

LOWIACEAE

(Kai Larsen, Aarhus)¹

Lowiaceae Ridley, Fl. Malay Penins. 4 (1924) 291.

Perennial, glabrous *herbs* without aerial stem, often tufted from a horizontal or vertical, sympodial rhizome bearing scale-like leaves. *Leaves* distichous, glabrous, eligulate, base sheathing, petiole well-defined, lamina entire, lanceolate, dorsiventral, enrolled in bud; venation pinnate-parallel with the secondary veins emerging from the prominent main vein at narrowly acute angles and regularly connected by fine transversal veins (conspicuous in dried material, but not in living plants). *Inflorescence* dense or lax, consisting of irregularly branching monochasial cymes. *Flowers* bracteate, bisexual, epigynous, with the ovary prolonged into a solid extension. *Sepals* (outer tepals) 3, subequal, narrow, fused basally into a tube. *Petals* (inner tepals) 3, very unequal, the two lateral small, narrow, the median large, forming a variously shaped labellum. *Stamens* 5, free from each other, the upper median reduced; filaments short, adnate to the base of the petals; anthers tetrasporangiate, introrse, opening by long slits, apically terminated by a short connective tip. *Gynoecium* of 3 fused carpels, with septal nectaries and axile placentae; style elongate, widening apically; stigmatic lobes 3, large, simple undivided or flattened, lacinate-fimbriate, wet. *Ovules* numerous, anatropous, bitegmic, crassinucellate. *Fruit* a dry, loculicidal, elongate capsule terminated by a beak formed by the proximal part of the ovary extension. *Seeds* numerous, globose, hairy, endospermous, with a lacerate aril and an operculum opposite the radicle.

DISTRIBUTION

There is only one genus, *Orchidantha*. For the distribution, see there.

TAXONOMY

The systematic position of the *Lowiaceae* is undisputed; since its establishment it has been recognized as belonging to the order *Zingiberales*.

The only genus *Orchidantha* was described by N.E. Brown, who published *O. borneensis* on 23 October 1886 in a note titled "A new genus of *Scitamineae*." He stated: "for the present I place it in the *Museae*." The plant was introduced from Borneo without indication of locality and grown at Ghent, Belgium.

On the 25th of October of the same year Scortechini published *Lowia* as a new genus from the Malay Peninsula based on *L. longiflora* from Perak. Also he referred it to the tribe *Museae*, regarding it as closely related to *Heliconia*. On account of the developed labellum he suggested it being a link between *Museae* and *Zingibereae*.

1) With contributions by R.W.J.M. van der Ham, Leiden (palynology) and R. Hegnauer, Leiden (phytochemistry).

In 1893 Ridley published *Protamomum maxillarioides*, also from the Malay Peninsula. He knew of Scortechini's description, but not of Brown's, and recognized his genus as belonging to the same group as *Lowia*; he proposed the family name *Lowiaceae*, without any formal description.

In 1897 K. Schumann treated the group under *Musaceae* as *Lowieae* in Engler & Prantl, Nat. Pflanzenfamilien, and as *Lowioideae* in Das Pflanzenreich three years later. H. Winkler followed him in the second edition of Engler & Prantl's Pflanzenfamilien (1930). Ridley established the family in 1924, in 1941 T. Nakai [J. Jap. Bot. 17 (1941) 201, in key] added a Latin diagnosis. All subsequent authors have recognized the family with only one genus, *Orchidantha*. See also Cronquist (1980).

Cladistic analyses undertaken by Dahlgren et al. (1985), Kress (1990) and Smith et al. (1993), all using different outgroups, show its relationship to the group of families related to *Musaceae*, rather than to the *Zingiberaceae*–*Marantaceae* group, and are thus in full agreement with the observations and conclusions of Brown. The study by Smith et al. (1993) involved the analysis of chloroplast DNA of *Orchidantha fimbriata* and *O. siamensis*.

The most striking character of the family is the enlargement of the median petal to a labellum as in the orchids, hence the name *Orchidantha*. However, little is known about the family. To quote Kress (1990): "The *Lowiaceae* are among the most poorly known taxa in the order in terms of taxonomy, general morphology, embryology, chemistry, and ecology."

References: Cronquist, A., An integrated system of the classification of flowering plants (1980). — Dahlgren, R.M.T., H.T. Clifford & P.F. Yeo, The families of the Monocotyledons: structure, evolution, and taxonomy (1985). — Kress, W.J., The phylogeny and classification of the Zingiberales. Ann. Missouri Bot. Gard. 77 (1990) 698. — Smith, J.F., W.J. Kress & E.A. Zimmer, Phylogenetic analysis of the Zingiberales based on *rbcl* sequences. Ann. Missouri Bot. Gard. 80 (1993) 620.

MORPHOLOGY

The distal partial inflorescences of *Orchidantha siamensis* consist of a bract subtending a branch with a basal prophyll and three bracts, the uppermost of which subtends a flower bud, the next from the apex subtends a branch of a similar construction; the axis continues beyond the uppermost flower bud (pers. obs.). Holttum in his analysis of *O. longiflora* [Gard. Bull. Sing. 25 (1970) 239] described the flower as truly terminal. He also observed from old inflorescences a succession of scars where the flowers had fallen, with two bract scars between each; he concluded that the cyme is close to being a cincinnus. The bracts are all more or less tubular at base and their orientation is not easy to establish.

The ovary has an apical prolongation which is sometimes called a calyx tube or hyp-anthium. It is, however, solid with a central vascular strand connecting the base of the style with the ovary; here the term ovary extension, introduced by Holttum, has been used. The sepals (or outer tepals) are similar; the petals (or inner tepals) are arranged as in an orchid flower with two lateral petals and a labellum. The flower is resupinate. The lateral petals are small and overlap the stamens; the labellum is variously shaped, in some species having a narrower proximal part and a broad distal part, in other species

(e. g. *O. holttumii*) the whole labellum is rather broad but distally curved back and forming a claw-like structure. The labellum often has lamellae along the vascular strands. These parts may play a role in pollination.

ANATOMY

The roots are relatively thick and air channels are present. Vessels are present in the roots only and have scalariform perforation plates with numerous bars. The rhizomes are rich in small, angular starch grains quite different from those found in *Musaceae* and *Strelitziaceae*. The chlorenchyma of the lamina is without a palisade layer and consists of an irregular mixture of small and large cells. The leaf axis includes two distinct systems of narrow air canals. Stomata are paracytic with deeply sunken subsidiary cells. Stegmata are present in the form of 'hat-shaped' silica-bodies. Raphide sacs are common, especially in the rhizome. Crystals of calcium oxalate are found in all parts. Tannins occur only in the rhizome.

All in all *Lowiaceae* are anatomically very different from the other families in *Zingiberales*.

Literature. Tomlinson, P.B., in C.R. Metcalfe (ed.), *Anatomy of the Monocotyledons 3, Commelinales-Zingiberales* (1969).

POLLINATION BIOLOGY

Very little is known about the pollination. The flowers of *Orchidantha fimbriatum* have a foul smell (Corner writes on a label that they smell of "bugs and coconut-oil"). The labellum is white and placed close to the soil, and the succulent central part along the midvein contains cells with nutritious tissue, protein cells. Kress (pers. comm.) reports that the labellum is eaten during the night; he suggests that small primates, tree shrews (*Tupaiaidae*), feed on the labellum then. *Orchidantha holttumii*, on the other hand, has purple flowers smelling of horse-dung (Boyce) or fish (Dransfield), and the labellum is erect during anthesis. This species may be pollinated by flies.

PHYTOCHEMISTRY

(R. Hegnauer)

Formerly *Lowioideae* (*Orchidantha*), *Strelitzioideae* (including *Heliconiaceae* 3 or 4 genera) and *Musoideae* (1–3 genera) formed one family, *Musaceae* s.l. As the chemistry of all these taxa is rather poorly known at present, some general remarks about chemical characters of *Musaceae* s.l. seem to be appropriate here. For recent reviews see Tomlinson (1959, 1969), Hegnauer (1963, 1986) and Dahlgren et al. (1985). It should be stressed that some of the important anatomical and chemical characters of *Musaceae* s.l. are intimately connected: structures of starch grains, crystals of calcium oxalate (raphides and other crystal-types), silica bodies located in longitudinal rows of specific silica-cells, called stegmata, and 'tannins' in ordinary parenchymatic cells or deposited in idioblasts or articulated lactifers with their mucilaginous tannin-like and

polyisoprenoid contents; rubber-like polyisoprenes seem to be restricted to *Musaceae* s.str. The tannins of *Musaceae* s.l. are of the condensed type; all seem to be proanthocyanidin oligo- and polymers yielding pelargonidin, cyanidin and/or delphinidin on treatment with mineralic acids. Serious chemical investigations are restricted to *Musaceae* s.str. apart from a flavonoid survey of *Zingiberales* by Williams & Harborne (1977); leaves of most representatives of *Musaceae* s.l. contained glycosides of the flavonols kaempferol and quercetin, but lacked glycosides of myricetin, flavones and C-glycoflavones; flavonoid content of leaves of *Orchidantha maxillarioides*, the only investigated taxon belonging to *Lowiaceae*, was so low that no positive identifications were possible. According to Tomlinson proanthocyanidins are restricted in *Lowiaceae* to subterranean parts. Remarkable observations were published recently for bananas (*Musa acuminata*, *M. × paradisiaca*). Fruits of vegetable varieties of banana are used in India as anti-ulcerogenic medicine; the active principles were reported to be acylated (16:0; 18:1) 3-glycosidic derivatives of sitosterol, called sitoindosides I to IV (Ghosal & Saini 1984; Ghosal 1985). *Musa acuminata* 'Giant Cavendish', has *Colletotrichum musae*-resistant fruits; unripe fruits were shown to produce the phenalenone-type phytoalexin 2-(4'-hydroxyphenyl)-naphthalic anhydride after infection with conidia of this pathogen (Hirai et al. 1994). A year before Luis et al. (1993) had isolated two phenalenones, irenolone and emenolone, from banana leaves infected with *Mycosphaerella fidjiensis*. It is noteworthy that these phytoalexins strongly remind the yellow to red pigments of *Haemodoraceae* (see Flora Malesiana I, 11: 357 and Hegnauer 1986: 659). Tomlinson stressed the fact that from an anatomical point of view *Lowioideae* have an isolated position within *Musaceae* s.l.; one argument is based on the structure of their rather small and often composite starch grains which strongly deviate from the zingiberalean type present in the rest of *Musaceae* s.l. Other pleas for family status of *Lowiaceae* are based on epicuticular leaf waxes which are lacking in *Orchidantha*, but are represented in all other investigated *Musaceae* s.l. by the so-called *Strelitzia*-type (Fröhlich & Barthlott 1988), and by a low diameter of their sieve-element plastides which belong to the P2cs-type (i.e. containing cuneate protein crystals and starch grains) in all *Zingiberales* (Behnke 1994). Chemically the *Strelitzia*-type wax rodlets of *Musaceae* are composed predominantly of wax esters which are accompanied by alkanes, alkanols, alkanals and free fatty acids; triterpenoids are lacking (*Heliconia*, *Strelitzia*) (Meusel et al. 1994).

References and remarks: Behnke, H.-D., Sieve-element plastides, nuclear crystals and phloem proteins in the *Zingiberales*, Bot. Acta 107 (1994) 3–11; investigated 2 *Heliconia* species, 5 *Musaceae* s.str., 3 *Strelitzia* species and *Orchidantha maxillarioides*. — Dahlgren, R.M.T., H.T. Clifford & P.F. Yeo, The families of the Monocotyledons (1985) 352–359; cyanogenic glycosides erroneously indicated on p. 355 for *Musaceae* s.str. and the statement that *Musaceae* s.str. produce 3-deoxyanthocyanidins is based on a preliminary report (no isolation; no structure elucidation) on reddish compounds in UV-irradiated fruits of *Musa* 'Dwarf Cavendish' by N.S. Singh, Influence of UV light on the biosynthesis of anthocyanin-like pigments in ripening bananas, Phytochemistry 11 (1972) 163–164. — Fröhlich, D. & W. Barthlott, Mikromorphologie der epicuticularen Wachse und das System der Monokotylen, Tropische und subtropische Pflanzenwelt 63 (1988) 1–134 (Akad. Wiss. Mainz); from *Lowiaceae* only *Orchidantha maxillarioides* investigated. — Ghosal, S., Phytochemistry 24 (1985) 1807–1810. — Ghosal, S. & K.S. Saini, J. Chem. Research (S) (1984) 110. — Hegnauer, R., Chemotaxonomie der Pflanzen 2 (1963) 362–371, 490; 7 (1986) 557 (proanthocyanidins of monocots), 596 (flavonoids of

leaves of *Zingiberales*), 733–735, 596 (*Musaceae* s.l.). — Hirai, N., et al., *Phytochemistry* 37 (1994) 383–385. — Luis, J.G., et al., *J. Org. Chem.* 58 (1993) 4306–4308. These authors used leaves and green fruits of *Musa paradisiaca* ‘Grand Dwarf’ and ‘Valery’. Infected leaves yielded largest amounts of phytoalexins. According to Luis et al. banana phenalenone-phytoalexins are biogenetically different from phenalenone-pigments of *Haemodoraceae*. If this assumption turns out to be true, the two types of phenalenones are analogous, not homologous metabolites. — Meusel, I., et al., *Chemistry and micro-morphology of compound epicuticular wax crystalloids (Strelitzia-type)*, *Pl. Syst. Evol.* 193 (1994) 115–123. — Tomlinson, P.B., *An anatomical approach to the classification of Musaceae*, *J. Linn. Soc. London (Bot.)* 55 (1959) 779–809. — Tomlinson, P.B., in C.R. Metcalfe (ed.), *Anatomy of the Monocotyledons, Vol. 3, Commelinales–Zingiberales* (1969) 303–340 (also figures of starch grains: *Musaceae* p. 306, *Heliconiaceae* p. 320, *Orchidantha longiflora* p. 339). — Williams, Ch.A. & J.B. Harborne, *Biochem. Syst. Ecol.* 5 (1977) 221–229.

PALYNOLOGY

(R.W.J.M. van der Ham)

Little is known about the pollen morphology of the *Lowiaceae*. Winkler (1930) and Erdtman (1952) described the pollen grains of *Orchidantha* as spheroidal and psilate. According to Lane (1955) the pollen is ‘granular’ and very large. Kress (1986, 1990) implicitly described *Lowiaceae* pollen as inaperturate (functionally omniaperturate), with a reduced, non-stratified, poorly sculptured exine and an elaborated, stratified intine. Such pollen is ubiquitous in the *Zingiberales*, and is probably a primitive character of the order.

Light microscopic observation of the pollen of *Orchidantha longiflora* (untreated material from specimen HBL 06527 in the Hortus Botanicus, Leiden) shows subspheroidal (long axis av. 165 μm , short axis av. 150 μm), inaperturate, psilate grains. The pollen wall is 4–6 μm thick and possibly completely intinous. It consists of a thick (1/2–4/5), densely radially striate outer layer (‘exintine’) and a usually thinner, homogeneous inner layer (‘endintine’).

References: Erdtman, G., *Pollen morphology and plant taxonomy* (1952). — Kress, W.J., *Linn. Soc. Symp. Ser.* 12 (1986) 329–345; *Ann. Missouri Bot. Gard.* 77 (1990) 698–721. — Lane, I.E., *Mitt. Bot. Staatssammlung München II* (1955) 114–131. — Winkler, H., in A. Engler & K. Prantl, *Die natürlichen Pflanzenfamilien*, ed. 2, 15a (1930) 505–541.

CHROMOSOMES

$2n = 18$ has been found in *Orchidantha maxillarioides* and *O. holttumii* by the author and in *O. siamensis* by C. Artharamas, Thailand (pers. comm.).

ORCHIDANTHA

Orchidantha N.E. Br., *Gard. Chron.*, n.s., 26 (1886) 519; Ridley, J. *Str. Br. Roy. As. Soc.* 32 (1899); *Fl. Malay Penins.* 4 (1924) 291; H.J.P. Winkl. in Engl. & Prantl, *Nat. Pflanzenfam.*, ed. 2, 15a (1930) 541; Holttum, *Gard. Bull. Sing.* 25 (1970) 239; K. Larsen, *Bot. Tidsskr.* 56 (1961) 348; in *Fl. Thailand* 2 (1972) 170, f. 10; in *Fl. Camb., Laos & Vietnam* 20 (1983) 147; *Nordic J. Bot.* 13 (1993) 285; Nakai, J. *Jap. Bot.* 17 (1941) 189; T.L. Wu, *Acta Phytotax. Sin.* 9 (1964) 343; T.L. Wu & S.-J. Chen in *Fl. Reip. Pop. Sinica* 16, 2 (1981) 19. — Type species: *Orchidantha borneensis* N.E. Br.

Lowia Scort., Nuov. Giord. Bot. Ital. 18 (1886) 308; Baker in Hook. f., Fl. Brit. India 6 (1892) 263; K. Schum. in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. 1 (1897) 90. — Type species: *Lowia longiflora* Scort. [= *Orchidantha longiflora* (Scort.) Ridley].

Protamomum Ridley, Trans. Linn. Soc. Lond. II, 3 (1893) 383, t. 66. — Type species: *Protamomum maxillarioides* Ridley [= *Orchidantha maxillarioides* (Ridley) K. Schum.].

Description — For a description, see the family description.

Distribution — The ten species are distributed from southern tropical China (Kwangtung and Hainan), through Vietnam (1), Laos (1), and Thailand (1), in *Malesia* to West Malaysia and Borneo. It has frequently been reported in recent literature from 'Pacific islands'. This is probably due to an error.

Habitat & Ecology — The genus seems to be restricted to the lowest layer in lowland tropical forest, mostly evergreen rain forest, along streams and waterfalls, sometimes also in clearings after logging. The plants are light-requiring and often occur together with *Zingiberaceae*.

Notes — 1. The genus has no economic importance and is not often cultivated; *O. maxillarioides* is, however, often grown as a greenhouse plant.

2. Many species are known only from a few collections, or even from the type collection alone. The author has studied several populations of *O. siamensis* in nature in southern Peninsular Thailand. Future research should concentrate on inflorescence structure, pollination and dispersal biology.

KEY TO THE SPECIES

- 1a. Style with stigma 2.5–4.5 cm long 2
- b. Style with stigma not more than 1.6 cm long 4
- 2a. Stigma branches undivided **3. *O. holttumii***
- b. Stigma branches fimbriate 3
- 3a. Labellum 10–12 cm long, apical part 5 cm wide; sepals 11–14 cm long **2. *O. fimbriatum***
- b. Labellum c. 6 cm long, apical part c. 2.2 cm wide; sepals 6–6.5 cm long **6. *O. siamensis***
- 4a. Ovary 8–12 cm long including extension; sepals 6–10 cm long **4. *O. longiflora***
- b. Ovary 2–5.5 cm long including extension; sepals 2.5–3 cm 5
- 5a. Stigma lobes bilobed with a small tooth in the sinus; ovary c. 5.5 cm long including extension **5. *O. maxillarioides***
- b. Stigma lobes finely toothed; ovary 2–2.5 cm long including extension **1. *O. borneensis***

1. *Orchidantha borneensis* N.E. Br.

Orchidantha borneensis N.E. Br., Gard. Chron., n.s., 26 (1886) 519; Holttum, Gard. Bull. Sing. 25 (1970) 246. — Type: Cult. from Borneo (K holo), see note.

Leaves up to 50 cm long; petiole 10–25 cm long, terete in upper part; lamina broadly ovate to ovate lanceolate, acuminate, 15–25 by 6–9 cm. *Floral bracts* purplish. *Sepals*

pale yellowish with purple apex, linear-lanceolate, acuminate, 2.5–2.8 cm long. Lateral *petals* blackish violet, linear, truncate with a fine bristle at apex, c. 8 by 1.1 mm. *Labellum* blackish violet, c. 2 cm long, linear-lanceolate, acuminate. *Stamens* 5–6 mm long. *Ovary* 18 mm long including extension; style as long as stamens, slender, terete, whitish, terminating in a blackish violet, tripartite, fimbriate crest with a V-shaped stigma.

Distribution — *Malesia*: Borneo (more precise origin unknown).

Note — This is the most poorly known species. Only the specimen deposited in K is known. It originates from a cultivated plant introduced by the 'Compagnie Continentale d'Horticulture', Ghent, Belgium.

2. *Orchidantha fimbriata* Holttum

Orchidantha fimbriata Holttum, Gard. Bull. Sing. 25 (1970) 243, pl. 1. — Type: *Haniff 3957* (SING holo), Perak.

Leaves up to 130 cm long; petiole with sheath up to 30 cm long; lamina light green, up to 100 by 15 cm, base narrowly decurrent, margin undulate. *Inflorescence* little branched; prophyll c. 18 mm long; intermediate bracts up to 7 cm long; floral bracts dull purple, up to 15 cm. *Sepals* reflexed, 11–14 by 2 cm, gradually narrowed to the mucronate apex; margin strongly recurved during anthesis, later flattening, dark dull purple throughout or green with purple base. *Lateral petals* cream with dark purple tip and base, up to 27 by 6 mm, narrowly triangular, apex filiform. *Labellum* dark purple brown, 10–12 by 5 cm, narrow with inflexed sides at the base, widening abruptly beyond the stigma to a creamy white, irregularly grooved and folded lamina, towards apex usually 3-lobed; lateral lobes reflexed, middle lobe smaller and straight, texture rather fleshy, surface smooth and somewhat mucilaginous. *Stamens* 24 mm long; filaments 3 mm, flushed with purple; anthers cream coloured. *Ovary* purple, 12–20 mm long including extension, distal part 4 mm diam.; style c. 2 cm long, purplish, wiry; stigma c. 2.4 cm long, white at base, divided towards apex into 3 narrow, dark purple, shining lobes, distally fimbriate for 5–6 mm. *Fruit* c. 8.5 cm long including the extension. *Seeds* hairy, c. 10 mm long; aril lobes up to 15 mm long.

Distribution — *Malesia*: West Malaysia: Perak, Selangor, Pahang, Trengganu and S Johore.

3. *Orchidantha holttumii* K. Larsen — Fig. 1, 2

Orchidantha holttumii K. Larsen, Nordic J. Bot. 13 (1993) 285, f. 2, 3. — Type: *Poulsen et al. 298* (AAU holo; BRUN, K), Brunei.

Robust *perennial* with distichous leaves. Roots numerous, robust, c. 3 mm diam., from a vertical rhizome, c. 15 mm diam., more than 6 cm long. The base of the plant surrounded by several narrow, purple leaf-sheaths 5–8 cm long. *Leaves* up to 150 cm long; petiole 30–70 cm long; lamina lanceolate, 30–80 by 7–10 cm. *Inflorescence* apical on a slender, branched, pale, burrowing stem with prominent bract scars. *Floral bract* appearing above the soil, purple, c. 7 cm long, sheathing the c. 10 cm long, white ovary extension, this curved just below the insertion of the perianth. *Sepals* whitish,



Fig. 1. *Orchidantha holttumii* K. Larsen. Base of plant with flower. Photograph A.D. Poulsen, at type locality, 1992.



Fig. 2. *Orchidantha holttumii* K. Larsen. a. Flower; b. androecium and gynoecium (Poulsen *et al.* 298). Drawing K. Tind. Reproduced with permission from Nordic J. Bot.

equal, lanceolate, cuspidate, c. 9 by 2 cm. *Lateral petals* dark purple, c. 3 by 1 cm, apical part with crenulate-undulate margin, apex cuspidate. *Labellum* dark purple, broadly lanceolate, c. 7 cm long, c. 2 cm broad in lower half, main vein thickened, raised on upper side, the apical part crenulate-undulate, incurved, forming a claw-like structure. *Stamens* c. 2 cm long. *Style* robust, c. 2 cm; stigma 3-fid, branches 8–10 mm, undivided, coarse. *Capsule* 25–30 cm, with a 2 cm long beak. *Seeds* not seen. — Fig. 1, 2.

Distribution — *Malesia*: Borneo: Brunei (Belait Distr., Labi, Kampung Teraja), Sabah (Sandakan, Kabili F. R.).

Note — A sheet in K, *Keith 10013*, bears a label “Seeds-fruit studied for USDA Tech. Bull. — C.R. Gunn.” However, there were no seeds in the capsule when Gunn studied the specimen (Gunn, pers. comm.).

4. *Orchidantha longiflora* (Scott.) Ridley

Orchidantha longiflora (Scott.) Ridley, Fl. Malay Penins. 4 (1924) 292; Keng, Gard. Bull. Sing. 24 (1969) 347; Holttum, Gard. Bull. Sing. 25 (1970) 245. — *Orchidantha longiflora* (Scott.) H.J.P. Winkl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, 15a (1930) 541, nom. superfl. — *Lowia longiflora* Scott., Nuov. Giorn. Bot. Ital. 18 (1886) 308, t. 11; K. Schum. in Engl., Pflanzenr., fam. IV.45 (1900) 40, f. 10A, B. — Lectotype: *Scortechini 2023* (K lecto), see note.

Orchidantha calcarea M.R. Hend., Gard. Bull. Str. Settl. 7 (1933) 125. — Type: *Henderson 26023* (SING holo), Perak.

Leaves up to 75–100(–160) cm long; lamina c. 55 by 6 cm, base long decurrent and not sharply distinct from the c. 20 cm long petiole. *Flowers* solitary or in a few-flowered inflorescence; floral bracts 4–7 cm. *Sepals* 6–10 by 1.5 cm, oblong, with shortly narrowed to apiculate apex, edges ± revolute, dark brown-purple towards apex, olive green with brown veins towards base. *Lateral petals* whitish, c. 28 by 3 mm, with long slender tip. *Labellum* 5–6 by 2.2–2.5 cm, base dark purple, lamina ovate, creamy white, strongly rugose with raised veins, apex with a triangular sinus (always?), c. 14 mm deep, the midrib ending in a mucro in the sinus. *Stamens* 12 mm, with short filaments, enlarged towards the base. *Ovary* 8–12 cm long including the extension, tinged with pink; style c. 1 cm long; stigma lobes purple, with truncate apices finely and irregularly toothed, midlobe c. 6 mm long, side-lobes shorter. Mature *capsules* not seen.

Distribution — *Malesia*: West Malaysia: Perak, Selangor.

Habitat & Ecology — Lowland evergreen dipterocarp forest, in damp places among leaf litter.

Note — Holttum was not able to trace Scortechini's specimen but there are three sheets in a type cover in K, all belonging to the *Scortechini 2023* collection from Perak. This collection has been selected as lectotype.

5. *Orchidantha maxillarioides* (Ridley) K. Schum.

Orchidantha maxillarioides (Ridley) K. Schum. in Engl., Pflanzenr., fam. IV.45 (1900) 42, f. 10C–G; Ridley, Fl. Malay Penins. 4 (1924) 293; Holttum, Gard. Bull. Sing. 25 (1979) 245. — *Protamomum maxillarioides* Ridley, Trans. Linn. Soc. II, 3 (1893) 383, t. 66. — *Lowia maxillarioides* (Ridley) Baker, Bot. Mag. (1894) t. 7351. — Type: *Ridley 2399* (SING holo), Pahang.

Leaves up to c. 75 cm long; lamina to 33 by 8.5 cm, sharply distinct from the slender, narrowly grooved, 20–40 cm long petiole. *Inflorescence* richly branched; floral bracts dark purple, c. 3.5 cm long. *Sepals* oblong acute, 3–3.2 by 4.5–5.5 cm, purplish, translucent, greenish towards apex. *Lateral petals* purplish with pale veins, oblong, c. 7 mm long, up to c. 2 mm wide. *Labellum* creamy coloured with faint purple mottling, especially towards apex, elliptic, c. 21 by 10 mm, apex rounded, basal 3–4 mm with sides upcurved; surface with c. 3 longitudinal folds on either side of a broad median band. *Stamens* white, up to 5 mm long including the short filaments. *Ovary* 5–5.5 cm long including the extension; style white, c. 4 mm long; stigma dark violet, c. 2 mm long, with 3 bilobed lobes with a small tooth in each sinus. *Capsule* 2.5–3 by 1.7 cm, triangular, at apex narrowed to a stiff appendage 15 mm long. *Seeds* 7 by 5 mm, hairy; aril of c. 6 stiff narrow lobes longer than seed. — **Fig. 3.**

Distribution — *Malesia*: West Malaysia: known only from few collections, all from Pahang.

Note — A plant grown in Singapore Botanic Gardens was studied by Holttum, who writes that the flowers have no perceptible odour. It is the only species which is commonly grown in greenhouses in Europe.

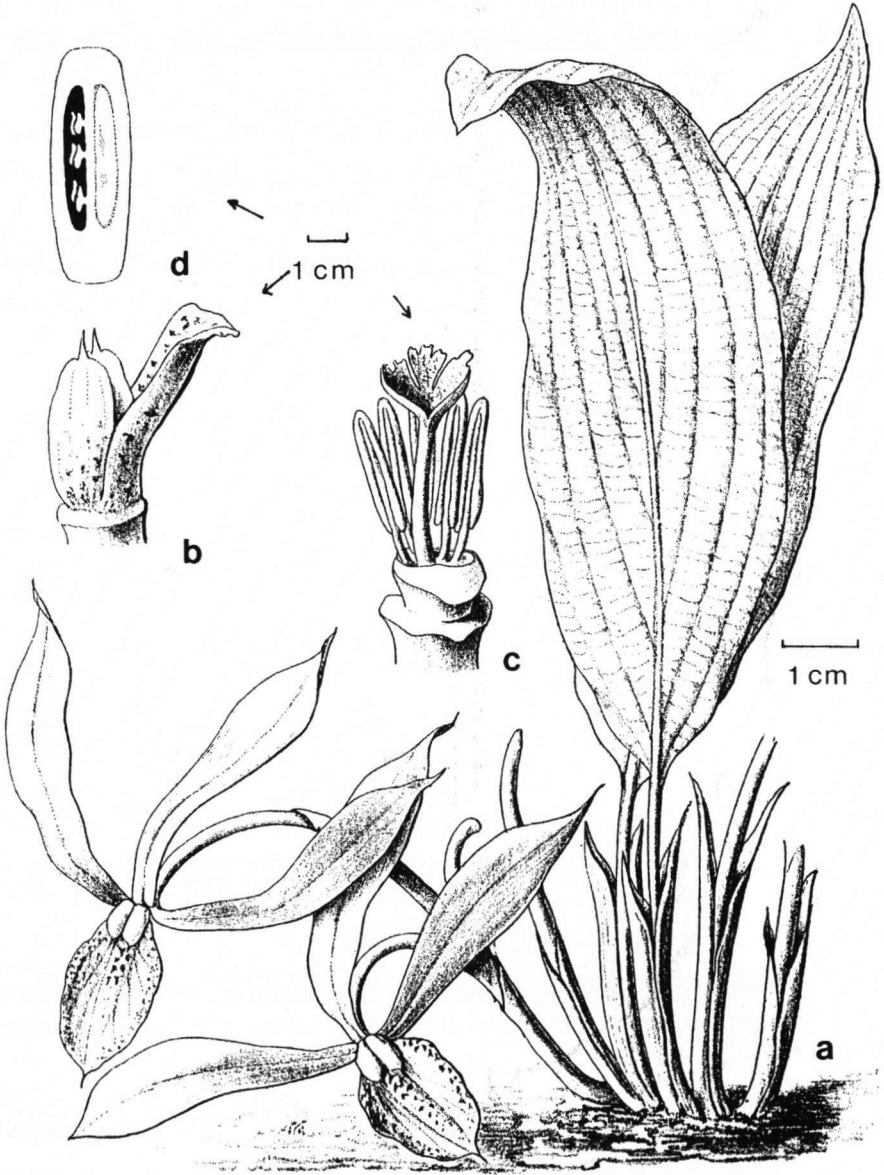


Fig. 3. *Orchidantha maxillarioides* (Ridley) K. Schum. a. Flowering plant; b. petals; c. androecium and style; d. ovary, section. Reproduced from Pflanzenreich IV. 45.

6. *Orchidantha siamensis* K. Larsen

Orchidantha siamensis K. Larsen, Bot. Tidsskr. 56 (1961) 347, 348, f. 2, 3; in Fl. Thailand 2 (1972) 170, f. 10; Holttum, Gard. Bull. Sing. 25 (1970) 244. — Type: *Kerr 7148* (K holo), Thailand.

Leaves up to 60 cm long; petiole c. 30 cm long; lamina lanceolate, up to 30 by 6–7 cm, tapering at base. *Floral bract* greenish purple, c. 8 cm. *Inflorescence* few-flowered. *Sepals* dark purple, reflexed, linear-lanceolate, apiculate, subequal, 6.5–8 cm long, 8–10 mm wide. *Lateral petals* white, narrow, with dentate apex, 15–20 by c. 2.2 mm. *Labellum* c. 3 cm long, purplish green striate, basal part narrow, lamina white, sub-orbicular, emarginate, c. 2 by 2.2 cm, the median vein raised as a sharp fold. *Stamens* 10 mm long, filament c. 3 mm, enlarged towards the base. *Ovary* 14–20 cm long including the extension; style 10–15 mm long, stigma 15 mm long, with lacinate lobes, c. 6 mm long. *Capsule* 2.5–3 cm long with short beak. *Seeds* c. 7 mm long.

Distribution — Thailand (Peninsular, Narathiwat and Phatthalung provinces); *Malaysia*: West Malaysia (according to Kress in Smith et al. 1993).

Habitat — In Thailand in lowland evergreen dipterocarp forest; moist forest floor, together with other ombrophilous Zingiberaceous herbs such as *Scaphochlamys*, *Boesenbergia* and *Globba*.