REINWARDTIA
Published by Herbarium Bogoriense, Bogor, Indonesia
Vol. 8, Part 2, pp. 309 — 318 (1972)

STUDIES IN MALESIAN PANDANACEAE VII. A REVIEW OF JAVANESE PANDANACEAE, WITH NOTES ON PLANTS CULTIVATED IN THE HORTUS BOGORIENSIS *)

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SUMMARY

In the light of recent monographic studies it has been found necessary to augment and revise to some extent the treatment of Javanese Pandanaceae in Backer & Bakhuizen van den Brink's "Flora of Java". Several name changes are suggested and some species omitted by these authors are enumerated. Notes on various species of different origin now cultivated in the Hortus Bogoriensis are also included. *Pandanus* sect. *Multispina* Fagerlind is reduced to a subsection of *Pandanus* sect. *Rykia.*

INTRODUCTION

The recent appearance of Backer and Bakhuizen van den Brink's "Flora of Java" volume 3 (1968) dealing with the Monocotyledons, presents in the format usual for this Flora rather full and detailed descriptive keys to all the species of *Freycinetia* and *Pandanus* which are found, either wild or in cultivation, in Java. It is the purpose of this short review to bring up to date the nomenclature of the wild Java Pandanaceae, in line with recent monographic studies, and to augment Backer's work by referral of species to their appropriate sections, to add species which in the present author's opinion were erroneously omitted or reduced, and to discuss some of the species cultivated in the Hortus Bogoriensis.

*) In recognition of his active service in the botanical exploration in Malesia, this and the following eight short articles have been contributed by some close friends and associates of Prof. A. J. G. H. Kostermans, D. Sc. at the occasion of his 65th birthday, which coincides with his retirement. All of us hope that this "official" retirement will not prevent Prof. Kostermans from continuing his research activities, especially as tropical taxonomic botany will always gain from the crystallization of his thoughts and the fruits of his vast experience. — EDITORS.

The opportunity to work in Bogor recently has led to this report, and I wish to express my thanks to the Directors of the Hortus Bogoriensis and the Herbarium Bogoriense for their kind assistance.

I should like to dedicate this brief study to Dr. A. J. G. H. Kostermans, as a tribute to his many years of work on the Malesian flora, which has been an inspiration to many of his younger colleagues, and in hope that many more problems of tropical botany will be cleared up in the course of his work.

FREYCINETIA Gaud.

The species in this genus which are spontaneous in Java number six. They are enumerated here according to their sectional position and with the name now deemed correct, with synonyms, as used by Backer, appended.

Sect. OLIGOSTIGMA Warb.

1. F. SCANDENS Gaud.

Syn. — *F. gaudichaudii* Br. & Benn.; Backer, p. 201.

This species has long been neglected; it has been renamed several times in different regions, and appears to be a rather variable species. The full area of its occurrence is not yet worked out but it seems to be in Java, the Sunda Islands, New Guinea, and Queensland in slightly different varieties. The illustration provided by Gaudichaud is somewhat misleading. There is no doubt that *F. gaudichaudii* is the same species. It does not apparently occur farther west, unless it is in Sumatra, which is still in doubt.

Sect. BLUMEELLA B.C. Stone

2. F. INSIGNIS Blume

This species is correctly interpreted by Backer, p. 200.

Sect. AURICULAEFOLIAE B.C. Stone

3. F. SUMATRANA Hemsl.

Syn. — *F. valida* Ridl.; Backer, p. 201.

The Malayan specimens which were discriminated by Ridley as *F. valida* differ from the Sumatran plants only in a few relatively trivial details, as for example the coarseness of the marginal serrations. They

are certainly conspecif ie, although a local variety seems to exist in Malaya. The Java plants are at any rate certainly referable to *F. sumatrana.*

Sect. RACEMOSIFLORAE B.C. Stone

4. F. ANGUSTIFOLIA Blume

This species is correctly interpreted by Backer, p. 201

Sect. SARAWAKENSES B.C. Stone

5. F. IMBRICATA Blume

Baker correctly interprets this species on p. 201

Sect. CYRTOPODA B.C. Stone

6. F. JAVANICA Blume

This species, one of the most distinct in the area, is correctly interpreted by Backer, p. 201.

In my paper on the sections of the genus *(in* Blumea 16: 367. 1968) I mentioned that *F. javanica* might belong to Sect. *Warburgiella.* I now find that this is incorrect, and *F. javanica* and its closest relatives, *F. celebica* and *F. palawanensis,* are now included in Sect. *Cyrtopoda.* The clearest single distinctive feature of this group is the unusual shortness and stockiness of the pistillate pedicels.

SPECIES OF FREIYCINETIA CULTIVATED IN THE HORTUS BOGORIENSIS

It was not possible to identify all the plants which are in the Hortus, but the following are definitely in cultivation and were observed by the author:

Freycinetia funicularis (Sav. in Lam.) Merr., of Sect. *Lateriflorae;* from Amboina.

F. sumatrana Hemsl., of Sect. *Auriculaefoliae;* from Sumatra.

F. undalata Merr. & Perry, of Sect. *Filiformicarpae;* from New Guinea.

F. borneensis Martelli, of Sect. *Sarawakenses;* from Borneo (probably).

F. amboinensis Martelli, of Sect. *Auriculaefoliae;* from Amboina.

F. kamiana B. C. Stone, section uncertain; from Sumatra. This plant, recently discovered, occurs in Malaya (whence the type collection). The plants in the Hortus Bogoriensis (no. H.B. XII-B-V-128) were sterile but almost certainly belong here; thus extending the known range to Sumatra.

F. pseudo-insignis Warb. (at least sensu Merr. & Perry), of Sect. *Blumeella;* from New Guinea. The identity of this is somewhat in doubt.

Of these species, only *F. funicularis* is likely to be much in evidence outside the Hortus Bogoriensis. It is of interest to note that this same species has been tried in various Botanical Gardens; it was successfully grown and flowered in Africa, as evidenced by a specimen in the East African Herbarium in Nairobi. The plants were grown in Amani, Tanganyika, now in Tanzania.

PANDANUS Stickm.

Backer's "Flora of Java" contains an extended key to the Java pandans, both wild and cultivated, that allows identification of sterile, and staminate plants as well as fruiting plants, and thus is highly satisfactory in general, and exemplary in this aspect. Unfortunately he omits (or synonymizes and fails to mention) several species and has taken for some species a far too comprehensive concept that requires certain readjustments. These will be taken up here according to the sections of the genus (not mentioned by Backer).

Sect. ACROSTIGMA Kurz

1. P. KURZII Merr.; Backer, p. 203.

   Syn. — *P. caricosus* sensu Kurz, non Sprengel.

   This species, wild in Java, is the only one in its section. It falls into a subsection *Scabridi* which I recently proposed *(in* Fed. Mus. J. (Malaysia) n.s. for 1967, 12: 118. 1969). Its relatives are species such as *P. atrocarpus* Griff., *P. gibbsianus* Martelli, etc. It is cultivated in the Hortus Bogoriensis.

Sect. JEANNERETIA (Gaud.) B.C. Stone

2. P. POLYCEPHALUS Lam.; Backer, p. 204 - 205.

   This well-marked species is according to Backer native in Java, and is also cultivated in the Hortus Bogoriensis (plants of various origins).

Sect. MICROSTIGMA Kurz

3. P. FAVIGER Backer ; Backer, p. 204.

   This highly characteristic species seems to be a member of Kurz's section *Microstigma.* In Java, according to Backer, found only on Lamongan in East Java, and also in Bali. Collection of staminate specimens remains a much-desired goal.

Sect. HOMBRONIA (Gaud.) Warb.

4. P. DUBIUS Sprengel

Syn. — *P. bidur* Jung.; Backer, p. 203.

The complex of forms which I think must be treated as *P. dubius* sensu lato certainly includes *P. bidur*. The latter, if it has any distinctiveness (which is conceivable), is at best a subspecies, or more likely a minor form. The status of *P. compressus* Martelli must be reassessed in a more detailed treatment of this species. This is cultivated in the Hortus Bogoriensis.

Sect. PANDANUS

5. P. ODORATISSIMUS L.f.

Syn. — P. *tectorius* var. *littoralis* Martelli; Backer, p. 202.

Backer (quite correctly) gives the synonymy but in the reverse order from above, treating *P. odoratissimus* as a synonym of P. *tectorius* var. *littoralis*. As I have shown elsewhere *(in* Gard. Bull. Sing. 22: 231-^257. 1967) there is good reason to hold P. *odoratissimus* as a distinct species. This is, as Backer remarks, 'The only form wild in Java." The remaining plants under P. *tectorius* (which he incorrectly ascribes to Soland. ex Park. — the binomial in Parkinson is hyphenated, thus a monomial, and the name dates from Warburg, 1900) are therefore only cultivars. Their status is still more or less in question. P. *tectorius* has not yet been neotypified or lectotypified and until this is done its exact identity is unsure. It is however a plant from Tahiti. The cultivars which, correctly or not, may at least for the time being be subsumed under this name, include the following.

6. P. TECTORIUS cv. VEITCHII Hort. (incl. P. *sanderi* Hort., P. *laevis* Hort.)

These plants may easily be discriminated from *P. odoratissimus* by their much shorter, green (not white) marginal leaf-teeth. The various cultivars may be unarmed *(laevis)*, yellow-stripped *(sanderi)* or white-striped *(veitchii)* or by chimaeras all these forms may be found in different branches of a single plant. Usually they are sterile, if fertile normally male; only once have female plants been found in fruit (specimens collected by the author in the Solomon Islands).

The plants called P. *tectorius* var. *samak* (Hassk.) Warb. are probably of different origin, and it is likely that they are cultivars deriving from P. *odoratissimus*.

7. P. ANDAMANENSIUM Kurz; Backer p. 203.

So far as I can tell these plants appear to be correctly identified.

8. P. PLATYCARPUS Warb.

This species is not mentioned by Backer. It was said by Warburg to be from Zanzibar, but Martelli later showed that it came from Java. Its status is still somewhat doubtful; there is a specimen in the Herbarium Bogoriense. It might be a form of P. *odoratissimus*, although I thinks this unlikely.

Sect. RYKIA (DeVr.) Kurz

This section contains many rather problematical species and it is not possible to give here a final revision. The main problem so far as the Java plants are concerned appears to be the status of the species which are given as synonyms of *P. furcatus* Roxb. by Backer. Under the latter he includes: P. *bantamensis* Koord., *P. oviger* Martelli, *P. pseudolais* Warb., and P. *scabrifolius* Martelli. Of these, P. *pseudolais* Warb. and P. *scabrifolius* Martelli seem perfectly distinct species. The name P. *furcatus* Roxb. is a valid one but whether it can be applied to any wild species in Java is certainly a matter of doubt. As generally treated the application of the name P. *furcatus* involves plants of Bengal, Assam, Nepal, and this vicinity. It is not yet certain whether pandans of Sect. *Rykia* beyond this region are correctly referred to P. *furcatus* Roxb., and indeed the typification of the species is by no means fully established. It is not at all impossible that extra-Himalayan plants may be conspecific but in the meantime it is certainly unwise to apply the name P. *furcatus* in such a loose way.

The other Java species of this section are much easier to discuss, and as will be seen below, belong to distinctive groups or subsections of *Rykia.*

9. P. PSEUDOLAIS Warb.

Syn. — P. *furcatus* Roxb. sensu Backer, p. 204 (in past, excluding his synonyms).

This is the species with large ellipsoid-oblong solitary cephalia and relatively large drupes, always, with bifurcate styles, which may be found e.g. on the upper slopes of Tjibodas just above the Mountain Gardens. It is certainly spontaneous in Java, but is probably also in cultivation.

10. P. SCABRIFOLIUS Martelli ex Koord.

Syn. — *P. furcatus* sensu Backer, synonymy, p. 204.

This species with its small subglobose cephalia and very depressed pilei seems very distinct.

11. P. oviGER Martelli ex Koord.

Syn. — *P. furcatus* sensu Backer, in synonymy, p. 204.

Whether this species should be revived I cannot say, but it certainly demands a renewed study.

12. P. BANTAMENSIS Koord.

Syn. — *P. furcatus* sensu Backer, synonymy, p. 204.

Likewise I am not at all sure that this is a distinct species, but it deserves a renewed study.

If *P. furcatus* Roxb. itself (sensu stricto!) actually occurs in Java it will no doubt be solely in cultivation. Perhaps some of the plants which are labelled *P. furcatus,* now in the Hortus Bogoriensis, are in fact that species, if they owe their origin to seeds imported from, e.g. Calcutta.

13. P. NITIDUS Kurz; Backer, p. 204.

This distinctive species stands apart from those just above, in habit, in the form of the cephalium, and in other characters. Although no doubt a member of Sect. *Rykia,* it must be considered as close to Sect. *Asterodontia* (Stone *in* Fed. Mus. J. (Malaysia) n.s. for 1967, 12: 114. 1969), and thus is somewhat intermediate, standing next to *P. tetrodon* Ridl. (of *Aster odontia)* and suggestive also of *P. stelliger* Ridl. and *P. sandakanensis* Merr.

Backer's remark that the staminate plants are rare is probably incorrect; all staminate inflorescences are very ephemeral, thus rarely collected, but staminate plants are not, therefore, rare.

14. P. SPINISTIGMATICUS Fagerlind *in* Sv. Bot. Tidskr. 34: 113, fig. 6a-e. 1940.

This species is omitted by Backer. Whether he considered it a synonym is not certain; he may have meant it to be included in his very broad concept of P. *furcatus.* The plants were described from materials collected in the Hortus Bogoriensis by Fagerlind; These plants are still there and were recently studied by the author (tree no. II-C-31 bore several nearly mature fruits). The original place of collection is somewhere on the south

coast of Java; it seems to be a native, species, the local name being "tjangkoenang."

In its broad leaves this is a typical member of Sect. *Rykia;* however, the styles are simple (very rarely a few drupes at the extreme base of a cephalium may have forked styles). In this way it approaches P. *bantamensis* Koord., which way perhaps be the same, but has a solitary cephalium.

I see no reason for excluding this species from the flora of Java, and here reinstate it, realizing however that an earlier name may be found for it.

15. P. MULTIFURCATUS Fagerlind *in* Sv. Bot. Tidskr. 34: 107, fig. 3, 4a-f, 5 b-h. 1940.

This species likewise is omitted in Backer's treatment. I assume that this is because he included it in P. *labyrinthicus* Kurz, a Sumatran species which attributes to Java. The only Java plants which he cites for that species are the very ones mentioned by Fagerlind, which were obtained in Srigontjo, Pasuruan. It is quite true that these species are similar, but there seems good reason to accept Fagerlind's species as a distinct taxon, at least in a subordinate rank. The diagnostic characters which distinguish it from P. *labyrinthicus* are chiefly the occurrence of phalanges (rather than simple drupes) and the apiculate anthers (the apiculus with an enlarged apex). In addition there seems to be some minor characters of difference in the leaves; the prickles on the base of the midrib in P. *multifurcatus* seem on the average to be somewhat more widely-spaced. I consider that P. *multifurcatus* should be accepted as an endemic species, albeit very closely related to P. *labyrinthicus.* The plants from which Fagerlind's materials were collected still exist in the Hortus Bogoriensis, at least the pistillate plants, and fruits were recently collected from it (n. II-C-58). P. *labyrinthicus* Kurz is also cultivated in the Hortus, in several locations in the garden. In general aspect these species are almost indistinguishable.

Fagerlind based a new generic section on his species P. *multifurcatus,* naming it Sect. *Multispina* Fagerl. *(in* Sv. Bot. Tidskr. 34: 112. 1940). His diagnosis bears repeating here: "Drupae pluriloculares, loculi uniseriatim dispositi, styli elongati, spinescentes, persistentes. Stamina in apice columnae umbellatim dispostia." These characters are however not sufficiently different to entail sectional discrimination. The overall complex of characters found in P. *multifurcatus* very clearly shows that it is a

species of Sect. *Rykia.* The occurrence of phalanges ("drupae pluriloculares") rather than simple drupes is now known to occur in other species of *Rykia* (e.g. *P. piniformis* Holtt. & St. John, *P. klossii* Ridl.), which at most warrant a subsectional status. The section *Multispina* therefore is to be included, at subsectional rank, in Sect. *Rykia,* as provided for below.

Sect. **Hykia** subsect. **Multispina** (Fagerl.) B.C. Stone, *comb, et stat. nov.*

BASIONYM: Sect. *Multispina* Fagerl. *in* Sv. Bot. Tidskr. 34: 112. 1940.
TYPE SPECIES: *P. multifurcatus* Fagerl.
INCLUDED SPECIES: *P. labyrinthicus* Kurz; *P. spinosissimus* Ridl. (probable).
DISTRIBUTION: Sumatra and Java. *P. labyrinthicus* is known only from Sumatra; *P. multifurcatus* from Java; and *P. spinosissimus* Ridl. only from Mentawei.

By including three species in this subsection it becomes more, natural, but at the same time, Fagerlind's diagnosis must be altered, as both phalangiate and drupaceous forms occur together. In fact, the diagnostic feature of this taxon seems rather to be the slender style which may be simple or forked, the, horns sharp, slender, and erect. In addition the relatively narrow leaves, lacking the manifest transverse reticulations so evident in most true Rykias, and the habit of growth, with numerous proproots forming thickets, may be adduced as supporting characters.

P. multifurcatus is known as "pandan sirih" according to the specimens preserved in the Herbarium Bogoriense. There seems no reason to suppose that it is anything but an indigenous, perhaps relictual, Java species.

Section unknown

16. P. AMARYLLIFOLIUS Roxb.

Syn. *P. odorus* Ridl.

The "pandan wangi" is the familiar household plant which provides aromatic leaves commonly used in Malay cooking. Generally such plants are small (presumably because they are constantly trimmed), but otherwise they may develop a sizeable trunk and leaves many times larger than those ordinarily used. Since these plants have never been found in flower or fruit it is impossible to say anything of their relationships or sectional position. I suspect, but cannot prove, that *P. latifolius* Hassk. refers to the same, but fully-grown, plants, and at least some specimens suggests that this may be so.

CULTIVATED SPECIES OF PANDANUS IN THE HORTUS BOGORIENSIS.

P. *recurvatus* St. John (sect. *Acrostigma* Kurz) is cultivated in the Hortus Bogoriensis in area XIX-Z. It may be from Sumatra.

P. utilis Bory (sect. *Vinsonia* Warb.) is cultivated at the Mountain Garden, Tjibodas.

P. pygmaeus Thouars (sect. *Foullioya* Warb.) is cultivated in the Hortus Bogoriensis. Two separate clumps in different areas were seen; one had remnants of staminate flowers, the other was sterile.

P. leram Jones, the "Nicobar breadfruit", (sect. *Hombronia* (Gaud.) Warb.) is cultivated in the Hortus Bogoriensis.

P. livingstonianus Rendle (sect. *Heterostigma* (Gaud.) B.C. Stone) is listed in the Catalog of the Hortus Bogoriensis. I was unable to find the specimens.

Other species said to be in cultivation, which I was unable to verify, and which are mentioned in Backer's flora, are *P. vandermeerschii* Balf. f. *in* Baker (a species from Mauritius, of Sect. *Vinsonia),* and *P. boninensis* Warb. (Sect. *Pandanus).*

Several large trees of P. *papuanus* Solms of sect. *Pandanus* exist in the Hortus Bogoriensis, and are quite possibly of this species (they are so named in the Catalog), but I was unable to verify the identification.

Pandanus aff. *nanus* Martelli (H. B. XII-B-V^C) (sect. *Acrostigma?).* This plant was in flower, and the staminate spike was collected. The acaulescent habit, leaves with prickly ventral pleats, yellow bracts, yellow stamens, yellow pollen, the subsessile stamens, attached singly to the spike axis, with apiculate anthers 11 —12 mm long, all point to Sect. *Acrostigma,* or perhaps to the closely similar Sect. *Fusiforma.* In general aspect the plant is very much like P. *nanus* Martelli (of Malaya). It is however also simular to P. *saint-johnii* B.C. Stone. The source of this plant was not discovered, but probably was from Sumatra or Borneo. Many small flies were found attracted to the open staminate inflorescence.