

The Araceae of Indomalaya I: *Piptospatha* N.E.Br.

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ABSTRACT

A review of the genus *Piptospatha* N.E.Br. is presented with new generic boundaries implemented since the last full revision. 10 species are recognized, two of them (*P. marginata* (Engl.) N.E.Br. & *P. repens* H.Okada & Tsukaya) recognized only recently as distinct species. Two species (*P. angustifolia* Engl. ex Alderw. and *P. remiformis* Ridl.) are treated as inadequately known. A key to accepted species is given, and all species are illustrated, the majority from living plants.

KEY WORDS

Araceae, *Piptospatha*, Schismatoglottideae, Indomalaya, Sunda, Borneo.

Introduction

Piptospatha is a genus of 10 accepted described species of obligate rheophytes occurring along streams and on waterfalls in lowland to lower montane perhumid to everwet tropical broadleaf forest. Two of these (*P. perakensis* (Engl.) Ridl. & *P. ridleyi* N.E.Br.) occur in West Malaysia, with one of these (*P. perakensis*) extending into southern Peninsular Thailand. The remainder are endemic on Borneo, with one species (*P. viridistigma* P.C.Boyce, S.Y.Wong & Bogner) recorded from the Aru Islands (Bogner, pers. comm.), but this

requiring confirmation. Study of the significant herbarium collections in Leiden (L) and Herbarium Bogoriense (BO) has revealed at least another 5 species awaiting formal description. Unfortunately none of the material is of insufficient quality to permit description of these novelties.

Most species are restricted to specific geologies, for example: sandstone (e.g., *P. impolita* P.C.Boyce, S.Y.Wong & Bogner), shales (e.g., *P. marginata* (Engl.) N.E.Br.), granite (e.g., *P. elongata* (Engl.) N.E.Br.), karst limestone (e.g., *P. viridistigma*), and travertine (*P. manduensis* Bogner & A.Hay).

The most recent complete taxonomic revision of *Piptospatha* is Bogner & Hay (2000). However, generic boundaries proposed there are now considerably altered following combined molecular and morphological analyses. Key changes are:

1. Removal (and resurrection to generic status) of *Hottarum truncatum* (M.Hotta) Bogner & Nicolson (Low *et al.*, unpubl. data)
2. Recognition of two new genera based on species previously included in *Piptospatha*:
Bakoa P.C.Boyce & S.Y.Wong (Boyce & Wong, 2008; Wong, 2011)
Ooia S.Y.Wong & P.C.Boyce (Wong & Boyce, 2010)
3. Additional novel species: *P. impolita* and *P. viridistigma* (Wong *et al.*,

- 2009), and *P. repens* H.Okada & Tsukaya (Okada & Tsukaya, 2010)
4. Resurrection of *P. marginata* (Wong *et al.*, 2011)

Problems remain, however. Critically, the type species (*P. insignis* N.E.Br.) has never been recollected, and is yet to be sampled for molecular analysis; attempts to isolate DNA from the type material have failed. *Piptospatha insignis* has staminate flowers of unique morphology, and this together with the free pistils set it apart from all other species.

Preliminary molecular analysis of *P. perakensis* has shown it to fall outside the clade to which all *Piptospatha* species belong (Ooi, unpubl. data). Combined with a suite of unique morphologies this lends much support to the removal of *P. perakensis* from *Piptospatha*, and into a new genus; a decision awaits further supporting molecular evidence from the ITS (internal transcribed spacer) marker.

Piptospatha is now defined by the combination of ligular petiolar sheaths, nodding inflorescences, shedding spathe limb, thecae lacking a horn- or needle-like structure, parietal placentation, an erect splash cup carried on an erect peduncle, fruits either fused into a syncarpium (most) or free but cohering (*P. insignis*), and the presence of micropylar appendage on the seed.

Piptospatha N.E.Br., *Gard. Chron.*, n.s. 11: 138, fig.20 (1879); Engler in A.L.P.de Candolle & A.C.P.de Candolle, *Monogr. Phan.* 2: 644–645 (1879); Brown in G.Bentham & J.D.Hooker, *Genera Plantarum* 3(2): 985 (1883); Engler in H.A.G.Engler & K.A.E.Prantl, *Nat. Pflanzenfam.* 2(3): 132. (1889); Ridley, *Mat. Fl. Malay. Penins.*: 34–35. 1907; Engler in H.G.A.Engler, *Pflanzenr.* 55(IV.23Da) 124–128, Fig.75 (1912); Ridley, *Fl. Mal. Pen.* 5: 114 (1925); Mayo *et al.*, *Genera of Araceae* 184–187, Map 50, Pl.50 & 117D (1997); Bogner & Hay, *Telopea* 9(1): 201–218 (2000); Wong *et al.*, *Gard. Bull. Sing.* 61(1): 221–238. (2009); Wong & Boyce, *Bot. Stud.*

(*Taipei*) 51: 543–552 (2010); Wong *et al.*, *Webbia* 66(1): 29–32 (2011). **Type:** *Piptospatha insignis* N.E.Br.

Rhynchosytle Engl., *Bot. Jahrb. Syst.* 1: 183 (1880 ‘1881’). Lectotype: *Rhynchosytle elongata* (Engl.) Engl. [= *Piptospatha elongata* (Engl.) N.E.Br.] (selected by Nicolson, 1967: 518).

Gamogyne N.E.Br., *J. Bot.* 20: 195 (1882); Engler in H.G.A.Engler, *Pflanzenr.* 55(IV.23Da): 123 (1912). — *Piptospatha* sect. *Gamogyne* (N.E.Br.) M.Hotta, *Mem. Coll. Sci. Univ. Kyoto, Ser. B*, 32: 26 (1965). Type: *Gamogyne burbridgei* N.E.Br. [= *Piptospatha burbridgei* (N.E.Br.) M.Hotta].

Small to medium-sized evergreen obligate rheophytes; *Stem* erect or decumbent, usually more or less condensed. *Leaves* several; petiole semi-terete to canaliculate on upper side; *petiolar sheath* short with long, marcescent ligule; *leaf blade* elongate-lanceolate to elliptic or oblanceolate, coriaceous, basally cuneate, apex with tubular mucro; *primary lateral veins* pinnate, running into distinct marginal vein, *secondary laterals* and *higher order venation* either parallel-pinnate or tessellate. *Inflorescence* solitary per module, emerging orthotropic, maturing (prior to the onset of anthesis) anatropic; *peduncle* subequal to or longer than petiole; *spathe* stoutly ellipsoid, not constricted, usually pink, rarely white, lower part persistent and cup-like, upper part inflating and then gaping at anthesis, soon-caducous, cuspidate to acuminate, often with a pronounced terminal rostrum becoming reflexed at anthesis, interior frequently with one to several pronounced crests, especially in the distal part; *spadix* sessile with oblique insertion, often with *staminodes* basally; *pistillate flower zone* cylindrical; *pistils* connate into a syncarpium, or free but cohering to neighboring ones; *ovary* 1-locular; *ovules* many, placenta 2–4, parietal; *stigma* ± sessile, usually as broad as ovary and more or less contiguous with adjacent ones; *staminate flower zone* contiguous with pistillate, cylindrical to ellipsoid, equal in thickness to pistillate, obtuse; *stamens*

arranged in pairs or irregular, free, compressed, anthers truncate, connective ± flat or expanded apically or with conspicuous conical beak overtopping thecae; *thecae* oblong-ellipsoid, dehiscing by apical pore; *appendix* absent. *Infructescence* a cluster of berries subtended by a narrow to wide-flaring obconic spathe base carried on an erect peduncle, spadix above fruiting

portion degrading and shed entirely soon after fertilization; *berry* obovoid to subcylindric, small, green, either fused into a syncarpium (most species), or free but cohering to adjacent berries. *Seed* numerous, elongate-ellipsoid to cylindric, with long, curved micropylar appendage, testa slightly costate, embryo elongate, endosperm copious.

KEY TO PIPTOSPATHA

- 1a. Sterile interstice between pistillate and staminate flower zones well-defined
 - 2a. Stem short, erect; spadix thick (width of pistillate zone: entire length = 5/18); pistillate zone green, staminate zone pale yellow; N Borneo (Sarawak: Limbang, Brunei, W Sabah) ***P. burbridgei***
 - 2b. Stem long, repent, spadix slender (width of pistillate zone: whole length = 3/30), pink; N Kalimantan Tengah. ***P. repens***
- 1b. Sterile interstice absent or very ill-defined 3
 - 3a. Anther connective extended into a pronounced elongate beak; “North Borneo”. ***P. insignis***
 - 3b. Anther connective not so, or if elevated then shortly so and obtuse. 4
 - 4a. Anthers pubescent 5
 - 5a. Connective of stamen swollen, dome-like; S Peninsular Malaysia . . . ***P. ridleyi***
 - 5b. Connective not swollen, flat 6
 - 6a. Spathe white; anthers in closely appressed regularly arranged pairs; leaf blade with conspicuously tessellate tertiary venation on both surfaces; Malay Peninsula and S peninsular Thailand ***P. perakensis***
 - 6b. Spathe pink; anthers irregularly arranged; leaf blade without tessellate venation, or if present then only very faint and only abaxially; Borneo . . . 7
 - 7a. Robust plants to 25 cm tall with short, erect stems; leaves forming a rosette; leaf blade very narrowly oblong-elliptic, 12–20 cm long, all veins parallel pinnate; spadix ca. 2 cm long; pistillate flower zone fertile to the base; fruiting spathe 2.5 cm long and wide; plants of exposed shales; Sarawak: Rejang valley ***P. marginata***
 - 7b. Diminutive plants up to 14 cm tall with decumbent-creeping stems; leaves loosely clustered, or distributed along the stem; leaf blade elliptic, 4–6 cm long, tertiary venation abaxially forming a very faint tessellate reticulum; spadix 0.8–1.2 cm long, pistillate flower zone with 3–5 oblique whorls of staminodes at the base; fruiting spathe up 1 cm long and wide; plants of travertine; Kalimantan Timur: Sangkulirang ***P. manduensis***
 - 4b. Anthers glabrous 8
 - 8a. Spadix bullet-shaped, the staminate portion tapering towards the apex; lower part of staminate zone comprised of larger flowers, that may be sterile, intermixed adjacent to the pistils with white staminodes; thecae broadly excavated, the excavations of adjacent anthers forming a butterfly-shaped depression; stigmas bright green; spathe at anthesis shading proximally to distally from deep olive-green through very pale pink to medium pink, the interior of the spathe tip rostrum with 5–7 conspicuous keels; persistent fruiting spathe wide-flared; plants frequently limestone associated; SW Sarawak (? NW Kalimantan) ***P. viridistigma***