

CURRENT ADVANCES IN THE TAXONOMY OF *POTHOS*

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Abstract The c. 70 species of *Pothos* (subtropical and tropical forest climbers centered on Malesia) show growth patterns and inflorescence presentation that have taxonomic significance at specific and generic levels in tribe *Pothoeae* (*Pothos*, *Pedicellarum* possibly congeneric and *Pothoidium*). In subg. *Allopothos* inflorescence presentation now suggests that the *P. insignis* group should be separated from, not allied with, the *P. rumphii* group. The latter seems closer to certain Bornean species previously thought to be isolated (e.g. *P. kinabaluensis*, *P. atropurpuracens*) and possibly the Australian *P. brassii*. The taxonomically isolated *P. falcifolius* from New Guinea varies greatly in its inflorescence presentation. The *P. luzonensis* group approaches *Pedicellarum* – both highly modified in inflorescence structure and sharing characters formerly used to separate the latter. In subg. *Pothos* the architecture appears more uniform. The *P. scandens* group flowers synchronously on short shoots in the axils of most leaves of a flowering branch; in the *P. papuanus* group inflorescences are fewer and irregularly positioned. In *Pothoidium* spadices are often arranged pseudopaniculately and mature sequentially but the vegetative architecture is similar to that in subg. *Pothos*, with which it also shares distinctive leaf morphology.

Key words *Pothos*, *Pothoidium*, taxonomic studies, advance.

INTRODUCTION

Pothos L. is a genus of approximately 70 species of subtropical and tropical forest climbers centred in Malesia (Hay *et al.*, 1995) belonging to Araceae subfamily *Pothoideae* (sensu Mayo, Bogner et Boyce, in press). Shared leaf, flower and fruit characters suggest that *Pothos* is most closely related to *Pedicellarum* M. Hotta (1976) and *Pothoidium* Schott (1857a, b). Indeed, *Pothos* and *Pedicellarum* may be congeneric. Until a full revision of *Pothos* is completed we are adopting a modified informal version of Engler's infrageneric classification of *Pothos* (Engler, 1905). While we follow Engler's sections (as subgenera) we reject his serial concepts. Instead recognizing informal species groups.

SHOOT ARCHITECTURE

In common with many vining Araceae, species of tribe *Pothoeae* display differentiation of stem function manifesting as various types of shoot architecture. All *Pothos* species investigated have at least five types shoot architecture. On germination a monopodial leafless (minute cataphylls present) thread-like shade-seeking (skototropic; see Strong et Ray, 1975) creeper (eocaul) is produced. Once this shoot begins to climb a monopodial, leafy, juvenile phase develops; this in turn leads to a monopodial, leafy, sterile mature phase; sympodial fertile shoots arise from the sterile mature phase. Both mature sterile and fertile shoots arise from the sterile mature phase. Both mature sterile and fertile shoots can give rise to a terminal extension consisting of a monopodial leafless flagelliform foraging shoot. A sixth shoot type occurs in some species of subgen. *Pothos* and in *Pothoidium* and is discussed later in more detail.

1. Subgenus *Allopothos*

Species of subgen. *Allopothos* display five types of shoot architecture. All species investigated pass

through an eocaul phase that grows along the forest floor until a suitable climbing surface is encountered. Once a climbing surface is reached all but one (*P. brassii* B. L. Burt) investigated produce a distinctive shingle climber bearing ovate to lanceolate, almost sessile, distichously arranged leaves overlapping in the manner of roof tiles. The shingle phase continues for approximately 2 metres when, abruptly, adult leaves are produced with long petioles and lanceolate to elliptic laminae. This transition marks the beginning of the second type of shoot architecture (sterile mature). Many species of subgen. *Allopothos* remain at this phase for a considerable period of time. The sterile mature shoots continue growth and often branch repeatedly from the lower parts, especially in the *P. luzonensis* (Presl) Schott group. The shingle phase is always closely attached to the substrate by roots arising from the nodes and occasionally produces geotropic feeder roots that reach the ground. Sterile mature shoots are often scandent, rooting at distant nodes and often form hammocks in the canopy. Mature sterile shoots occasionally transform terminally into a foraging flagellum with a few leaf-like cataphylls and reduced foliage – leaves at first but soon becoming naked with slightly prominent nodes up to 10 cm distant. This stem forages for several meters until a suitable climbing surface is encountered and does not branch unless damaged apically when it then branches from the nearest healthy node. The foraging stem occasionally roots sparsely from the nodes but always roots prolifically on resumption of climbing habit. Occasionally fertile mature shoots transform terminally into a foraging flagellum. Eventually sterile mature stems branch from the older, often leafless, lower parts, giving rise to sympodial fertile shoots. These fertile shoots, although initially produced from the mature sterile stem, later give rise to new fertile shoots that are produced from post fertile portions, usually the older mid-portions, the whole structure eventually forming a much-branched system. Each plant may bear many such systems and each is capable of producing a succession of inflorescences. The length of these individual branches and the degree of leaf development varies between species' groups. Extremes of branch length are exemplified by species of the *P. insignis* Engl. group (Boyce et Poulsen, 1994) and *P. luzonensis* group while the extremes of leaf development are spanned by species of the *P. rumphii* (Presl) Schott and *P. luzonensis* groups. Occasionally larger or robust fertile mature shoots transform terminally into a foraging flagellum.

2. Subgenus *Pothos*

Most species of subgen. *Pothos* appear to have the five-phase growth architecture described for subgen. *Allopothos*. A possible sixth phase, a modified version of the sterile mature growth, has been observed in four species of *Pothos* and in *Pothoidium lobbianum* and is discussed later. The eocaul is not known for all species in the subgenus but for those known, (*P. scandens* L., *P. repens* (Lour.) Druce (syn. *P. loureirii* Hooker et Arn.), *P. longipes* Schott (see Hay, in press), *P. cathcartii* Schott and *P. yunnanensis* Engl.), this phase consists of a skototropic flagellar growth that, on reaching a suitable climbing surface, alters into a shingle climber with closely arranged or overlapping leaves of much the same shape as those of the mature growth phases. The shingle phase appears to be monopodial but also produces simple branching systems by iteration (sensu Halle, Oldemann et Tomlinson, 1978). This phase continues until the production of the sterile mature growth phase. The transition between the seedling and sterile mature phases is gradual with leaves becoming progressively larger. The mature sterile phase is a densely leafy, later naked, appressed monopodial climber rooting copiously from the nodes. The sterile mature growth phase does not branch terminally unless damaged when it then reiterates from a node usually some distance back from the damaged apex. However, this phase does occasionally transform terminally into a foraging. At some point the sterile mature phase begins to produce fertile mature shoots from lateral buds. These fertile shoots are sympodial, of varying determinate lengths and often branch to several orders from lateral buds. They are generally moderately leafy, later becoming naked below. Fertile mature shoots eventually produce much-abbreviated lateral shoots consisting of a minute prophyll and one to several cataphylls and terminating in one to several. more-or-less synchronously

– produced inflorescences. Occasionally fertile mature shoots transform terminally into a foraging flagellum.

In *P. scandens*, *P. macrocephalus* Scort. ex Hook. f., *P. repens*, *P. cathcartii* and *Pothoidium lobbianum* Schott, the sterile mature growth phase occasionally produces exceptionally robust lateral branches in which the leaves, while of conventional shape and size, are tightly imbricated and not spreading. The factors triggering this modified growth phase are not known. It might represent another form of foraging shoot, a means for the plant to reiterate from lower buds when the top growth carried begins to exceed the capability of the functional root mass. To date this sixth shoot type has not been reported from subgen. *Allopothos*.

SHOOT ARCHITECTURE AND SPECIES GROUPINGS

Shoot architecture in *Pothos* can be used to make species groupings that appear to form a classification framework. To date 7 groups have been distinguished, representing c. 25% of described species. The groups, their salient shoot architecture and the Malesian and [extra – Malesiana] species thus far included are listed below.

1. Subgenus *Allopothos*

1). *P. insignis* Group (*P. borneensis* Furtado, *P. insignis*).

Inflorescences carried on greatly elongated robust orthotropic fertile shoots, clothed with large inflated cataphylls, arising from lower, often leafless, parts of sterile mature stems. This is an architecturally isolated group with no clear links to other groups. The fertile shoots are morphologically similar to the sixth shoot phase noted for subgen. *Pothos*.

2). *P. rumphii* Group (*P. atropurpurascens* M. Hotta, *P. barberianus* Schott, [*P. brassii*], *P. brevistylus* Engl., *P. hosei* Rendl., *P. kinabaluensis* Furtado, *P. kingii* Hook. f., *P. lancifolius* Hook. f., *P. lorispatha* Ridl., *P. oxyphyllus* Miq., *P. rumphii*).

Inflorescences carried on plagiotropic leafy, exceptionally rarely cataphyllary shoots, arising from upper parts or tips of sterile mature stems.

This group is not yet well defined. Even without critical investigation it is clear that a number of subordinate (separate?) groups can be formed using inflorescence morphology. Addition of these data will undoubtedly result in further division, e.g. *P. barberianus* group, *P. rumphii* group.

3). *P. polystachyus* Group (*P. polystachyus* Engl., *P. cuspidatus* Alderw.)

Inflorescences carried on a plagiotropic or pendent, sympodial, much branched cataphyllary branches.

To date only two (New Guinean) species have been assigned to this group (see Hay, in press). However, cursory examination of several Bornean species (e.g. *P. leptostachyus* Schott) suggests that a similar, but less developed, branching inflorescence is present.

4). *P. luzonensis* Group ([*P. amatus* Fischer], *P. beccarianus* Engl., *P. luzonensis*, *P. peninsularis* Alderw., [*P. remotiflorus* Hook. f.]).

Inflorescences carried on much abbreviated stems clothed in minute cataphylls and arising from the mid – parts, rarely tips, of sterile mature stems.

Considering the characters cited here, *Pedicellarum* belongs in the *P. luzonensis* group. The floral differences between *Pedicellarum* and the *P. luzonensis* group (latrorse anther, dehiscence, fused perigon members and presence of a ‘receptacle’) are not strong.

The position of *P. fulcifolius* Engl. et Krause and *Pothos motleyanus* Schott is debatable. Inflorescence

type (comparatively scattered flowers on a more – or – less gracile spadix) support inclusion in the *P. luzonensis* group. However, the great plasticity of inflorescence presentation position combined with the curious inflorescence (flowers sunken into pits) is odd. More data are required.

2. Subgenus *Pothos*

1). *P. scandens* Group ([*P. balansae* Engl., *P. chinensis* Schott], *P. scandens* L.).

All species flower synchronously on short shoots in the axils of most leaves of a flowering branch.

A rather uniform group with an essentially Indo – Malesian distribution. Many species of the *P. scandens* group, especially those from Indo – China, are clearly closely related. All species have rather small inflorescences. Entire fertile branches seem to function as a compound inflorescence.

2). *P. papuanus* group ([*P. grandis* Buchet ex P. C. Boyce & D. V. Nguyen], [*P. kerrii* Buchet], *P. macrocephalus*, *P. papuanus* Becc. ex Engl., [*P. seemanii* Schott]).

Inflorescences few and irregularly positioned.

A geographically diverse assemblage with species from northern Vietnam (*P. grandis*) to Australasia (*P. papuanus*). All species have scattered, rather large, inflorescences which seem to function as separate flowers.

3). *P. repens* Group (*P. repens*).

Fertile shoots borne from terminal or several distal leaf axils on long plagiotropic or pendent sterile mature shoots.

Pothoidium has unisexual spadices arranged pseudopaniculately and maturing sequentially but the vegetative architecture is similar to that in the *P. repens* group, with which it also shares distinctive leaf morphology. The structure of the pseudopaniculate fertile shoots is not clear. It is possible that they are developed by the reduction of all leaves to minute prophylls and cataphylls and that the entire pseudopaniculately is in essence a compound fertile shoot. *Pothos repens* and *Pothoidium* are vegetatively identical. Depauperate flowering specimens of *Pothoidium* greatly resemble robust plants of *P. repens*. Despite these similarities with the *P. repens* and *Pothoidium* are vegetatively identical. Depauperate flowering specimens of *Pothoidium* greatly resemble robust plants of *P. repens*. Despite these similarities with the *P. repens* group, *Pothoidium* appears to be generically distinct since it is readily separable by inflorescence characters. Interpretation of *Pothoidium* inflorescences suggests the species is functionally dioecious. ‘Male’ spadices have flowers with prominently visible anthers and an apparently sterile ovary. ‘Female’ spadices have flowers with a large unilocular fertile ovary and no stamens. Flowers of *Pothos* species are always bisexual with a trilocular ovary.

SUMMARY

Subgenus *Allopothos* consists of several species groups which appear to reflect some degree of evolutionary pattern. The *P. luzonensis* group is of particular interest since it forms a ‘bridge’ between *Pothos* and the presently generic *Pedicellarum*. The floral characters used to maintain *Pedicellarum* are not strong. All occur in various species of the *P. luzonensis* group, although not all in one species. It seems reasonable to suggest that either:

- i. *Pedicellarum* should be merged into a newly defined *Pothos*, or
- ii. The species comprising the *P. luzonensis* group should be removed from *Pothos* and merged into an expanded *Pedicellarum*.

Subgenus *Pothos* seems more closely knit than subgen. *Allopothos*. The relationship between *Pothoidium*

and *Pothos* must be investigated from this point. It is tempting to regard *Pothoidium* as a derived offshoot of subgen. *Pothos* in which functional dioecy has been favored. The major obstacle to this elegant theory is the geographical gulf between *Pothoidium* (Indonesia (Moulccas, Sulawesi, Sumatra), Philippines, and Taiwan) and the putatively related species in subgen. *Pothos* (*P. repens*, northern Indo – China, SW China).

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