. 23424). — Trengganu: *Cockburn KEP FRI 8394*, Galong. — Pahang: *Burkill & Haniff SF 17031*, Raub Dist., Batu Talam; *Cockburn KEP FRI 7973*, Ulu Endau near Chegar Rambutan; *Hamid CF 5724*, Temerloh. — Selangor: *Curtis 3773*, Batu Caves. — Negri Sembilan: *KL 2856*, between Seremban and Broga. — Malacca: *Goodenough 1904*, Bt. Tampin; *Griffith KD 999*, type of *Nephelium malaiense; Maingay 1115 & 1125* (both = *KD 455*). — Johore: *Kiah SF 32405*, S. Kayu. — Langkawi: *Curtis 1668*, type of *Pometia curtisii.* — Singapore: *Ridley 4782*, between Kranji and Bt. Timah; *6774*, Chau Chukang; *11322*, Yochu Kang Rd.

SUMATRA. Tapanuli: *NIFS bb 19654*, Sibolga, Sibung For. — Djambi: *Posthumus 963*, Batang Sungai. — Palembang: 11 collections. — Lampong Districts: *Gusdorf 37*, Manggala (BO, L); *171*, Gunungsugis (BO); *Teijsmann 4356 HB & 4367 HB*, Mangala. — Banka: *Hort. Bot. Bogor s.n.* (M). — Riouw Arch.: *Hort. Bot. Bogor III I 31 & 31a.*

BORNEO. 137 collections from all over the island.

PHILIPPINES. 97 collections from Palawan, Mindoro, Luzon, Polillo, Masbate, Samar, Leyte, Negros, the Sulu Is., Basilan, and Mindanao.

CELEBES. North: *NIFS bb 19432*, Menado, Gorontalo. — P. Moena: *NIFS bb 21771*, Raha.

MOLUCCAS. Sula Is.: *NIFS bb 29888*, N. Mangoli, Kimakol, Lamapu.

*Vern.* The main Malayan name is *Mata kuching.*

*Note.* The present variety is nearly as variable as the species as a whole; for that reason the description is shorter than that of the other varieties. This variation is mainly restricted to the vegetative parts and the fruits; the flowers are rather uniform.

The greatest variation is found in Borneo. With sufficient material it might be possible to distinguish here between 30 to 40 local races. As, however, the delimitation is often vague, and as especially fruits are lacking in many cases. it was impossible to give a clear circumscription of even the main forms. Moreover, this seemed the more senseless as surprisingly few of these sometimes very extreme forms have ever been described and named.

In the Philippines, on the contrary, the situation is fairly simple: all fruiting material can be divided into two races, for a long time distinguished as species already: '*cinerea*' with densely thick-warty fruits, *c.* 2 cm ⌀, and '*gracilis*' with fine-warty fruits 1 cm or less ⌀. Both races are also represented in Borneo, the latter named there *Euphoria microcarpa.*

The material from Sumatra is rather uniform; it agrees with the form from N. Borneo usually identified as *Euphoria malaiensis.*

The Malay Peninsula has few forms. The usual one agrees with the form from Sumatra; this is true '*malaiensis*' with rather big (1⅜ cm ⌀), nearly smooth fruits and large (up to *c.* 16 × 6 cm) leaflets. *Pometia curtisii* is about identical with '*gracilis*' from the Philippines and *Euphoria microcarpa* from Borneo: it has smaller leaflets (up to *c.* 10 × 3 cm) and smaller (1¼ cm ⌀) fine-knobby or -spiny fruits. A 3rd form to which belongs *SF 32405* is densely reddish brown velvety and big in all parts; comparable material is also known from Sumatra.

The material from continental Asia is fairly uniform and agrees mainly with '*gracilis*'.

The few specimens from Celebes and the Moluccas all lack fruits; they cannot further be placed.

var. **echinatus** Leenh., *nom. nov.* — *Euphoria nephelioides* Radlk. (basionym). — *Nephelium schneideri* Merr.

*Twigs* 4—7 mm ⌀, whitish, smooth, early glabrescent. *Leaves* 2—4-jugate; petiole 6—9 cm, mostly terete; petiolules 3—15 mm, grooved above; leaflets 4—22 × 1½—9 cm, ratio 2—4, chartaceous, mostly glabrous above, subglabrous beneath, with or without naked or hair-covered glands beneath in part of the nerve axils, base ± equalsided, variable, apex acuminate, midrib sunk above, nerves 1—1¾ cm distant along the midrib, angle to midrib 55—80°, grooved above, veins transverse, inconspicuous, veinlets slightly grooved beneath, invisible above. *Inflorescences* and *flowers* as in var. *malesianus*. *Fruit:* lobe(s) 1½—3 cm ⌀, densely covered with ¾—1 cm long flattened spines.

BORNEO. North: *Chai SAN 18354*, Lahad Datu Dist., Ulu Malambabula; *Heya c.s. SAN 61671*, Lahad Datu Dist., Bakapit, mile 27; *Sindin SAN 63772*, Semporna Dist., Mt. Pock For. Res.; *G. H. S. Wood SAN 16099*, 15 miles ESE. of Lahad Datu.

PHILIPPINES. Basilan: *Klemme FB 15218*, type of *Euphoria nephelioides; Santos 4124*, Basilan City, Panusupan (L). — Mindanao: *Foxworthy c.s. FB 13775*, type of *Nephelium schneideri; Jimenez FB 27186*, Lanao Dist. (BM, K).

*Note.* Only specimens with (fairly) well-developed fruits can be separated from certain forms of var. *malesianus*. Still I am of the opinion that a varietal rank should be assigned to this uniform material with for *Dimocarpus* a rather unusual fruit.

*Nomenclature.* Though Willdenow, sp. Pl. 2, 1 (1799) 346, united the 4 species described by Loureiro under *Dimocarpus* and choose for the name *D. lichi*, and though *D. lichi* is doubtless the type of the genus, I have accepted *D. longan* as the correct name. The epithet *lichi* was erroneously derived from the Chinese vernacular on which the genus *Litchi* was already based, and it gave repeatedly rise to a misunderstanding of the present species and genus. I am of the opinion that art. 69, Edinburgh Code, can be applied here.

The combinations under *Scytalia* Gaertn. are illegitimate as that name was clearly based upon *Litchi* Sonn.

## DUBIOUS NAMES

**Dimocarpus informis** Lour., Fl. Coch. (1790) 234. — *Scytalia informis* Raeusch., Nomencl. ed. 3 (1797) 113, *nom. illeg.* — *Euphoria informis* Poir., Enc. Suppl. 3 (1812) 478, *nom. illeg.* — *Nephelium informe* Cambess., Mém. Mus. Hist. Nat. Paris 18 (1829) 30.

The interpretation of this species, known only from the short description by Loureiro, has always been problematic. Radlkofer )1932, p. 945) accepts Pierre's opinion by reducing it with a questionmark to *Xerospermum microcarpum* Pierre. Apart from the statement *'Baccae . . . inedules'* it could as well be some form of *Dimocarpus longan* var. *malesianus*.

*Euphoria rimosa* Royle, Ill. Bot. Himalayan Mts. 1 (1839) 138, *nom. nud.*

*Sapindus undulatus* Wall. *ex* Voigt, Hort. Suburb. Calcutt. (1845) 94, *nom. nud.*

The only 'description' reads 'Flowers small, whitish', but the same remark is given under some other species of the same genus. The interpretation is doubtful as it can not be directly correlated with any Wallich specimen. The only indication as to its identity may be the citation of *Euphoria undulata* under *Euphoria longana*, Wallich Cat. nr 8049. This may be why since Hiern (1875) the present name is often cited under *Euphoria longana* (also by Radlkofer, 1932).

## EXCLUDED TAXA

*Dimocarpus crinita* Lour., Fl. Coch. (1790) 234; ed. 2, 1 (1793) 288. Doubtless *Nephelium* and probably rightly reduced to **Nephelium lappaceum** L. by Radlkofer, Pfl. R. Heft 98 (1932) 958.

*Euphoria annularis* Blco, Fl. Filip. (1837) 285, *nom. illeg.*; ed. 2 (1845) 199; ed. 3, 2 (1878) 7. The interpretation of this name remains doubtful. Merrill, Sp. Blanc. (1918) 240, referred it with some doubt to *Euphoria didyma* Blco. I agree with Radlkofer, Pfl. R. Heft 98 (1932) 612 (*sub Atalaya annularis* Bl.), that it hardly may represent one of the *Nephelieae* but rather a *Cupaniea*, either *Arytera* as suggested by Fernandez-Villar, Nov. App. (1880) 52 (as *Ratonia montana*) and by Radlkofer, l.c., or a *Guioa* as also suggested by Merrill, l.c. *Atalaya*, to which it was referred by Blume, Rumphia 3 (1849) 186, seems out of question.

*Euphoria crinita* (Lour.) Poir., Enc. Suppl. 3 (1814) 478, *nom. illeg.* See under *Dimocarpus crinita*.

*Euphoria cubili* Blco, Fl. Filip. (1837) 287, *nom. illeg.*; ed. 2 (1845) 200; ed. 3, 2 (1878) 10 = **Cubilia cubili** (Blco) Adelb., Blumea 6 (1948) 325.

*Euphoria danura* (Roxb.) Roxb. *ex* Wall., Cat. (1847) nr 8051, *nom. illeg.* = **Lepisanthes senegalensis** (Poir.) Leenh., Blumea 17 (1969) 85.

*Euphoria didyma* Blco, Fl. Filip. (1837) 288, *nom. illeg.* = **Litchi chinensis** ssp. **philippinensis** (Radlk.) Leenh., *comb. nov.* Because of the confusion around the interpretation of this name it seems desirable to typify it; I designate as neotype *Ramos B.S. 17429* (L). The new combination is based upon *Litchi philippinensis* Radlk., Philip. J. Sc. 8 (1914) Bot. p. 458, and lectotypified by *W. M. Maule FB 2995* (M; iso in L) from Luzon.

*Euphoria glabra* Bl., Bijdr. (1825) 233, *nom. illeg.* = **Nephelium lappaceum** L.; cf. Radlk., Pfl. R. Heft 98 (1932) 958.

*Euphoria leichhardtii* Benth., Fl. Austr. 1 (1863) 468, *nom. illeg.* = **Arytera leichhardtii** (Benth.) Radlk. Sapind. Holl.-Ind. (1879) 44.

*Euphoria lit-chi* Desfont., Tableau (1804) 135, *nom. illeg.* = **Litchi chinensis** Sonn.; cf. Radlk., Pfl. R. Heft 98 (1932) 917. The name is also illegitimate as it was based upon *Sapindus edulis* Ait., Hort. Kew. 2 (1789) 36, the epithet of which should have been used.

*Euphoria lit-chi* Desfont. var. *undulata* Bl., Bijdr. (1825) 233, *nom. illeg.* = **Litchi chinensis** Sonn.

*Euphoria malaanonan* Blco, Fl. Filip. (1837) 286, *nom. illeg.* = **Shorea guiso** (Blco) Bl. *(Dipterocarpaceae)*; cf. Merr., Sp. Blanc. (1918) 270.

*Euphoria nephelium* Poir., Dict. Sc. Nat. 27 (1823) 59, *nom. illeg.* = **Nephelium lappaceum** L. The name is also illegitimate as it was based upon *Nephelium lappaceum*, the epithet of which should have been used.

*Euphoria noronhiana* Bl., Bijdr. (1825) 234, *nom. illeg.* = **Xerospermum noronhianum** (Bl.) Bl., Rumphia 3 (1849) 100.

*Euphoria pometia* Poir., Dict. Sc. Nat. 27 (1823) 59, *nom. illeg.* = **Pometia pinnata** Forst.; cf. Jacobs, Reinwardtia 6 (1962) 121.

*Euphoria punicea* Lamk, Enc. 3 (1792) 573, *nom. illeg.* = **Litchi chinensis** Sonn. which name was already cited as a synonym.

*Euphoria ramb-outan* Labill., Mém. Prés. Inst. Sci. Lettres Sci. Math. Phys. 1 (1806) 472, t. 1, *nom. illeg.* = **Nephelium lappaceum** L. The latter name was cited in synonymy.

*Euphoria ramb-outan-aké* Labill., Mém. Prés. Inst. Sci. Lettres Sci. Math. Phys. 1 (1806) 474, t. 2, *nom. illeg.* = **Nephelium mutabile** Bl.; cf. Radlk., Pfl. R. Heft 98 (1933) 968.

*Euphoria verticillata* Lindl., Bot. Reg. (1827) t. 1059, *nom. illeg.* = **Lepisanthes senegalensis** (Poir.) Leenh., Blumea 17 (1969) 85.

*Eyphoria xerocarpa* Bl., Bijdr. (1825) 234 *p.p.*, *nom. illeg.*; *emend.* Rumphia 3 (1849) 170 = **Xerospermum noronhianum** (Bl.) Bl.; cf. Radlk., Pfl. R. Heft 98 (1932) 946.

*Pseudonephelium subaequilaterum* Radlk. *ex* I. K. Suppl. 9 (1938) 225, *nom. inval.* This is a mistake for **Podonephelium subaequilaterum** Radlk.

## INDEX TO BOTANICAL NAMES

Synonyms are printed in *italics*, new names in **bold characters**, an asterisk denotes a figure.