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MONOGRAPH OF THE GENUS PHYLACIUM (LEGUMINOSAE)

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SUMMARY

In the genus *Phylacium* 2 species are recognized. Special attention is paid to the morphology of the inflorescence; full descriptions are given with plates and a map, showing the distribution of both species.

ACKNOWLEDGEMENTS

This treatment is a precursor to the Flora Malesiana. The course for advanced students was guided by Dr. J. F. Veldkamp, and this study was mainly supervised by Drs. R. Geesink, to whom I am much obliged also for his help with the preparation of the manuscript. I am thankful to the director of the Rijksherbarium for the kind hospitality, to Mr. J. van Os for the preparation of the final drawings, and to Dr. W. Vink for his critical remarks.

1. INTRODUCTION

The author followed in December 1977 a course for advanced students in taxonomy at the Rijksherbarium. During this course the material, present in the Rijksherbarium was identified and the observations led to this publication.

The genus *Phylacium* was first recognized by J. J. Bennett in 1840 with one species, *P. bracteosum* Benn., in Java. In 1843 Hasskarl described a second species, *P. scandens*, which already in 1855 was sunk into the synonymy of the former by Miquel. In 1890 an actual second species was described from Burma, *P. majus* Coll. & Hemsl.

2. MORPHOLOGICAL NOTES

1. Inflorescence.

The 'large bract'.

Most striking in the inflorescences are the large pale green bracts, which cover the fruits and the old flowers. Bennett, in the original description, describes the development of this bract as follows: 'The subtending bracteae, or those which are placed at the base of the flowerbearing pedicels, enlarge very greatly at the time of flowering and during the progress of the fruits to maturity; and at the same time their stipes or petiole bends upwards, while the pedicel of the flower or not unfrequently the terminal portion of the raceme (when the enlargement takes place in one of the lower bracteae) curves downwards. By means of these mutual displacements the flower or portion of inflorescence is brought into relation with the

undersurface of the bractea, which then folds backwards along its midrib, bringing its margins into contact with each other and thus forms a compressed cucullate bag for the protection of the flower and fruits. At the period of maturity these enveloping bracteae readily fall off together with their contents, and doubtless contribute much by their levity to the dispersion of the seeds'.

To this very precise description, based upon observations on *P. bracteosum*, not much can be added. The large bract folds backwards along the about horizontal midrib and covers the flower or inflorescence and fruit(s) completely. As far as can be ascertained from herbarium material this orientation is more clear in *P. majus* than in *P. bracteosum*, probably because in the latter species the branches of the inflorescences are less rigid.

At the base of 'the large bracts' two ovate to lanceolate scales are situated. These do not bear axillary buds, so that I regard them as stipules of the 'large bract'.

The structure of the branching system.

The branches, originating from the axils of the upper leaves, have always two basal subopposite buds which can develop into flowering branches or apparently can stay dormant. These subopposite basal buds probably originate axillary to a bract. In both species the main lateral branch can develop into an inflorescence or it can continue vegetatively. In the latter case one or both basal buds develop into an inflorescence. In *P. bracteosum* mostly both develop into flowering branches, and these bear also basal subopposite branches, finally resulting in a bunch of 2—10 flowering branches. In *P. majus* mostly only the main lateral branch develops into an inflorescence and the two basal buds stay dormant, sometimes, if the main lateral branch continues vegetatively, one or both basal buds develop into an inflorescence; in this case the inflorescence has again two basal buds, one of which sometimes also develops into an inflorescence. The large bract, of which the peculiar behavior is described above, bears an axillary flower or a fascicle of 2—6 stalked flowers.

2. The flower.

Bracteoles.

In *P. bracteosum* two opposite bracteoles are present on the top of the pedicel; these are lacking in *P. majus*, even in very young buds.

Calyx.

The upper two calyx lobes are connate, a common feature in *Papilionatae*. Complete fusion, resulting in a one-topped lobe, occurs as well as the shortly two-topped condition. During the development of the fruit the calyx tears longitudinally. This might explain why Hasskarl described the calyx of *P. scandens* (a synonym of *P. bracteosum*) as having 5 subulate teeth.

Standard.

The standard bears at the base of the blade two inflexed auricles; somewhat more towards the apex two callosities along the midrib bend towards the median, clasping the vexillar (upper) filament. In the herbariummaterial no evidence could be found whether the standard reflexes or not. This feature normally remains visible after drying, so that it is assumed that the flower only opens apically.

The vexillary stamen.

The question, whether the vexillary filament is free from the other 9 or united is left unsolved, as this requires anatomical investigation in different stages of development of the flower.

The vexillary filament has the appearance to be 'confluent' with the other 9, but liberates very easily, facilitated by the two central callosities of the standard.

3. The fruit.

The fruit is normally described as a one-seeded loment. In *P. bracteosum* the wall is rather thin and looks indehiscent. In *P. majus* the wall is thicker and dehisces at least during the drying process of herbarium material. Though dehiscence of loments in the tribe *Hedysareae* occurs here and there (e.g. in the genus *Codariocalyx*, also referred to as *Desmodium* sect. *Pleurolobium*) it demonstrates again that grouping of Leguminous genera, exclusively based upon dehiscence of the pods, is very artificial.

3. SYSTEMATIC POSITION OF PHYLACIUM

Bennet (1840) considered the genus to be closely allied to the genera *Eleiotis* and *Lespedeza*. Bentham (1865) placed it consequently in the tribe *Hedysareae*. Taubert (1894) had it in the *Hedysareae-Desmodiinae*, which are considered to deserve tribal rank by Polhill (1976). Hutchinson had the genus in his tribe *Lespedezeae*, which were split from the *Hedysareae*, so that it can be concluded that the systematic position has not changed since the original publication.

4. GEOGRAPHICAL DISTRIBUTION

P. majus and *P. bracteosum* have a more or less continuous distribution. *P. majus* occurs in E. Burma, Laos, and in Thailand north of the Isthmus of Kra. *P. bracteosum* occurs in the Malesian area, from Peninsular Thailand (Craib, 1928) to New Guinea and N. Queensland, not in Borneo and not East of New Guinea. One collection (*d'Alleizette 1771*, L) is recorded to have been collected in S. Vietnam, but as is well-known, it is very probable that the label is copied wrongly.

P. bracteosum occurs in secondary vegetations in areas with a distinct dry season, and this might explain why this species has not (yet?) been found in Borneo.

The distribution pattern of the genus *Phylacium* resembles the eastern part of the distribution patterns of *Smithia sensitiva* Ait. and *Pycnospora lutescens* (Poir.) Schindl., as depicted by van Meeuwen *c.s.* (1961).

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PHYLACIUM

Phylacium Benn., Pl. Jav. Rar.(1840)159, t. 33; Benth. & Hook.*f*., Gen. Pl. 1 (1865) 523; Taub., in E. & P., Nat. Pfl. Fam. 3, 3 (1894) 331; Hutch., Gen. Fl. Pl. 1 (1964) 448. — T y p e s p e c i e s: *P. bracteosum* Benn.

Herbaceous twining plant. Stem longitudinally ribbed, strigose to hirsute. Other vegetative parts strigose. *Leaves* alternate, pinnately trifoliolate with stipules and stipellae. *Leaflets* medium-sized, terminal leaflet slightly larger than the lateral leaflets; base rounded to cordate; margin entire; apex obtuse to emarginate, mostly mucronate; nerves pinnate, main nerve and lateral nerves slightly raised on both surfaces. Axillary buds mostly 3, seemingly collateral, all forming inflorescences or the central one vegetative, the lateral ones sometimes dormant. *Inflorescences* axillary. Flowers in fascicles, (1—)2—6 together, with as many small subulate bracts, the fascicles in racemes. The bract to the fascicles enlarging and by abaxial folding covering the downwardly bent flowers and fruits, then obliquely ovate to lanceolate-ovate, mostly mucronate, hyaline, strigose inside. *Calyx* 4-lobed with the dorsal lobe larger than the other 3 and sometimes 2-topped; persistent, outside strigose. *Corolla* papilionate, glabrous. Standard and wings free, keel-petals ventrally connate. Standard with 2 basal inflexed auricles and with 2 median callosities slightly more apically. Vexillary *stamen* free or at least halfway confluent with the other 9, forming a tube or sheath. *Ovary* fusiform to ovoid, strigose, shortly stipitate, stipe surrounded at base by an annular disk. Style laterally compressed, cylindric towards the capitate stigma. Ovule 1. *Pod* laterally compressed, valves with reticulate nervation, strigose. *Seed* reniform, dull, without endosperm; hilum annular, *c.* 1 mm in diam., pale pink to yellowish. Embryo with an incurved radicle.

KEY TO THE SPECIES

a. Stem hollow. Flowers 6—8 mm long, with 2 bracteoles. Petals caducous in fruit. Pod obliquely elliptic, style remnant in the same direction as the longitudinal axis of the fruit. ..... **1. P. bracteosum**
b. Stem not hollow. Flowers 12—14 mm long, without bracteoles. Petals persistent in fruit. Pod elliptic, style remnant ventrally bent ..... **2. P. majus**

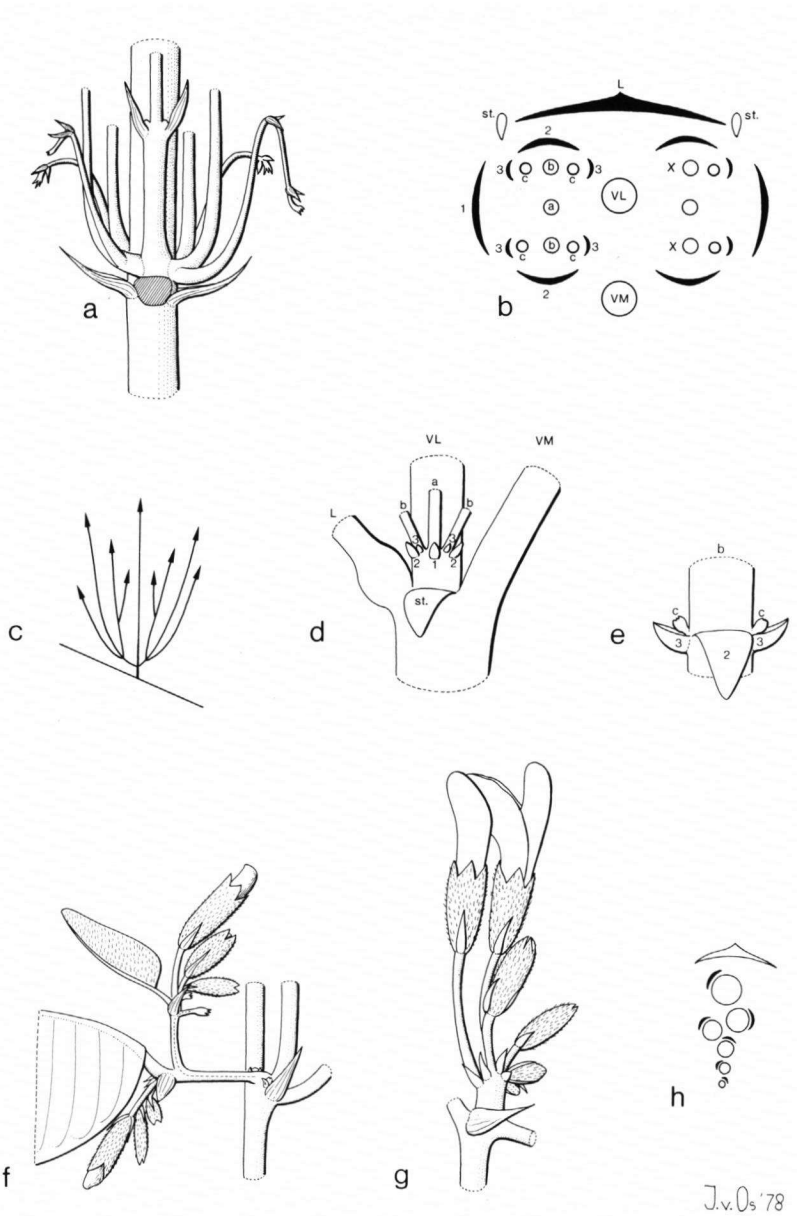

Fig. 1. *Phylacium bracteosum.* — a. Inflorescence with 9 branches developed, × $3^1/_2$. — b. Diagram of branching pattern of a. (VM: vegetative main axis; VL: vegetative lateral axis; L: leaf, in a. depicted as a scar; st: stipules; a, b, c: flowering branches; 1, 2, 3: bracts corresponding to these branches). — c. Simplified scheme of b. — d. Lateral view of a part of a young branching system comparable to a. — e. Part of d. from another angle. — f. Flowering branch with the lower 'large bract' already folded backwards and the upper one still in original position; the broken line corresponds with branch 'a' in diagram b; × 3. — g. A six-flowered fascicle, × 6. — h. Diagram of g. — (a—c: *Boerlage s.n.*; d—h: *Brass 23947*).

1. Phylacium bracteosum Benn. — Fig. 1, 3a—f.

P. bracteosum Benn., Pl. Jav. Rar. (1840) 159, t. 33; Miq., Fl. Ind. Bat. 1 (1855) 228; Boerl., Handl. 1, 2 (1890) 365; Coll. & Hemsl., J. Linn. Soc. 28 (1890) 44; Gagnep., Fl. Gén. I.-C. 2 (1920) 527; Ridl., Fl. Mal. Pen. 1 (1922) 604; Merr., Enum. Philip. 2 (1923) 294; Craib, Fl. Siam. Enum. 1 (1928) 431. — T y p e: *Horsfield s.n.* (BM, K, *n.v.*).

P. scandens Hassk., Tijdschr. Nat. Gesch. Phys. 10 (1843) 147. — T y p e: *Herb. Hasskarl 1205, 1.* (BO, *n.v.*).

Stem hollow, glabrescent. Stipules ovate-lanceolate to triangular, 2—3.5 by 0.5—1 mm. Rachis of *leaf* 3—7.5 cm, abaxial side longitudinally ribbed, adaxial side with 2 longitudinal ridges. Stipellae ovate-lanceolate, 1.5—2 by 0.3—0.5 mm. Terminal *leaflet* mostly elliptic, often ovate to ovate-lanceolate, sometimes lanceolate, rarely obovate, (3—)4.5—8(—9.5) by (1.2—)2—3.5(—4.5) cm, the lateral leaflets slightly smaller. *Flowers* 3—6 per fascicle, 2—10 racemes per leaf-axil, per raceme 1 or 2 (or 3) large bracts. Large bract (2—)2.5—4(—4.5) by (1.2—)1.5—2.3(—2.5) cm, its stipules triangular, 1.5—2.5 by 0.5—1 mm, acute. Small bracts up to 1 by 0.3 mm. Pedicel up to 4 mm. Bracteoles 2, opposite, on the apex of the pedicel, ovate-lanceolate, *c.* 3 by 0.4 mm, strigose. Flower 6—8 mm long. *Calyx c.* 1.5 mm in diam., cup 2.5—3 mm long lobes ± triangular, acute, the dorsal one 1.5 by 1 mm, the other 3 lobes 1.3—1.6 by 0.6—1 mm. Calyx longitudinally ruptured in fruiting stage. *Corolla* caducous. Standard blade obovate, *c.* 5 by 3—3.5 mm, base cordate, auricles 0.3—0.5 mm, callosities *c.* 3.5 mm under the apex; claw 1.5—2 by

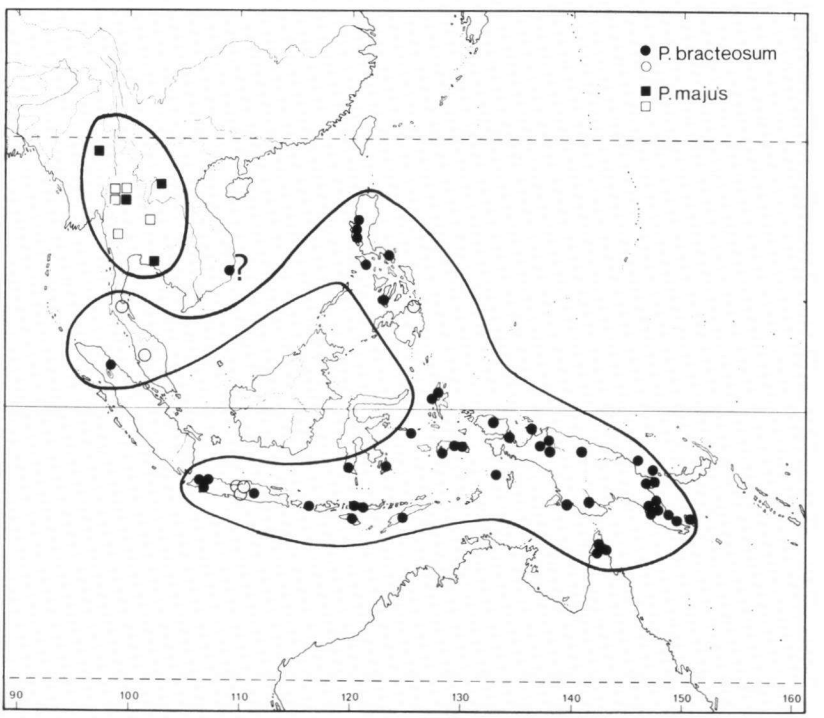

Fig. 2. Distribution of *Phylacium*. — Black symbols: specimens studied; open symbols: reliable data from literature.

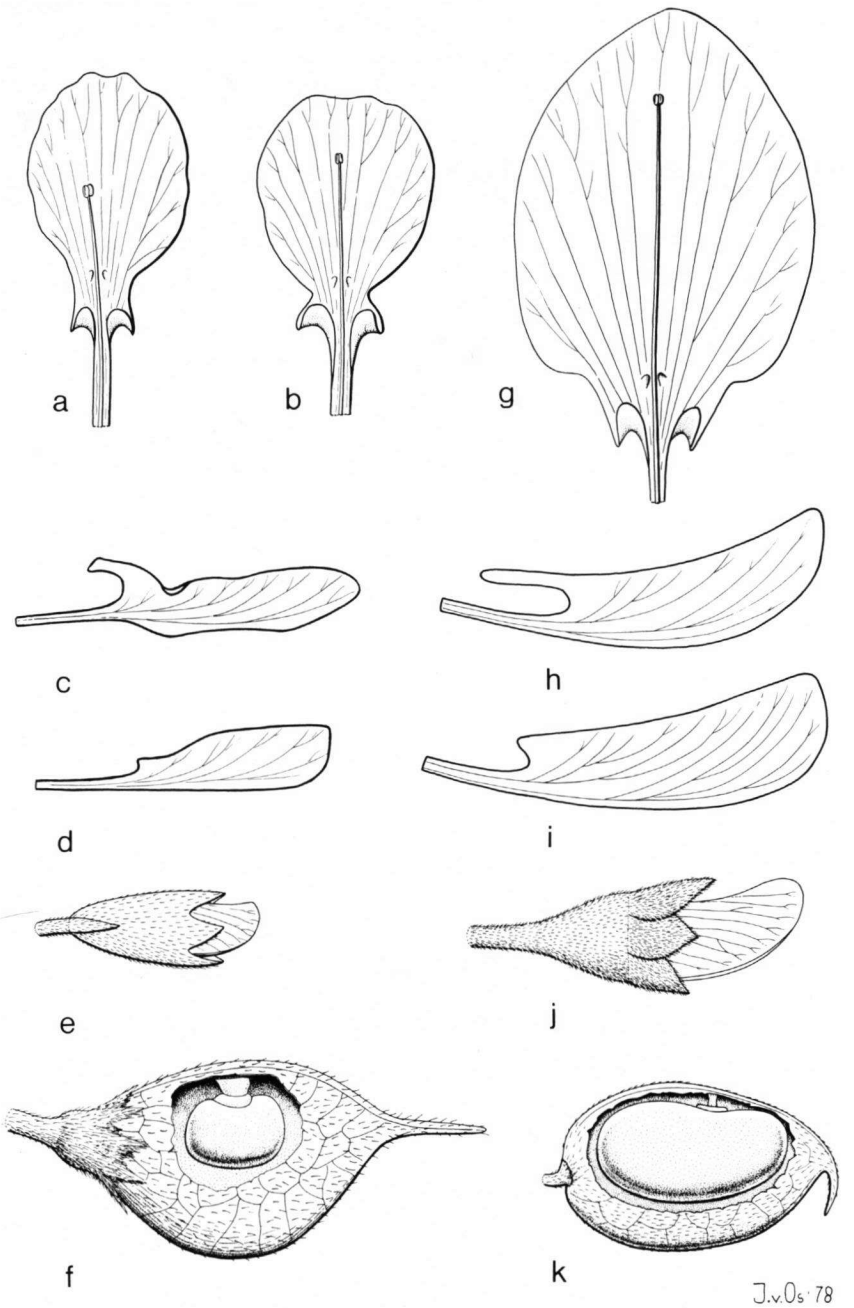

Fig. 3. a—f. *Pylacium bracteosum*; g—k. *P. majus*. — a, b, & g. Standard with vexillary stamen; c & h. wing petals; d & i. keel petals; e & j. flowerbuds; f & k. pods, wall partly removed showing the seed. — (a—e; *Brass 23947*; f: *Zippel s.n.*; g—k: *Kerr 925*) — a—d: × 7; e—k: × 5).

0.3—0.5 mm. Wing blades *c.* 4.5 by 0.8—1.2 mm; claws 2—2.5 by 0.2 mm. Keel-petal blades *c.* 4 by 1—1.5 mm; claws 2—3 by 0.2 mm. *Filaments* 5—6 mm, the basal 4.5—5.5 mm united, the apical 1 mm bent dorsally. Connective broadly ellipsoid, *c.* 0.3—0.1 mm, darker than the anther. Anthers *c.* 0.3 by 0.25—0.35 mm. *Style* sometimes constricted at the base. *Pod* indehiscent, obliquely elliptic, 7—11 by 4—6 mm; style remnant not bent, in the same direction as the longitudinal axis of the pod, 2—3 mm long. *Seed* *c.* 4 by 3 by 2 mm with a small appendage perpendicular to and on the curvature directed to the base of the pod; funicle *c.* 0.3 by 0.5 mm.

Distribution: Peninsular Thailand, Malesia (not in Borneo), and N. Queensland.

Ecology: In areas with a dry season, in secondary vegetations and forest edges.

Field observations: Leaves greyish to glaucous below. Large bracts pale green. Corolla recorded to be white, green, blue, purple, pale purple, white lilac, whitish with shades of blue, and white with blue on the keel.

2. Phylacium majus Coll. & Hemsl. — **Fig. 3g—k.**

P. majus Coll. & Hemsl., J. Linn. Soc. 28 (1890) 44, t. 7; Craib, Fl. Siam. Enum. 1 (1928) 431; Prain, J. As. Soc. Beng. 66 (1897) 387. — Type: *Collet s.n.* (K, *n.v.*).

Stem not hollow, indument persistent. Stipules lanceolate to linear, 5—7 by 0.6—1 mm. Rachis of *leaf* 4—7.5 cm, indistinctly longitudinally ribbed. Stipellae ovate-lanceolate to linear, 2.5—5 by *c.* 0.5 mm. Terminal *leaflet* elliptic, 4—6.5(—8.5) by 2.2—3(—4.8) cm, lateral leaflets slightly smaller. *Flowers* 1—3 per fascicle, 1 or 2 (or 3) racemes per leaf-axil, per raceme 5—13 large bracts. Large bract (2.7—)3—4(—4.5) by 1—2 cm, its stipules ovate-lanceolate to triangular, 2.5—4.5 by 0.8—1.4 mm, acuminate. Small bracts 1—2 by *c.* 0.3 mm. Pedicel up to 5 mm. Bracteoles absent. Flower 12—14 mm long. *Calyx* 2.5—3 mm in diam., cup 2.5 mm long, lobes broadly obovate, acuminate, the dorsal one 2—2.5 by 3—3.5 mm, the other 3 lobes 2—2.5 by 2—2.5 mm. Calyx not longitudinally ruptured in fruiting stage. *Corolla* persistent in fruiting stage. Standard blade broadly obovate, *c.* 12 by 8—11 mm, base cordate, auricles *c.* 1 mm, callosities *c.* 10 mm under the apex; claw *c.* 2 by 0.7—1 mm. Wing blades 9.5—12 by 3—3.5 mm; claws 2.5—3 by 0.5 mm. Keel-petal blades 8.5—9.5 by 2.5—3 mm; claws *c.* 2.5 by 0.5 mm. *Filaments* *c.* 13 mm long, the basal *c.* 11 mm united, the apical 3 mm bent dorsally. Connective fusiform, *c.* 0.4 mm long, with the same colour as the anther. Anthers *c.* 0.4 by 0.25—0.4 mm. *Style* constricted at the base. *Pod* dehiscent (in herbarium material), elliptic, with a ventral incision at base, *c.* 7 by 4—5 mm, style remnant strongly bent ventrally, 1.5—3 mm long. *Seed* 4—5 by 1.5—2 mm, without an appendage, dark brown. Funicle *c.* 0.2 by 0.3 mm.

Distribution: N. Burma, Laos, and Thailand north of the Isthmus of Kra.

Ecology: In areas with a dry season, in secondary vegetations and forest edges.

Field observations: Large bract pale green. Corolla recorded to be purplish; standard pale green outside, pale violet or light lilac inside; wings violet, lilac; keel violet, lilac.

INDEX TO COLLECTIONS STUDIED

Numbers between brackets refer to numbering of species in this paper.
(unnumbered specimens not cited)

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