

TACCACEAE (E. Drenth, Leyden)

The affinity of *Taccaceae* has been subject to diverse opinions, many authors favouring a place near *Dioscoreaceae*, but in my view the unisexual flowers, the branching habit, the racemose inflorescences and the 3-celled ovary in that family make this not very probable. I prefer to share the opinion of those who seek its affinity to *Amaryllidaceae*, because of the habit, the scape-shaped inflorescence, the umbellate flower disposition with an involucre, and the fact that in that family also occasionally a 1-celled ovary is found. Neither the systematic anatomy nor the inadequately known phytochemistry or chromosome number are sufficiently diagnostic to support opinions on affinity.

Before my precursory revision (1972) two genera were distinguished, viz *Tacca* and a monotypic genus, *Schizocapsa* (*S. plantaginea* HANCE) ranging from Thailand to Kweichow, which differs only by having dehiscent capsular fruits instead of the indehiscent ones in *Tacca*. I have seen since that this species has dehiscent fruit indeed, which removes my doubt (*l.c.* 370) on this point. I have tried to see whether there may be a tardy dehiscence in *Tacca* by keeping fruit stalks of *T. chantrieri* in erect position in the Leyden greenhouse, but this had no result. I see no reason to keep *Schizocapsa* as a separate genus or infrageneric taxon.

TACCA

J. R. & G. FORST. Char. Gen. Pl. (1775) 35, *nom. cons.*; PAX in E. & P. Nat. Pfl. Fam. 2, 5 (1887) 127; LIMPR. Inaug. Diss. Breslau (1902) 43; Pfl. R. Heft 92 (1928) 13; DRENTH, Blumea 20 (1972) 367, see there for further synonyms. — *Leontopetaloides* BOEHMER in Ludwig, Def. Gen. Pl. (1760) 512, *nom. rejic.* — *Ataccia* PRESL, Reliq. Haenk. 1, 3 (1828) 149. — Fig. 1–11.

Terrestrial, erect, perennial, mostly rosulate, scapose herbs. *Rhizome* tuberous, solid, starchy, globose or elongate, either with apical growth or with spaced growing points. *Leaves* up to 13, appearing together with the inflorescence, either spaced or crowded on the rhizome, petioled, entire, pinnatifid, palmatipartite or palmatisect and palmatisect with pinnately divided segments; herbaceous to chartaceous; nervation palmate or pinnate; venation reticulate; petioles erect, ribbed, canaliculate distally, glabrous, with a sheathing base, solid, rarely hollow. *Inflorescences* umbellate, involucre, sometimes bracteate; peduncle(s) (scape) simple, solid, very rarely hollow, erect, ribbed, distally canaliculate. *Involucral bracts* mostly 4 in 2 whorls (in *T. leontopetaloides* 4–12, in *T. bibracteata* 2), herbaceous, mostly erect, the outer ones mostly longer persisting after anthesis than the inner ones which are likewise originating later in the young stage of growing, always flattened, entire, parallel- or curvined, sometimes also pinnately nerved. *Floral bracts*, if present, filiform, never flattened, of the same number as the flowers, caducous after anthesis. *Flowers* actinomorphic, bisexual, epigynous, gamophyllous, with 6 lobes in 2 whorls, imbricate in bud, mostly very dark coloured, parallel- or curvined; pedicels 6-ribbed, elongated and thickened in fruit. *Stamens* 6, inserted on the corolla tube, epitepalous, outer ones slightly larger than inner ones; filaments short and flattened, at the base — except for the margins, which are inflexed — adnate to the perianth tube, this portion rhomboid in outline; the free portion helmet-shaped; thecae placed at the inner side of the helmet, introrse, lengthwise dehiscent. *Ovary* 1-celled, 3-carpellate, obpyramidal, 6-ribbed;

placentas 3, parietal, each with ∞ pendulous, apotropous-anatropous ovules; disk sometimes present; style 1, provided with 3 — sometimes deeply — incised wings, its apex with 3 obcordate lobes, each provided with a clear stigmatic canal. *Fruits* berry-like, with a fleshy pericarp, 6-ribbed, irregularly desintegrating, rarely (in one extra-Mal. *sp.*) dehiscent. *Seeds* completely filling the fruit, 10- ∞ , with a strongly ribbed, mostly glabrous testa and a mostly distinct raphe.

Distribution. Ten species, pantropical, within the tropics of Cancer and Capricorn, mainly developed in *Malesia*, where 8 out of 9 Old World species occur; 1 species in tropical South America. Fig. 1.

Ecology. Mostly on the floor of moist evergreen primary and secondary forests, but *T. palmata* also under seasonal climatic conditions for example in teak forest, and possibly *T. chantrieri* also in seasonal or dry evergreen forest in SE. Asia, not bound to special soil types. *T. leontopetaloides* has a far wider distribution and deviates from the other species in rarely occurring in primary forest but preferring secondary forest and thickets, and many open situations, clearings, grassland, savannah, coconut groves, and beach vegetation (*Barringtonia* formation), not shunning seasonally dry areas, such as teak and eucalypt woodland; its originally native habitat is probably the beach forest, but because of the food value of its tubers it is likely that it has been dispersed by man since time immemorial and though this can no longer be traced and proved it is likely that a great part of its range has been effected by man.

As to altitude, most species are restricted to the lowlands ascending to c. 1000 m; *T. palmata*, however, has been found up to 1200 (-1500) m.

Flower biology. The syndrome of sapromyophily as described by FAEGRI & VAN DER PUIJ (Principles of pollination ecology, 1966, 87-90) is clearly apparent in *Taccaceae*. There is an ecological group of *Diptera* attracted to blossoms by the 'impression of decaying substance', no adaptation of the flies for flower visits is present; 'the basis for the visit is deceit'. The adaptations of the plant are found in the inflorescence or in the flowers. Generally, the colours are dull, dark, brown-purple-greenish, these colours having under ordinary circumstances no attraction for this class of pollinators, viz the carrion and dung flies, but the same colours do possess a positive attraction value in the presence of the odour of decaying protein. These characters are present in *Taccaceae* (colours) or possible (odour) as we see in the flowers a large number of glandular epidermal cells. The flies find in the flowers openings through which they can crawl inside. An attraction point is here the light inner side of the flowers, which functions as a kind of window, towards which the insects crawl. As, however, the *Tacca* flowers have nothing to offer to the visitors, the latter will soon try to leave the flower. The structure of the flowers makes this difficult,

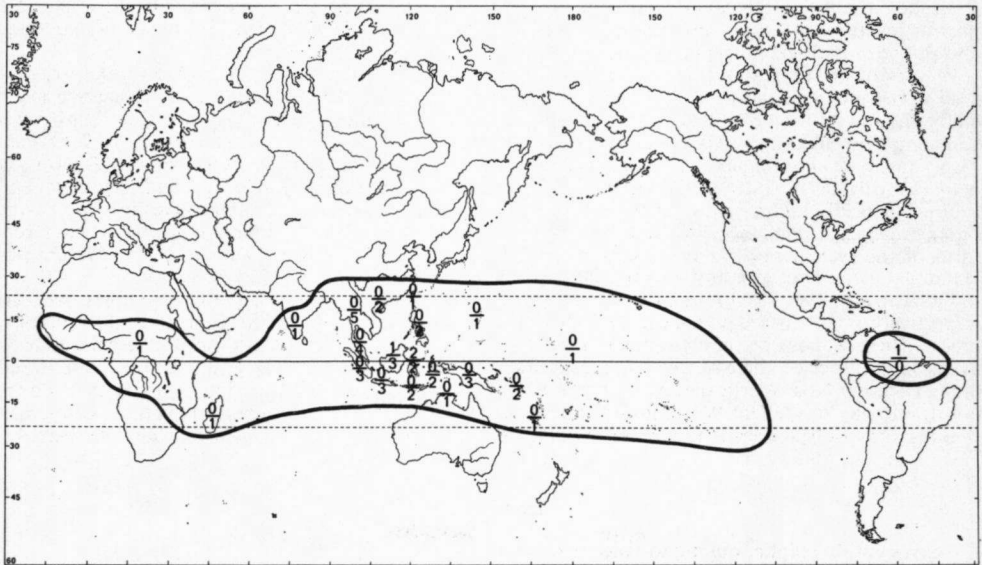


Fig. 1. Range of the genus *Tacca*; figures above the hyphen denote the number of endemic species, those below the hyphen the non-endemic species for each area or island group.

for the pollination units are built as traps—the helmet-like stamens, the obcordate lobes of the stigma—so that the insects cannot leave the flowers without efforts by which they effect pollination. It is not known whether the glandular cells secrete nectar in the flowers.

Besides these points, the filiform floral bracts and the large bracts around the inflorescence also may be attraction points for the insects.

Obviously, the flower biology of *Tacca* may yield interesting points and invites a critical study of observation and experiment yet to be made.

Dispersal. The ovoid or reniform, albuminous, ribbed or papillate seeds are smallish (c. 4–8 mm), with a fairly hard testa; they are freed in that the limping, decumbent, fruiting peduncle sags and deposits the fruit on the soil where it disintegrates; only in the continental SE. Asian species *T. plantaginea* the scape remains obvious erect and seeds are shed from a capsular fruit. How these seeds are dispersed over larger distances is unknown, but the more or less fleshy fruits will probably be eaten by ground animals; the raphe of the seed is distinct and fleshy. Some seeds must lead to new specimens at close range as *Taccas* are mostly found in groups of specimens.

In *T. leontopetaloides* the tuber emits from the growth apex thickish runners which grow downward and form a new tuber at apex, replacing the original tuber.

Seedlings. In the entire-leaved species young leaves are not different in shape from the mature ones. In *T. leontopetaloides* the first leaves are palmately incised, alike those of *T. palmatifida*; only later the mature leaves gain the 3-lobed pinnatifid structure.

It is observed that *T. leontopetaloides* may set flower after three years from seeding.

After flowering for the first time *Tacca* plants gain in dimension and differences in size have hence no systematical value.

In *T. leontopetaloides* leaves die off between December and March.

Morphology. The starchy, roundish or elongate, tuberous rhizomes are all naked and cauligenous. There are three types, viz a vertical elongate rhizome with apical growth in *T. integrifolia*, *T. plantaginea* (continental SE. Asia), and *T. chantrieri* (in *T. bibracteata* still unknown), a roundish rhizome with an apical cavity in *T. leontopetaloides*, *T. palmata*, and *T. ebeltajae*, and a horizontal elongate rhizome from the upper part of which leaves and inflorescences are emitted in a spaced way, hence without apical growth, in *T. palmatifida*, *T. celebica*, and *T. parkeri* (South America).

The erect peduncle (scape) terminates in an involucre consisting of leafy, herbaceous, mostly erect bracts, between which the umbellately arranged flowers are situated. EICHLER's assumption that the flowers are placed in cincinni must be checked anatomically. Except in the palmately-leaved species and in *T. parkeri* long, filiform, drooping bracts are found between the flowers.

The epitepalous stamens have a characteristic structure: the short flattened filaments are adnate to the perianth tube except for the inflexed margins and a short free apical part which is like a helmet at the inside of which the anther cells are placed.

At the base of the style an annular zone or disk is sometimes present; in this zone glandular cells are present together with short or long emergences. Only in *T. leontopetaloides* the disk is clearly developed and provided with glandular hairs.

Phytochemistry. Starch is (or was) produced from the tuberous rhizomes of several species of *Tacca*. The underground parts are reported to be bitter and toxic; special treatments are used to make edible the starch or whole tubers. Unfortunately the chemical nature of the constituents of *Taccaceae* is still completely unknown. Alkaloids are said to be present in *T. integrifolia* KER-GAWL. (syn. *T. cristata* JACK) and *T. leontopetaloides* (L.) O.K. The tubers of the latter species were investigated by J. SCHEUER *et al.* (Lloydia 26, 1963, 133). Besides ubiquitous substances like sucrose, β -sitosterol and cerylic alcohol, a bitter principle and a yellow ester were isolated by these authors. Preliminary investigations of the bitter principle, named taccalin, indicate that it represents a rather unusual plant constituent. No structures of the systematically more relevant constituents of *Taccaceae* being known at present, chemotaxonomy cannot yet give any help to plant systematics in this instance.—R. HEGNAUER.

Taxonomy. PAX (1887) and LIMPRICHT (1928) subdivided the genus into two and three sections respectively, mainly based on the degree of dissection of the leaves and presence *q.* absence of the filiform bracts. These sections are in my opinion unsatisfactory from the affinity point of view; there are four or five groups of species, three of which monospecific, and I find it undesirable to give these formal sectional rank. The only New World species, *T. parkeri* SEEM., occupies a rather isolated position, in that it does not fit into any of the Old World groups but shares certain characteristic characters with all of them.

Uses. The only species that is a useful plant for its edible tubers is *T. leontopetaloides*; see there.

KEY TO THE SPECIES

1. Leaves entire, elliptic, oblong to lanceolate.
2. Involucral bracts 2 4. *T. bibracteata*
2. Involucral bracts 4.
3. Seeds ovate to ovate-oblong in outline, convex-concave, dorsoventrally flattened, more or less shell-

shaped. Fig. 5a-b. Involucral bracts not decussate, 2 outer ones opposite, 2 inner ones more or less in the axils of one of the outer ones 2. *T. integrifolia*

3. Seeds reniform, laterally flattened. Fig. 5c-d. Involucral bracts more or less decussate.

3. *T. chantrieri*
1. Leaves distinctly shallowly or deeply lobed.
4. Leaves palmately divided into 3 lobes, each lobe pinnately divided into numerous smaller ones. Filiform bracts present 1. *T. leontopetaloides*
4. Leaves palmately incised and/or divided into 3-13 lobes, each lobe simple or only palmately divided into few \pm similar lobes. Filiform bracts absent.
5. Leaves and inflorescence(s) crowded in a hollowed portion of a tuberous, roundish rhizome. Flowers inserted on the end of the scape between the bracts.
6. Outer involucral bracts oblong-ovate, 1-2.5 by 0.4-1 cm, inner ones cordate, 3-4.5 by 1.5-2 cm. Inner perianth lobes obovate, 5-6 by 3-4 mm, with rounded apex. Fruit obpyramidal, 1.3-1.5 by 0.8-1.2 cm 6. *T. ebeltajae*
6. Outer involucral bracts broadly-ovate to ovate, 2.5-9.5 by 2-9 cm, inner ones broadly-ovate to cordate, 4.5-10 by 2.5-6 cm. Inner perianth lobes constricted halfway, 3-5 by 2-4 mm, the apex acuminate. Fruit globose, up to 1 cm in \varnothing 5. *T. palmata*
5. Leaves and inflorescence(s) all spaced on an elongated, horizontal, cylindrical, tuberous rhizome. Flowers inserted on the basal portion of the inner two bracts.
7. Leaves simple, palmately incised for almost $\frac{1}{3}$ of their length. Fruit ellipsoid to obovoid, 2.2-3 by 1 by 1 cm. 7. *T. palmatifida*
7. Leaves palmately compound, with 5 stalked leaflets of which the outer 2 may be connected at the base. Fruit obpyramidal, 1.8 by 1 by 0.8 cm 8. *T. celebica*

1. *Tacca leontopetaloides* (L.) O.K. Rev. Gen. Pl. 2 (1891) 704; BAILL. Hist. Pl. 13 (1894) 165, f. 107-110; BACK. Handb. Fl. Java 3 (1924) 107; HEYNE, Nutt. Pl. (1927) 452; LAM, Nieuw Guinee 1 (1935) 189, f. 37; MERR. J. Arn. Arb. 26 (1945) 85-92, pl. 1-2; HAYWARD, Baileya 5 (1957) 85; MANSFELD, Die Kult. Pfl. Beih. 2 (1959) 568; PARHAM, Pl. Fiji Is. (1964) 283; BACK. & BAKH. f. Fl. Java 3 (1968) 212; DRENTH, Blumea 20 (1972) 375, pl. 1, f. 1-7, with full synonymy and references. — *T. sativa* RUMPH. Herb. Amb. 5 (1747) 324, t. 112, p.p., is partly *Amorphophallus*. — *T. phallifera* RUMPH. l.c. 326, t. 113, p.p., is partly *Amorphophallus*. — *T. littorea* RUMPH. l.c. 328, t. 114. — *Leontice leontopetaloides* L. Sp. Pl. 1 (1753) 313; BURM. f. Fl. Ind. (1768) 82. — *T. pinnatifida* J. R. & G. FORST. Char. Gen. Pl. (1775) 35, t. 35; ROXB. Fl. Ind. ed. Carey 2 (1832) 172; DECNE, Nouv. Ann. Mus. Hist. Nat. Paris 3 (1834) 368; GRIFF. Ic. Pl. As. 3 (1851) t. 272a, 1, 2; FILET, Pl. Bot. Tuin Weltevr. (1855) 13; MIQ. Fl. Ind. Bat. 3 (1859) 577; BENTH. Fl. Austr. 6 (1873) 458, cum var.; BAKER f. Fl. Maur. (1877) 370; HOOK. f. Fl. Br. Ind. 6 (1892) 287; Bot. Mag. III, 49 (1893) t. 7299, 7300; KAERNB. Bot. Jahrb. 16 (1893) Beibl. n. 37, 13; BAKER f. Fl. Trop. Afr. 7 (1898) 413; BAILEY, Queensl. Fl. 5 (1898) 1613; TRIM. Fl. Ceyl. 4 (1898) 273; LIMPR. Inaug. Diss. Breslau (1902) 50, incl. ssp. *involutrata* LIMPR. etc.; RIDL. Mat. Fl. Mal. Pen. 2 (1907) 76; MERR. Fl. Manila (1912) 150; BAILEY, Compr. Cat. Queensl. Pl. (1913) 548, t. 533, incl. var. *brownii* (SEEM.) BAILEY, l.c. t. 534; MERR. Int. Rumph. (1917) 144; RIDL. Fl. Mal. Pen. 4 (1924) 309; LIMPR. Pfl. R. Heft 92 (1928) 27; GAGNEP. Fl. Gén. I.-C. 6 (1934) 697; BURK. Dict. (1935) 2118; PERRIER DE LA BATHIE, Fl. Madag. fam. 43 (1950) with plate; QUIS. Medic. Pl. Philip. (1951) 177. — *T. pinnatifolia* GAERTN. Fruct. (1788) 43, t. 14. — *T. involutrata* (LIMPR.) SCHUM.

& THONN. Beskr. Guin. Pl. (1827) 197; DARLINGTON & WYLLIE, Chrom. Atlas ed. 2 (1955) 403. — *T. dubia* SCHULT. Syst. Veg. 7 (1829) 167. — *T. gaogao* BLANCO, Fl. Filip. (1837) 262. — [*T. maculata* ZIPP. ex SPAN. Linnaea 15 (1841) 480, nom. nud.] — *T. brownii* SEEM. Fl. Vit. (1866) 100; LIMPR. Pfl. R. Heft 92 (1928) 30. — *T. artocarpifolia* SEEM. Fl. Vit. (1866) 101. — *T. maculata* SEEM. l.c. 103. — *T. samoensis* REINECKE, Bot. Jahrb. 25 (1898) 595, t. 9. — *T. viridis* HEMSL. in Hook. Ic. Pl. IV, 6 (1899) t. 2515, 2516; LIMPR. Inaug. Diss. Breslau (1902) 50; RIDL. Mat. Fl. Mal. Pen. 2 (1907) 78; LIMPR. Pfl. R. Heft 92 (1928) 26; GAGNEP. Fl. Gén. I.-C. 6 (1934) 697. — *T. hawaiiensis* LIMPR. Pfl. R. Heft 92 (1928) 30.

Tuber depressed-globose or broadly ellipsoid, thin-skinned, smooth, 1.5-5 cm high by 1-8 by 0.5-4 cm, white when young, older dark grey to brown, white within, somewhat juicy, growing near the surface to up to 50 cm deep, provided with an apical cavity emitting the leaves and inflorescences; the tuber is replaced during the year by a new main tuber which arises from a downward-growing runner-like thick rhizome at a lower level and remains dormant after yearly death of aerial parts of the original plant. Base of the leaves and the inflorescence in young plants (mostly?) surrounded by a linear-lanceolate, special leaf (cataphyll) 8-21 by 1.2-3 cm. *Leaves* 1-3, broadly obovate, ovate, or oblong-ovate in outline, palmately 3-sect, each of the 3 segments pinnately lobed to dissected, up to 70 by 120 cm; lobes orbicular to linear; petiole hollow, 17-150 by 0.3-2.5 cm, sheath 2-25 by 0.6-3.5 cm. *Inflorescences* 1 or 2, 20-40-flowered; scape hollow, green, 20-170 by 0.2-2.5 cm. *Involucral bracts* of different size, large ones 4-9 (-12), mostly surrounding the scape, sometimes only on the ribbed side of the scape (in that case with up to 10 small bracts in the

canaliculate zone), light to dark green, sometimes with fine purplish margin, 2 (-4) outer ones sessile, (ob)ovate, oblong, or lanceolate, 2.5-10 by 1.2-3.5 cm, with attenuate or cuneate base, acuminate at the apex, acumen entire or 2-3 dentate; 2-7 (-10) inner bracts more or less similar in shape to the outer ones, acuminate at the apex, curvined with pinnate side nerves, 2.5-10 by 0.7-5 cm; the small bracts linear lanceolate, sessile, with acute apex, 5-7 by 1-1.5 mm. *Filiform bracts* 20-40, up to 25 cm, (dark) purple or dark blackish-brown. *Flowers* 6-17 by 6-13 mm, drooping, light yellow, yellowish green or blackish purplish green; pedicel up to 6 cm by 1 mm (in fruit up to 8 cm by 2 mm); perianth tube 1.5-5 by 4-11 mm. *Perianth lobes* mostly fleshy with membranous margins, persistent, 3 outer ones elliptic or ovate (lanceolate), (1.5-) 4-7 by 2-3 mm, 3 inner ones (broadly) ovate or oblong ovate, 5-7.5 by 2.5-5 mm; apices obtuse or retuse, rarely truncate. *Stamens* white or dull yellow to brown or purple; adnate portion of the filaments 1-5 by 2-2.5 mm, free apical portion 1.5-2 by 1.5-2 mm, thecae up to 2 mm long. *Ovary* 2-5 by 2-4 mm; disk annular, ribbed, (always?) with numerous pellucid glandular hairs, 1.5-3 mm \varnothing ; style 1.5-3 by 0.5-1.5 mm, whitish to green; stigmatic lobes whitish to purple, 1.5-2 by 2-3 mm, sometimes their 2 apices emarginate. *Fruit* mostly globose, 1.5-2.5 cm \varnothing , but sometimes ellipsoid or ovoid, up

to 3.5 by 1.5-2.5 cm, pendulous, pale to darker green, finally pale orange; pericarp up to 1.5 mm thick. *Seeds* many, ovoid to ellipsoid, flattened, 5-8 by 3-5 by 1.5-3 mm glabrous, yellowish brown, with a spongy white testa, 15-19-ribbed.

Distr. Widely distributed in the Old and New World from W. Africa through SE. Asia, throughout *Malesia*, N. Australia to Polynesia (as far as the Tuamotus, Marquesas, and Hawaii). Fig. 2.

Ecol. Very indifferent to climatic, soil, and vegetation conditions, more rarely in heavy shade and in primary forest, frequently in coastal vegetation, usually below 200 m, occasionally up to 1100 m, the superterranean parts mostly dying off between December and March. *Fl. fr.* Jan.-Dec.

Seeds might be dispersable by seawater, and might possess buoyancy by their spongy testa. It is said also that some birds eat the fruit (RIDL. Disp. 1930, 470). Dispersal by man, however, is the most effective agency, as the plant has been and still is generally used for food.

Uses. Starch is extracted for making bread, paste, and puddings mixed with other ingredients. Good washing is essential because of the presence of the bitter substance (taccalin) which is said to be poisonous. Tubers are dug when the aerial parts have died off. In India and Polynesia tubers are also used as a medicine against diarrhoea. In Polynesia the fibres of the peduncle are used for making hats and for fishing. Especially in the

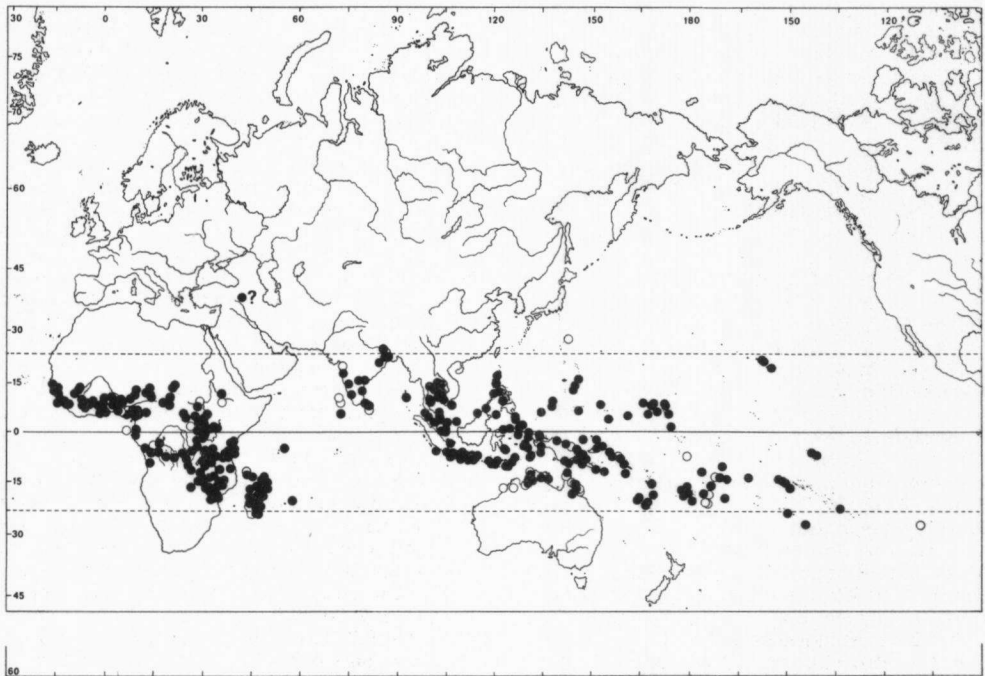


Fig. 2. Range of *Tacca leontopetaloides* (L.) O.K. Circles are localities derived from literature.

Pacific islands the plant has been cultivated on an extensive scale (see HEYNE, 1927). In cultivated plants the tuber is 5–10 cm long, but whether it may reach the size of a coconut, as is sometimes cited in literature, is doubtful to me.

Vern. Malaya: (*poko*) *lêkeh*, (? *lêkek*). Sumatra: *lêki*, Atjeh, *lago leké*, Riau, *krubut*, Enggano. Java: *katjondang*, *tjondang*, S, *katjunda*, *taka laut*, M, *labing*, Md, *kětjondang*, *tjondang*, J, *totoan*, Kangean. Timor: *têlo*, *tuloh*. Celebes: *kalopale*, Buton, *katjodo*, *katjunda*, Makassar, Saleyer, *katéo*, E. Cel., *tèrong i lawanan*, Alf., t.t., Minah. Philippines: *gau-gáu*, *yabyaban*, Tag., *kandông*, *tayôbong*, Bis., *panarién*, Ilk., *tambóbon*, Sbl. Moluccas: *lêkér*, *likir*, M, *anuwal*, Taruna, *huda korano*, *huda ma raka*, *nepu*, Ternate, *tað*, Buru. New Guinea: *tavulipum*, Tami.

Notes. In the vegetative state the plant is sometimes confused with equally tuberous species of the Araceous *Amorphophallus*, but it can immediately be recognized by the ribbed, hollow petiole, which is in *Amorphophallus* solid, smooth, and mostly flecked. As a matter of fact it was RUMPHIUS, from whom the name *Tacca* stems, who made this confusion, as MERRILL has revealed in his Interpretation of Rumphian plants (1917).

The species has a formidable synonymy as local forms have been described in many parts of its very large range. LIMPRICHT (1928) has distinguished some of them as subspecies or varieties and even seven forms he maintained as species. These forms and variations were largely based on leaf characters. In my opinion none of them deserves taxonomical distinction.

2. *Tacca integrifolia* KER-GAWL. Bot. Mag. 35 (1912) t. 1488; LAMK, Enc. Suppl. 5 (1817) 278; ROXB. Pl. Corom. 3 (1820) 53, t. 257; SPRENG. Syst. Veg. 2 (1825) 118; BL. En. Pl. Jav. 1 (1827) 83; PRESL, Rel. Haenk. 1, 3 (1828) 149; SCHNIZL. Icon. 1 (1843) 58; HOOK. f. Fl. Br. Ind. 6 (1892) 287; LIMPR. Inaug. Diss. Breslau (1902) 44; Pfl. R. Heft 92 (1928) 16, *incl. var. pseudolaevis* LIMPR. l.c. 17; MITRA, Fl. Pl. East. Ind. 1 (1958) 55; DRENTH, Blumea 20 (1972) 388, pl. 3, f. 19–21. — *T. cristata* JACK, Mal. Misc. 1, 5 (1821) 23; MIQ. Fl. Ind. Bat. 3 (1859) 578; HOOK. f. Fl. Br. Ind. 6 (1892) 287; BAILL. Hist. Pl. 13 (1895) 167, f. 111–113; LIMPR. Inaug. Diss. Breslau (1902) 44; RIDL. Mat. Fl. Mal. Pen. 2 (1907) 77; J. Str. Br. R. As. Soc. 49 (1907) 45; Fl. Mal. Pen. 4 (1924) 310; LIMPR. Pfl. R. Heft 92 (1928) 20; MERR. Pl. Elm. Born. (1929) 28; BURK. Dict. (1935) 2118; MERR. J. Arn. Arb. 33 (1952) 247; HEND. Mal. Wild Fl. (1954) 187. — *Ataccia integrifolia* PRESL, Rel. Haenk. 1, 3 (1828) 149; MIQ. Fl. Ind. Bat. 3 (1859) 578. — [*T. rafflesiana* JACK ex WALL. Cat. (1831–32) 5172A, B, *nom. nud.*] — *T. aspera* ROXB. Fl. Ind. ed. Carey 2 (1832) 169; LIMPR. Pfl. R. Heft 92 (1928) 20. — *T. laevis* ROXB. Fl. Ind. ed. Carey 2 (1832) 171; GRAHAM, Cat. Bomb. (1839) 730; HOOK. f. Fl. Br. Ind. 6 (1892) 288; HALLIER, Bull. Herb. Boiss. 6 (1898) 613; LIMPR. Inaug. Diss. Breslau (1902) 47; RIDL. J. Str. Br. R. As. Soc. 49 (1907) 45, *incl. var.*

minor RIDL., p.p. *typ. excl.*; LIMPR. Pfl. R. Heft 92 (1928) 17, *incl. var. latibracteata* LIMPR. l.c. *et var. angustibracteata* LIMPR. l.c. 18; GAGNEP. Fl. Gén. I.-C. 6 (1934) 695; MITRA, Fl. Pl. East. Ind. 1 (1958) 55; SMITINAND, Nat. Hist. Bull. Siam Soc. 20 (1961) 60. — *T. lancaefolia* ZOLL. & MOR. in Mor. Syst. Verz. (1846) 91; MIQ. Fl. Ind. Bat. 3 (1859) 578; LIMPR. Inaug. Diss. Breslau (1902) 48; BEUMÉE, Trop. Natuur 8 (1919) 47, f. 7; BACK. Handb. Fl. Java 3 (1924) 106; LIMPR. Pfl. R. Heft 92 (1928) 19, *incl. var. laevisformis* LIMPR.; BACK. & BAKH. f. Fl. Java 3 (1968) 212. — *Ataccia aspera* KUNTH, Enum. 5 (1850) 464. — *Ataccia laevis* KUNTH, l.c. 466. — *Ataccia lancaefolia* KUNTH, l.c. 465; ZOLL. Syst. Verz. 1 (1854) 69 (as *Atacca*). — *Ataccia cristata* KUNTH, Enum. 5 (1850) 466; Bot. Mag. 57 (1851) t. 4589; LEMAIRE, Jard. Fleur. 2 (1852) t. 186, 187; KUNTH, Fl. Serres I, 9 (1853) t. 860–861; OUDEMANS, Neerl. Pl. Tuin 2 (1866) t. 32; LE MAOUT & DECNE, Traité Gén. Bot. (1868) 573; Garden 5 (1874) 219; Gartenflora 30 (1881) 346. — *T. borneensis* RIDL. J. Str. Br. R. As. Soc. 49 (1907) 45; LIMPR. Pfl. R. Heft 92 (1928) 21. — *T. chantrieri* (non ANDRÉ) RIDL. Fl. Mal. Pen. 4 (1924) 309. — *T. sumatrana* LIMPR. Pfl. R. Heft 92 (1928) 18, *incl. var. ovalifolia* LIMPR. l.c. 19 — *T. chaudhuri* DEB, Ind. For. 90 (1964) 241, t. 1, 2. — Fig. 5a–b.

Rhizome cylindrical, growing vertically, up to 12 cm long by up to 3 cm \varnothing . Leaves 2–13, rosulate, very variable, usually oblong-(ovate) or lanceolate, more rarely elliptic, oblong-obovate or linear-lanceolate, greyish green, 7.5–65 by 3–24 cm, base attenuate, rarely cuneate or rounded, apex acuminate; nerves pinnate; petiole 4.5–41 cm by 2–6 mm, sheath 2.5–17 by 0.5–1.5 cm. *Inflorescences* 1–4 (–5), up to 30-flowered; scape 9–65 (–100) cm by 2–7 mm, dark violet, blackish purple, red, or rarely brown. *Involucral bracts* 4, very variable, 2 outer bracts opposite, 2 inner ones implanted together more or less in the axil of one of the outer bracts; outer ones sessile, elliptic, oblong, (narrowly) triangular, or (ovate) lanceolate, 1.5–14 by 0.5–7 cm, green to purple, veined black, apex acute, acuminate, rarely cuspidate; inner bracts thinner than the outer ones, sessile or with attenuate to cuneate base, (ob)ovate, oblong-(ob)ovate, (ob)lanceolate, or spatulate, rarely orbicular, 2.5–22 by 1–11 cm, white, shaded purple, veined black, apex acuminate or cuspidate. *Filiform bracts* 5–27, up to 25 cm by 0.2–1 mm, white or bright yellow green, on base darker. *Flowers* 1.4–2.7 by 0.6–3.2 cm; buds pale greenish, flowers green, greenish-violet, brownish-purple, or blackish-violet, the colour becomes steadily darker; pedicel 0.5–4 cm by 1–2 mm, dark red or blackish-purple; perianth tube 3–8 by 9–15 mm. *Perianth lobes* mostly reflexed during anthesis and caducous; 3 outer ones elliptic, triangular or oblong, 6–15 (–20) by 4–9 mm, inner ones broadly obovate or broadly ovate, 5–15 by 5–16 mm; at apex emarginate, retuse, rounded, acute, acuminate, or mucronate. *Stamens*: adnate portion of the filaments 2–3 by 0.5–1 mm, free apical portion up to 3 by 1.5 mm, thecae up to



Fig. 3. *Tacca integrifolia* KER-GAWL. In damp forest among rocks, along Ketambe R. (tributary of Alas R.), c. 35 km NW. of Kotatjane, Gajolands, N. Sumatra. Peduncle and bracts are dirty black-purple (Photogr. DE WILDE & DE WILDE-DUYFJES, 14354, 18-8-1972).

2 mm long. *Ovary* 3–15 by 2–7 mm, yellowish green with sepia-purple ribs; disk absent; style 1–3 by 1–3 mm; stigma lobes 1 by 1.5 mm. *Fruit* triangular to circular in cross-section, 2.5–5 by 1–2.5 cm, green to black, tinged with purple, pericarp up to 2 mm thick. *Seeds* ovoid convex-concave, 3.5–6 by 1–3.5 by 1–2 mm, glabrous to strongly papillose, 6–16-ribbed.

Distr. Continental SE. Asia (Bhotan, Assam, Bangla Desh, Burma, Thailand), in *Malesia*: Sumatra (throughout, incl. Banka, Lingga), West Java, Borneo (incl. Nunukan and Anambas & Natuna Is.). Fig. 4.

Ecol. Most primary and secondary forests, on various soils, from sea-level up to 1200 (–1500) m. *Fl. fr.* Febr.–Aug.

Vern. Malaya: *bunganbatong, pako bunga subeak, pako iangot baoo, pako subiak, subiak*, Malacca, *jangut bawo, kéladi murai, lébak tikus, sebiak*, Negri Sembilan, *kélémoyang ayêr, yanggut baung, yanggut kéli*. Sumatra: *puar lilipan, sa-lipit, si dalimbat*, Toba-Batak, Asahan, *djangat baung*, Indragiri, *daun patjam, pura gunung*, Djambi, *tambun tambun*, S. Sumatra, *gumba itam*, Banka. Java: *kumis utjing, tjurug lukur*. Borneo: *gédang gédang*.

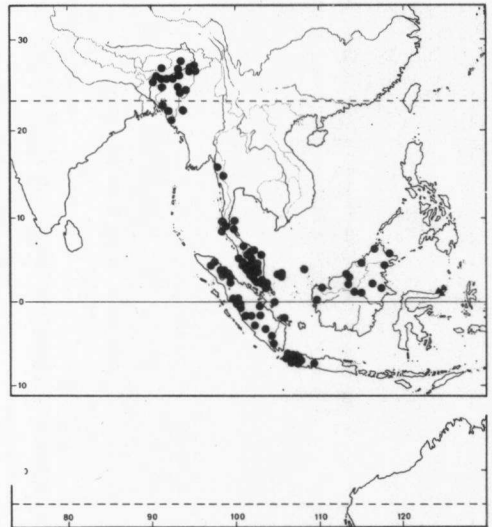


Fig. 4. Range of *Tacca integrifolia* KER-GAWL. (●) and *T. celebica* KOORD. (▲).

3. *Tacca chantrieri* ANDRÉ, Rev. Hort. 73 (1901) 541, with plate; LIMPR. Inaug. Diss. Breslau (1902) 45; non RIDL. Fl. Mal. Pen. 4 (1924) 309 (= *T. integrifolia*); LIMPR. Pfl. R. Heft 92 (1928) 14, incl. *f. garrettii* (CRAIB) LIMPR. l.c., *f. macrantha* (LIMPR.) LIMPR. l.c. et var. *vespertilio* (RIDL.) LIMPR. l.c. 16; GAGNEP. Fl. Gén. I.-C. 6 (1934) 694; HAYWARD, Bailey 5, 2 (1957) 85; DRENTH, Blumea 20 (1972) 393, f. 1e, pl. 3, f. 22-24. — *T. macrantha* LIMPR. Inaug. Diss. Breslau (1902) 45; BACK. & BAKH. f. FL. Java 3 (1968) 212. — *T. lancifolia* var. *breviscapa* OSTENFELD, Bot. Tidsskr. 26 (1904) 165. — *T. vespertilio* RIDL. J. Str. Br. R. As. Soc. 49 (1907) 46; Mat. Fl. Mal. Pen. 2 (1907) 77. — *T. minor* RIDL. Mat. Fl. Mal. Pen. 2 (1907) 78; Fl. Mal. Pen. 4 (1924) 311; LIMPR. Pfl. R. Heft 92 (1928) 18. — *T. garrettii* CRAIB, Kew Bull. (1912) 10, 406. — *Clerodendron* ('*Cherodendron*') *esquirolii* LÉVL.

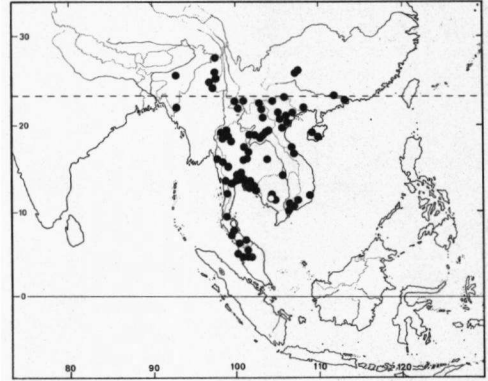


Fig. 6. Range of *Tacca chantrieri* ANDRÉ. The two circles are localities derived from literature.

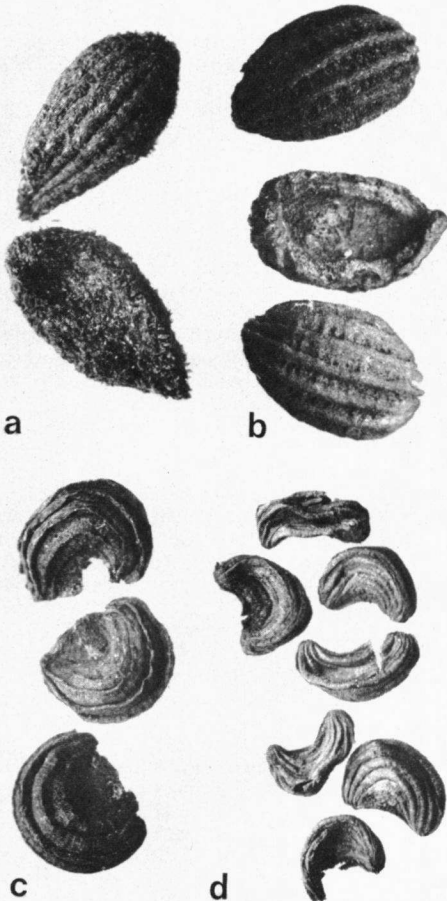


Fig. 5. *Tacca integrifolia* KER-GAWL. a-b. Seeds. — *T. chantrieri* ANDRÉ. c-d. Seeds. All $\times 5$ (a BACKER 23920, b AWANG YACUB 6546, c RIDLEY s.n., SING sheet 41640, d J. SCHMIDT 641).

Fedde Rep. 11 (1912) 298; cf. P'EI, Mem. Sc. Soc. China 1, 3 (1932) 162. — *T. cristata* (non JACK) VELENOVSKY, Verh. Morph. Pfl. 4, Suppl. (1913) 52, f. 19. — *Schizocapsa breviscapa* LIMPR. Pfl. R. Heft 92 (1928) 11; GAGNEP. Fl. Gén. I.-C. 6 (1934) 693. — *T. paxiana* LIMPR. Pfl. R. Heft 92 (1928) 16; GAGNEP. Fl. Gén. I.-C. 6 (1934) 694. — *T. roxburghii* LIMPR. Pfl. R. Heft 92 (1928) 18; SMITINAND, Nat. Hist. Bull. Siam Soc. 20 (1961) 61. — *T. wilsonii* LIMPR. Fedde Rep. 38 (1935) 218. — *T. esquirolii* (LÉVL.) REHDER, J. Arn. Arb. 17 (1936) 64; METCALF, J. Arn. Arb. 26 (1945) 198. — Fig. 5c-d, 7e.

Rhizome cylindrical, growing vertically, up to 10 cm long by 1.5 cm \varnothing . Leaves 3-12, rosulate, variable, elliptic, ovate, oblong-(ob)ovate, or (ovate-)lanceolate, 17-55 by 4.4-22 cm, deep green, paler beneath, base cuneately attenuate but not decurrent, sometimes unequal, apex acuminate; nerves pinnate; petiole 11-43 cm by 2-5 mm, sheath 3-15 by 0.3-2 cm. Inflorescences 1-2, up to 25-flowered; scape 6-63 by 0.1-0.7 cm. Involucral bracts 4, (sub)decussate, variable, green to almost black; 2 outer bracts ovate or triangular to ovate-lanceolate, sessile, 2-9 by 0.8-4 cm, apex acute or acuminate, 2 inner bracts thinner, (broadly) ovate to oblong, sometimes unequilateral, 2.5-10 by 1.5-9 cm, sessile or with attenuate base, apex acute or acuminate. Filiform bracts 6-26, up to 20 cm by 0.2-1 mm, pale green or violet green. Flowers 1-2.5 by 0.6-2 cm, buds green, flowers greenish white when young, when older red, violet, purple, or blackish; pedicel 1.2-4 cm by 0.5-2 mm \varnothing ; perianth tube 3-7 by 6-15 mm. Perianth lobes mostly reflexed during anthesis and persistent as a small remnant; 3 outer ones (oblong-)ovate or (narrowly) triangular, 5-12 by 3-8 mm, apex acute, acuminate, or mucronate; 3 inner ones (broadly) ovate, or triangular, 4-11 by 4-12 mm; apex acuminate or mucronate, veins prominent at inside. Stamens: adnate portion of the filaments 2-3 by 0.5-1 mm, free apical portion 3 by 1.5 mm; thecae up to 2 mm long, greenish yellow. Ovary

2-7 by 3-5 mm; disk absent; style 2-3 by 2-3 mm; stigmatic lobes 1 by 1.5 mm. *Fruit* triangular to round on cross-section, 2-4 by 1-2 cm, (lustrous) green, deep orange-red, or purple. *Seeds* reniform, 3-4 by 2-3 by 1-1.5 mm, glabrous, brown, 9-14-ribbed.

Distr. Continental SE. Asia: Assam, Bangla Desh, Burma, Thailand, China (Yunnan, Kweichow, Kwangsi, Kwantung, Hainan), Indo-China, in *Malesia*: Malay Peninsula (Perlis, Penang, Perak). Fig. 6.

Ecol. Primary and secondary forests, in Malaya at low altitude and on hills, elsewhere ascending to 1400 (-2100) m. *Fl. fr.* Febr.-Oct.

Uses. Tender leaves and inflorescences eaten in curries; in Thailand the bitter rhizome is used for medicinal purpose.

Note. From *T. integrifolia* distinguished by the nearly always decussate involucre bracts and the reniform seeds.

4. *Tacca bibracteata* DRENTH, Blumea 20 (1972) 395, f. 1a-c. — Fig. 7a-c.

Rhizome unknown. *Leaves* 6 or 7, oblong, 25-27 by 9.5-10.5 cm, with attenuate base and acuminate apex; nerves pinnate; petiole 12-19 by 0.2 cm, sheath 3.5-5.5 by 0.8-1.2 cm. *Inflorescence* as far as known solitary, up to 10-flowered; scape 20-31 by 0.2-0.5 cm, tinged with violet. *Involucral bracts* 2, opposite, ovate, 2-2.8 by 1.3-2.2 cm, sessile, apex acuminate. *Filiform bracts* 12-15, up to 10 (-14) cm by 0.4 (-2) mm \varnothing (see note). *Flowers* 1-2 by 0.8-1.6 cm, green, tinged violet or very dark purple; pedicel 1-3.5 cm by 1-1.5 mm \varnothing ; perianth tube 2-5 by 4-12 mm. *Perianth lobes*: 3 outer ones (broadly) ovate, 7-12 by 5-14 mm, with a long acuminate apex; 3 inner ones transversally broad-elliptic, 4-6 by 5-8 mm, with a mucronate or acuminate apex. *Stamens*: adnate portion of filaments 2 by 4 mm, free apical portion 2 by 2 mm; thecae up to 2 mm long. *Ovary* 7 by 7 mm; disk absent; style 2 by 3 mm; stigma lobes 1 by 2 mm. *Fruit* (unripe) obpyramidal, 1.5 by 0.8 by 0.8 cm. *Mature seeds* unknown.

Distr. *Malesia*: Borneo (Sarawak), 3 collections. Fig. 9.

Ecol. Mixed lowland Dipterocarp forest and in secondary forest, below 300 m.

Note. The measurements of the filiform bracts given in brackets were taken from 2 bracts which as an exception are neither ribbed, nor round, but flattened, and are facing each other and alternating with the involucre bracts. In my opinion they are actually involucre bracts, but for convenience sake I have called them filiform bracts.

5. *Tacca palmata* BL. En. Pl. Jav. 1 (1827) 83; SCHAUER, Nov. Act. Nat. Cur. 19 (1843) Suppl. 1, 444; ZOLL. Syst. Verz. 1 (1854) 69; MIQ. Fl. Ind. Bat. 3 (1859) 577; LIMPR. Inaug. Diss. Breslau (1902) 49; RIDL. Mat. Fl. Mal. Pen. 2 (1907) 76; MERR. Fl. Manila (1912) 150; Int. Rumph. (1917) 145; Sp. Blanc. (1918) 100; BEUMÉE, Trop. Natuur 8 (1919) 48; M.E.J. Trop. Natuur 9 (1920) 70, f.

1; BACK. Handb. Fl. Java 3 (1924) 107; RIDL. Fl. Mal. Pen. 4 (1924) 309; MERR. Philip. J. Sc. 29 (1926) 357; HEYNE, Nutt. Pl. (1927) 454; BACK. Onkr. Suiker. 1 (1928) 190; LIMPR. Pfl. R. Heft 92 (1928) 24, incl. var. *borneensis* LIMPR. l.c. 25; GAGNEP. Fl. Gén. I.-C. 6 (1934) 696; HOLTHUIS & LAM, Blumea 5 (1942) 168; STEEN. Fl. Scholen Indon. (1949) 144; QUIS. Medic. Pl. Philip. (1951) 177; SMITINAND, Nat. Hist. Bull. Siam Soc. 20 (1961) 61; BACK. & BAKH. f. Fl. Java 3 (1968) 212; DRENTH, Blumea 20 (1972) 397, pl. 2, f. 10-15. — *Pentaphyllum indicum* CLUSIUS, Exoticorum 4 (1605) 89 & fig. — *T. montana* RUMPH. [Herb. Amb. 5 (1747) 329, t. 115] ex SCHULTES, Syst. Veg. 7, 1 (1829) 168; HASSK. Cat. Hort. Bog. 2 (1844) 34. — *T. integrifolia* (non KER-GAWL.) SCHRANK, Syll. Pl. Ratisb. 1 (1824) 203. — *T. vesicaria* BLANCO, Fl. Filip. (1837) 261. — *T. rumphii* SCHAUER, Nov. Act. Nat. Cur. 19 (1843) Suppl. 1, 442; MIQ. Fl. Ind. Bat. 3 (1859) 577; SCHEFFER, Nat. Tijd. N. I. 31 (1870) 375; LIMPR. Inaug. Diss. Breslau (1902) 49; ELMER, Leaf. Philip. Bot. 6 (1914) 2284; MERR. Sp. Blanc. (1918) 100; LIMPR. Pfl. R. Heft 92 (1928) 24; HOSOKAWA, J. Jap. Bot. 13 (1937) 197. — *T. elmeri* KRAUSE, Leaf. Philip. Bot. 6 (1914) 2283; LIMPR. Pfl. R. Heft 92 (1928) 25; ELMER, Leaf. Philip. Bot. 10 (1939) 3795. — *T. angustilobata* MERR. Philip. J. Sc. 29 (1926) 356. — *T. fatisifolia* WARB. ex LIMPR. Pfl. R. Heft 92 (1928) 23. — *T. weberi* ELMER, Leaf. Philip. Bot. 10 (1939) 3794, nom. inval.

Tuber globose to broadly ellipsoid, 1-2.5 cm high by 1.5-5 (-8 cm, once observed) by 1.3-3 cm, fleshy, sordidly light brown with an apical cavity from which the leaves and inflorescences emerge. *Leaves* 1-3 (-5), broadly reniform or semi-orbicular in outline, 3-13, usually 4-8-palmatipartite, 7-36 by 7.5-40 cm; base attenuate; lobes (narrowly) obovate, elliptic, or (linear) lanceolate, 6-25 by (0.5-) 1-10 cm, with attenuate base and acuminate apex, the outer lobes mostly smaller than the inner ones; petiole (12-) 15-60 (-75) by 0.1-0.4 cm, sheath 2.5-7.5 by 0.3-0.8 cm. *Inflorescences* 1 or 2 (or 3), up to 30-flowered; scape 20-80 by 0.2-0.5 cm. *Involucral bracts* 4, decussate, green tinged with violet; 2 outer ones (broadly) ovate, 2.5-9.5 by 2-9 cm, sessile, apex acuminate; inner ones broadly ovate or cordate, 4.5-10 by 2.5-6 cm, with inflexed margins in the basal part, base attenuate, apex acuminate, sometimes caudate. *Flowers* 6-17 by 5-10 mm, green, tinged violet brown, brown violet, or dark violet; pedicel 10-20 by 0.5-1 mm; perianth tube 2-5 by 4-8 mm. *Perianth lobes*: 3 outer ones (broadly) ovate, rarely elliptic, 2-6 by 2.5-6 mm, obtuse or rounded at the apex; 3 inner ones with an acuminate apex, 3-5 by 2-4 mm, inflexed, each composed of a triangular basal portion of 0.5-1.5 by (2-) 3-4 mm, connected by a narrower part of 1-2 by 1-2 mm to a (sub)circular apical portion of 1.5-2.5 by 2-3 mm, the side lobes of which are reflexed. *Stamens*: adnate portion of the filaments up to 2.5 by 3 mm, free apical portion up to 2 by 2 mm; thecae up to 2 mm long. *Ovary* 2-5 by 1-4 mm;

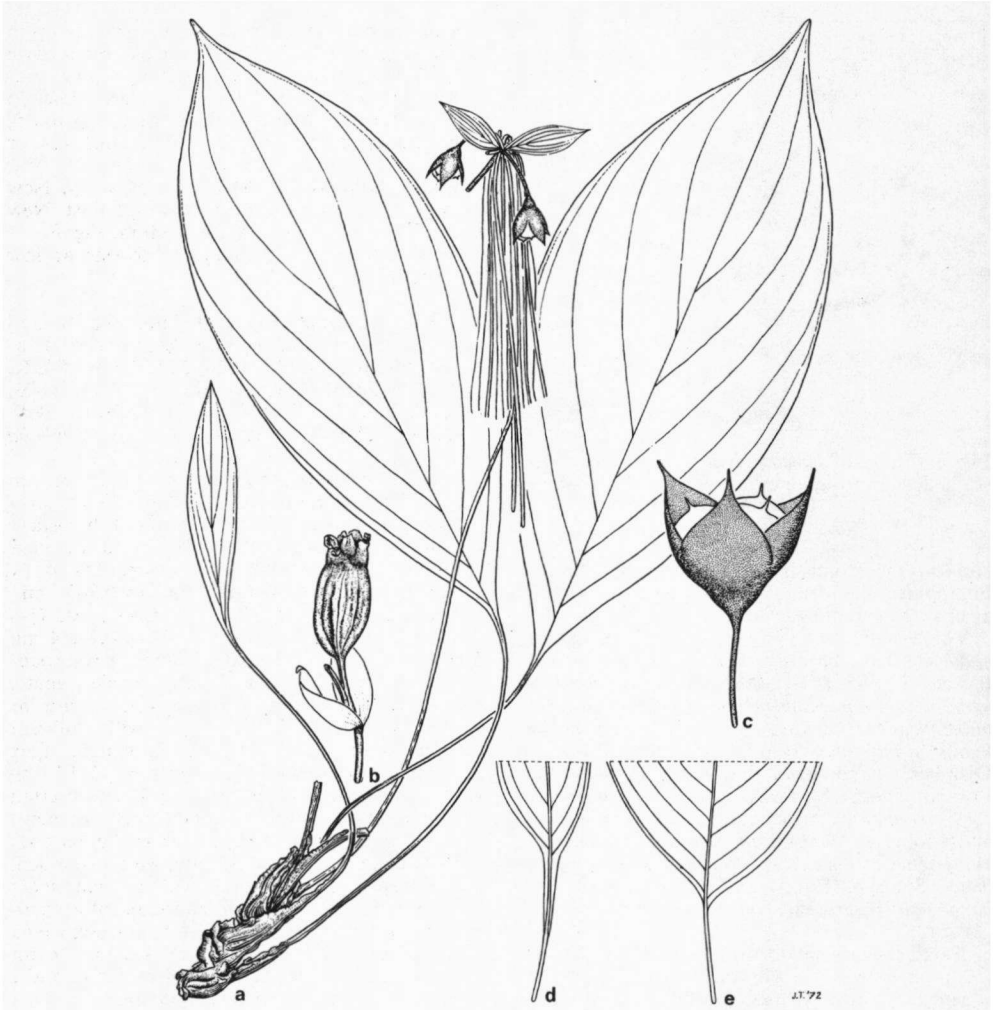


Fig. 7. *Tacca bibracteata* DRENTH. *a.* Habit, $\times \frac{1}{2}$, *b.* fruit, *c.* flower, both $\times \frac{1}{2}$. — *T. plantaginea* (HANCE) DRENTH. *d.* Leaf-base, $\times \frac{1}{2}$. — *T. chantrieri* ANDRÉ. *e.* Leaf-base, $\times \frac{1}{2}$ (*a, c* ASHTON S 18369, *b* RICHARDS 1569, *d* KERR 8891, *e* KOSTERMANS 1148).

disk absent; style 2, by 2 mm; stigma lobes 1.5–2 by 2 mm. *Fruit* globose, up to 1 cm \varnothing , mostly with 3 distinct and 3 indistinct ribs, bright red, pericarp up to 1 mm thick. *Seeds* up to 11 in each fruit, more or less pyramidal with a rounded base, 3–5 by 2–4 by 2–3 mm, 15–20-ribbed.

Distr. Continental SE. Asia (Indo-China, Thailand), in *Malesia*: Malay Peninsula (Kelantan, Johore, Penang, P. Tioman), Sumatra (throughout, incl. Enggano, Krakatao, Banka, Lingga), throughout Java (incl. Madura, Kangean, Bawean, Karimondjawa), Lesser Sunda Is. (Sumba, Flores, Timor), Borneo (incl. Tambelan Is., Karimata, Anambas & Natuna Is., Banguey), Philippines

(Balabac, Palawan, Calamianes, Mindoro, Luzon, Leyte, Panay, Mindanao, Sulu), Celebes (incl. Saleyer, Muna, Buton), Moluccas (Talaud, Halmahera, Ceram, Ambon, Saparua, Key, Tenimber Is.), West New Guinea (only Misool I.). Fig. 8.

Ecol. Mostly in secondary vegetation and forest margins, also in teak forest and bamboo groves, indifferent to soil and climate, from sea-level up to c. 1000 m. *Fl. fr.* Nov.-July.

Uses. In Malesia in different places used as a drug, generally in the form of scrapings of the tuberous rhizome, which are of a bitter taste. These scrapings are laid on wounds, e.g. caused by snake bites. Crushed petioles and scrapings are

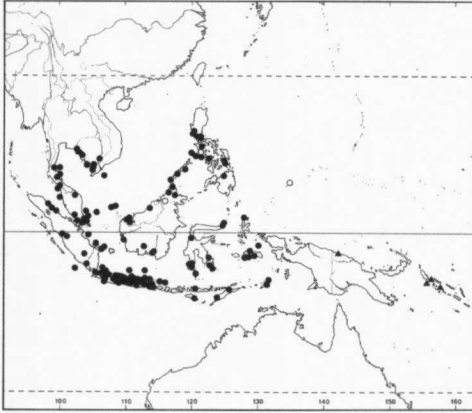


Fig. 8. Range of *Tacca palmata* BL. (● specimens studied, ○ from literature) and *T. ebeltajae* DRENTH (▲).

laid on the stomach to prevent aches. In the Philippines the drug is also taken by women against menstrual disorders.

Vern. Sumatra: *atjang tjangang*, Krakatau, *gadung tēkus, tumbal*, Banka. Java: *djambean*, Bawean I., *gadung tikus*, M. *ilēs-ilēs, kēmēndulan kēmū dulan, tēnggiling mēntik, tjèkèr ajam, treng-giling mēntik, tringgiling mēntèk*, J. *kotok bongkok, kumis utjing, obat tjekok kuda*, S. *pakis uling*, Djember, *suveg lètik*, Bantam, *tobitoan*, Md. Borneo: *gamah*, Sarawak. Celebes: *karimenga in sowa, mamèrang*, Minahasa, t.t. Lesser Sunda Is. and Moluccas: *mangattah*, Sumba, *tagomatengo*, Halmahera, *ilun lètek*. Philippines: *corazon de angel*, Spanish, Tag., *kandlong, magsalóro*, Bis., *payung-payūngan*, Tag., *tungang-basing, unodunod*.

6. *Tacca ebeltajae* DRENTH, *Blumea* 20 (1972) 401, f. 2, pl. 2, f. 16-17. — Fig. 10.

Tuber globose to subcylindrical, 0.8-1.5 cm high by 1.5-6 by 1-2 cm, provided with an apical cavity from which the leaves and the inflorescences emerge. *Leaves* 1-3, ± reniform to semi-orbicular in outline, 7-c. 10-palmatipartite or pedatipartite, 12-20 by 18-20 cm, base attenuate; lobes oblong lanceolate, 6-15 by 2.5-4.5 cm, with attenuated base and acuminate apex; petiole 20-44 by 0.2-0.4 cm, sheath 3-3.5 by 0.4 cm. *Inflorescences* 1 or 2, up to 9-flowered; scape 15-38 by 0.1-0.3 cm. *Involucral bracts* 4, decussate, 2 outer ones oblong ovate, 1-2.3 by 0.4-1 cm, sessile with cuspidate apex; 2 inner ones cordate, 3-4.5 by 1.5-2 cm, with inflexed margins at the basal part, base attenuate, apex acute. *Flowers* 6-9 by 6-12 mm; pedicel 8-20 by 1-3 mm; perianth tube 2-3 by 6 mm. *Perianth lobes* greenish grey to dark red; 3 outer ones ovate, 4-5 by 3-4 mm, apex acute or acuminate; 3 inner ones broadly obovate, 5-6 by 3-5 mm, apex rounded. *Stamens* pale or greenish: adnate portion of the filaments up to 2.5 by 3 mm,

free apical portion up to 2 by 1 mm; thecae up to 2 mm long. *Ovary* 3 by 2-4 mm; disk absent, style 2 by 2 mm; stigma lobes 1 by 2 mm. *Fruit* obpyramidal; 1.3-1.5 by 0.8-1.2 cm, dark violet to red, pericarp up to 1 mm thick. *Seeds* up to 15, comma-shaped, 4-5 by 2-3 by 2 mm, 12- or 13-ribbed.

Distr. Solomon Is. (Ovau, E. Treasury, New Georgia), 3 collections; in *Malesia*: East New Guinea (W. Sepik Distr.), 1 collection. Fig. 8.

Ecol. Primary and secondary forests at low altitude. *Fl. fr.* Febr.-May.

7. *Tacca palmatifida* BAKER, *J. Linn. Soc. Bot.* 15 (1876) 100; LIMPR. Inaug. Diss. Breslau (1902) 58; MERR. Philip. J. Sc. 29 (1926) 357; LIMPR. Pfl. R. Heft 92 (1928) 30; DRENTH, *Blumea* 20 (1972) 403, pl. 3, f. 26-28. — *T. flabellata* J. J. SMITH, *Bull. Jard. Bot. Btzg III*, 6 (1924) 79. — *T. breviloba* WARB. ex LIMPR. Pfl. R. Heft 92 (1928) 22.

Rhizome cylindric, growing horizontally, 8.5 cm long, 1.5 cm Ø, with the leaves and the inflorescences spaced. *Leaves* 1-3 (-4?), roundish-cordate in outline, palmatifid, 12-35 by 18-50 cm, base attenuate; lobes 5-11 (-13?), ovate, 2.5-14 by 1-9.5 cm, acuminate; petiole 36-60 by 0.3-0.5 cm, sheath 2.5-10 by 0.4-0.7 cm. *Inflorescences* (1-) 3-4, up to 25-flowered; scape 26-60 by 0.2-0.4 cm. *Involucral bracts* 4, decussate, 2 outer ones (broadly) ovate, 1-2.2 by 1-1.3 cm, sessile, acute, acuminate, or cuspidate; inner ones ovate or cordate, 6.5-12.5 by 4.5-7 cm, with inflexed margins at the basal part, base attenuate, apex acuminate or cuspidate. *Flowers* 15-17 by 12-15 mm; pedicel 15-30 by 0.5-1.5 mm, inserted on the basal portion of the inner bracts; perianth tube 4-5 by 9-10 mm. *Perianth lobes*: 3 outer ones broadly elliptic, 6-8 by 8-11 mm, with a rounded, reflexed apex; 3 inner ones with an acuminate apex, 5-6 by 4-5 mm, each composed of a triangular basal portion of 0.5-2 by 4-5 mm, connected by a narrower part of 1-1.5 by 1-2 mm to an obtriangular apical portion of 3-4 by 4-5 mm, the sides of which are reflexed. *Stamens*: adnate portion of the filaments up to 2 by 4 mm, free apical portion up to 3 by 1.5 mm; thecae up to 2.5 mm long. *Ovary* 5-6 by 3-4 mm; disk absent; style 2 by 2 mm, stigmatic lobes 2 by 2 mm. *Fruit*

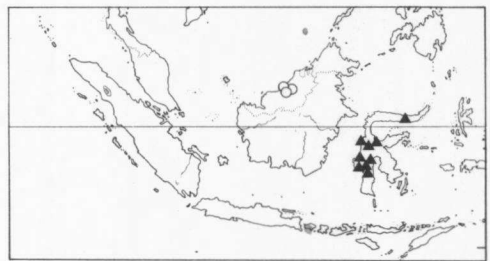


Fig. 9. Range of *Tacca bibracteata* DRENTH (○) and *T. palmatifida* BAKER (▲).

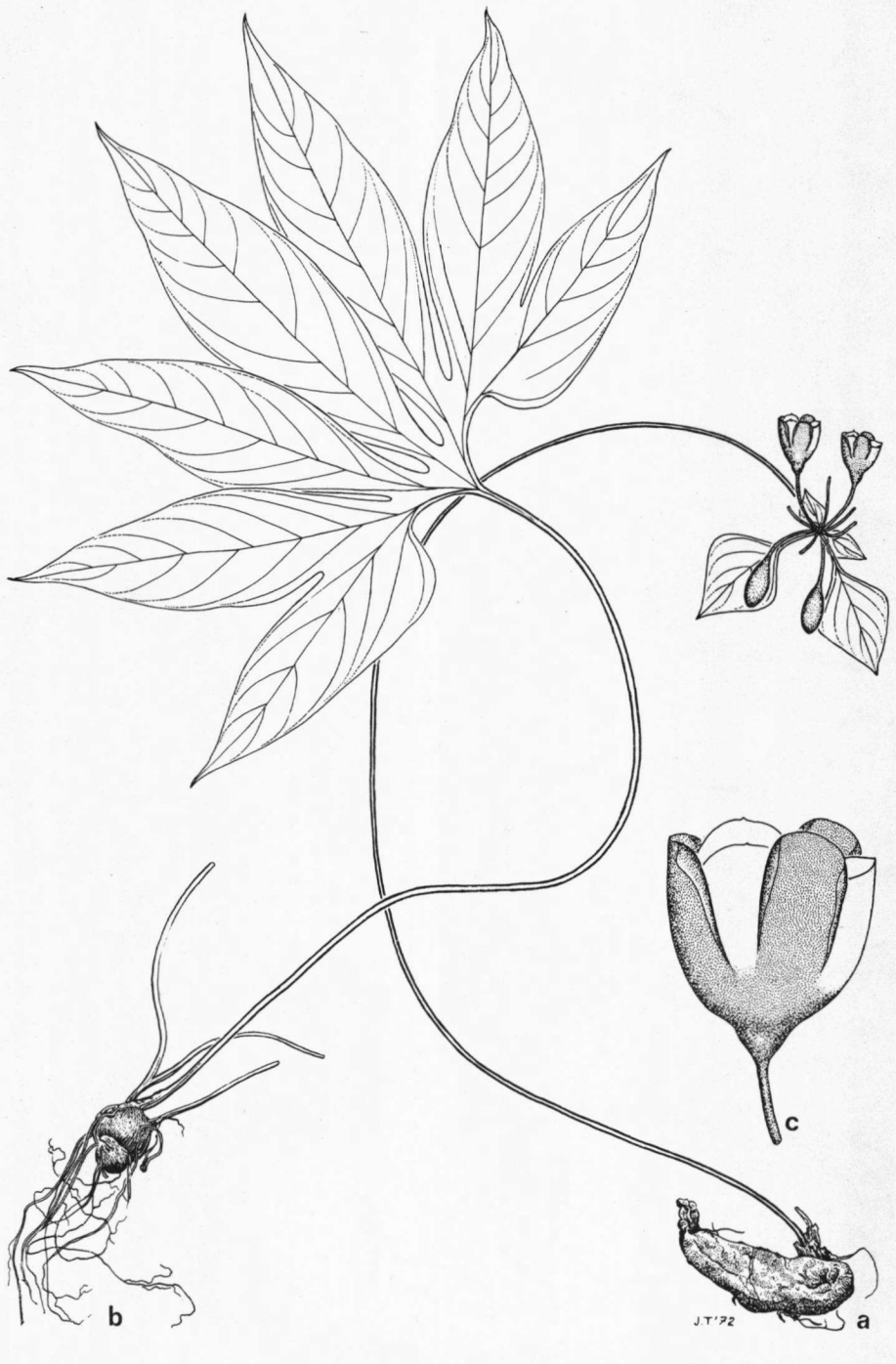


Fig. 10. *Tacca ebeltajae* DRENTH. a. Inflorescence, b. habit, both $\times \frac{1}{2}$, c. flower, $\times 2\frac{1}{2}$ (a-c BSIP 14243).



Fig. 11. *Tacca celebica* KOORD. a. Rootstock of young specimen with one leaf and one petiole, b-c. older leaves, d. mature leaf, e. inflorescence, all $\times 2/3$ (a-c, e DE VOGEL 2521, d KOORDERS 18919).

ellipsoid to obovoid, 2.2–3 by 1 by 1 cm, pericarp 1 mm thick. *Seeds* ∞, ovoid to ellipsoid, 2–3 by 1–1.5 by 1–1.5 mm, 11–13-ribbed.

Distr. *Malesia*: throughout Celebes. Fig. 9.

Ecol. Forest borders, thickets, on limestone and clay soils, 200–1000 m. *Fl. fr.* Dec.–July.

Vern. *Tilu-tilu*, Mamudju, *totilu*.

8. *Tacca celebica* KOORD. Med. Lands Pl. Tuin 19 (1898) 641, 311; LIMPR. Inaug. Diss. Breslau (1902) 48; Pfl. R. Heft 92 (1928) 31; DRENTH, Blumea 20 (1972) pl. 2, f. 18. — *T. minahasae* KOORD. Med. Lands Pl. Tuin 19 (1898) 641, 311 (also as *T. minahasae*); LIMPR. Inaug. Diss. Breslau (1902) 48; Pfl. R. Heft 92 (1928) 31. — Fig. 11.

Rhizome cylindric, growing horizontally, up to 18 cm long, 1 cm \varnothing , with the leaves and the inflorescences spaced. *Leaves* 2–6, in outline broadly ovate, palmate-3- or -5-sect, 18–25 by 25–30 cm, lobes entire, or when there are 3 lobes one or two shortly or deeply incised, (ob-) lanceolate, 9–31 by 3–8 cm, stalked, stalk of the central lobes 1.5–2.5 cm long, of the other lobes 0.5–1.5 cm, base attenuate, apex acuminate; petiole 25–45 by 0.2–0.4 cm, sheath 1.5–4 by 0.3 cm. *Inflorescences* 1–5, up to 30-flowered; scape 55–65 by 0.3–0.5 cm. *Involucral bracts* 4, decussate,

2 outer ones ovate, 1–1.5 by 1 cm, sessile, with acute apex; 2 inner ones ovate or cordate, 6.5–8 by 3.5–5 cm, with inflexed margins at the basal part, base attenuate, apex acuminate. *Flowers* 14–18 by 9–10 mm; pedicel 10–20 by 0.5 mm, inserted at the basal portion of the inner bracts; perianth tube 3–5 by 8–9 mm. *Perianth lobes*: 3 outer ones elliptic or ovate, 8–10 by 6–8 mm, with acute apex; 3 inner ones with a rounded to truncate apex, 4.5–5 by 4 mm, each composed of a triangular basal portion of 1–1.5 by 4 mm, connected by a narrower part of 1–2 by 1 mm to a broad elliptical portion of 3–4 by 4–5 mm, the sides of which are reflexed. *Stamens*: adnate portion of the filaments up to 1.5 by 2 mm, free apical portion up to 2 by 2 mm; thecae up to 2 mm long. *Ovary* 3 by 2 mm; disk absent; style 2 by 2 mm; stigmatic lobes 2 by 2 mm. *Fruit* pyramidal, 1.8 by 1 cm, triangular in cross-section, pericarp up to 1 mm thick. *Seeds* up to 26, (sub)rhomboid, 3 by 2 by 1.5 mm, 13- or 14-ribbed.

Distr. *Malesia*: Celebes (northern Peninsula), 3 collections. Fig. 4.

Ecol. Humid, shady places, between bamboo, and in high thickets, at 500–650 m. *Fl. fr.* Dec.–April.

Vern. *Karumenga intalum*, *ruki intjusu*.