Parasopubia Hofmannii Pradeep & Pramod and Parasopubia Hofmannii var. Albiflora Pradeep & Pramod (Orobanchaceae), Two New Taxa from India

Authors: Pradeep, Ayilliath K., and Pramod, Choorakkay

Source: Candollea, 68(1) : 115-122

Published By: The Conservatory and Botanical Garden of the City of Geneva (CJBG)

URL: https://doi.org/10.15553/c2013v681a16

Parasopubia hofmannii Pradeep & Pramod and Parasopubia hofmannii var. albiflora Pradeep & Pramod (Orobanchaceae), two new taxa from India

Ayilliath K. Pradeep & Choorakkay Pramod

Abstract

PRADEEP, A. K. & C. PRAMOD (2013). Parasopubia hofmannii Pradeep & Pramod and Parasopubia hofmannii var. albiflora Pradeep & Pramod (Orobanchaceae), two new taxa from India. *Candollea* 68: 115-122. In English, English and French abstracts.

Parasopubia hofmannii Pradeep & Pramod and *Parasopubia hofmannii* var. *albiflora* Pradeep & Pramod *(Orobanchaceae)* are two new taxa described from South India. They are compared with the Indian species *Parasopubia delphinifolia* (L.) H.-P. Hofm. & Eb. Fisch. Detailed descriptions, illustrations and taxonomical note are provided. A key for the identification of the Indian species of *Parasopubia* H.-P. Hofm. & Eb. Fisch. is also provided.

Key-words

OROBANCHACEAE – Parasopubia – South India – Taxonomy

Résumé

PRADEEP, A. K. & C. PRAMOD (2013). Parasopubia hofmannii Pradeep & Pramod et Parasopubia hofmannii var. albiflora Pradeep & Pramod (Orobanchaceae), deux nouveaux taxons d'Inde. *Candollea* 68: 115-122. En anglais, résumés anglais et français.

Parasopubia hofmannii Pradeep & Pramod et *Parasopubia hofmannii* var. *albiflora* Pradeep & Pramod *(Orobanchaceae)* sont deux nouveaux taxons décrits du Sud de l'Inde. Ils sont comparés avec l'espèce indienne *Parasopubia delphinifolia* (L.) H.-P. Hofm. & Eb. Fisch. Des descriptions détaillées, des illustrations et des notes taxonomiques sont fournies. Une clé servant à l'identification des espèces indiennes de *Parasopubia* H.-P. Hofm. & Eb. Fisch. est aussi donnée.

Addresses of the authors: AKP: Department of Botany, University of Calicut, Kerala-673 635, India. E-mail: **akpradeep1@rediffmail.com**

CP: Department of Botany, Govt. Brennen College, Darmadam, Thalassery, Kerala-670 106, India.

Submitted on December 12, 2011. Accepted on January 29, 2013. Edited by P. Bungener

ISSN: 0373-2967 – Online ISSN: 2235-3658 – *Candollea* 68(1): 115-122 (2013)

Introduction

The genus *Parasopubia* was established by Hofmann & Fischer (2004) to include two Asian species, earlier treated under *Sopubia* D. Don. The genus *Sopubia* as currently understood includes only those species with actinomorphic sub-rotate corolla with tubes much shorter than the lobes, and stomium of fertile anther thecae with long haired margins. Both genera are nowadays assigned to *Orobanchaceae* which comprises the parasitic former *Scrophulariaceae* (Bennet & Mathews, 2006; Fischer & al., 2012). Hofmann & Fischer (1998), while revising *Sopubia* in Madagascar had taken note of these interesting differences shown by the Asian species of *S. delphinifolia* (L.) G. Don and *S. fastigiata* Bonati and suggested for much detailed studies for their segregation from *Sopubia*. Subsequently they revised the generic boundaries of this genus, and redefined the genus by segregating *S. delphinifolia* and *S. fastigiata* to the new genus *Parasopubia* H.-P. Hofm. & Eb. Fisch. Therefore, this genus consists only of two species, *P. delphinifolia* (L.) H.-P. Hofm. & Eb. Fisch. and *P. bonatii* H.-P. Hofm. & Eb. Fisch., distributed in South East Asia. In India, the genus is represented only by *P. delphinifolia,* which is distributed in the Southern and Eastern India. In Kerala, the species is distributed in almost all districts (Sasidharan, 2008).

While studying the flora of the lateritic plateau habitats of Northern Kerala of South India, the authors noticed two populations of *Parasopubia*, one with purple corolla and the other with white corolla. Detailed taxonomic studies of the populations proved both as distinct from the Indian *P. delphinifolia*. They are sympatric and reproductively isolated from this species as they shed their seeds and complete their life before it blooms. SEM photographs of seeds using HITACHI SU6600 FE Scanning Electron Microscope, also supported this view. These two populations are described here as a new species and a variety.

Parasopubia hofmannii Pradeep & Pramod, **spec. nova** (Fig. 1).

Typus: India: Kerala, Kannur, Madayippara, 36 m, 12º 01.792'N 75º15.246'E, 27.IX.2011, *Pramod CU 126793A* (holo-: G; iso-: MH).

Closely allied to P. delphinifolia, *but can easily be distinguished by its less or non-segmented leaves, calyx with 2 mm long tube and up to 4 mm long divergent lobes, shorter (< 1.2 cm) campanulate corolla tube and the capsules being obovoid and much exceeding the calyx tube.*

Erect annual herb, to 50 cm high. *Stem* stiff, terete at base, sulcate and tetragonous above, seldom branched, glabrous, slightly purplish; internodes 5-10 mm long. *Leaves* opposite, 1-4 cm long; lower leaves usually with 3 linear segments or rarely 5-segmented or entire; upper leaves entire, slightly purplish, margins entire, midrib depressed, strigose on margins, glabrous on both the surfaces; segments 1 mm broad, filiform, terminal segment longer than laterals; leaves reduced towards apex. *Flowers* axillary, solitary, 1 × 0.7-1 cm; pedicels up to 1-2 mm long. *Bracteoles* 2, linear, 2-2.5 × 0.25 mm, slightly purplish, glabrous, tip acute. *Calyx* 6 mm long; lobes 5, unequal, tube 2-2.5 mm long, green, 10-ribbed; lobes linear, to 4 mm long, acute to acuminate at apex, slightly purplish, margins minutely strigose or glabrous, glabrous on both surfaces, persistent in fruits. *Corolla* campanulate, pale pink or mauve, often with deep pink blotches, 1 × 0.7-1 cm, tube to 7 mm long, narrow (1-1.5 mm) up to 2-3 mm of tube, then expanding; lobes 5, subequal, subrotund, ca. 3 × 4 mm, minutely puberulous with gland tipped hairs, glabrous within. *Stamens* 4, unequal, filaments attached below the middle of corolla tube, deep pink, glabrous, 2 longer (5 mm), 2 shorter (3 mm), arched, attached above longer stamens. *Anthers* 2, pendent from the apex of the filament, one perfect, oblong, shortly apiculate, 1.5-2 mm long, dehiscence from base, the other empty and spur-like, 1.5-2 mm long, cuspidate. *Ovary* ellipsoid, 1 × 0.5 mm, green, glabrous; cells 2, placentation axile, ovules many. *Style* simple, 6 mm long, pale pink, glabrous; stigma globose, glabrous. *Capsules* obovoid, 2.5 × 4 mm, purplish green, much exceeding the calyx tube, emarginate at apex, apiculate with withered style, glabrous; fruiting calyx to 7 mm long, lobes 4-5 mm, tubes 2-3 mm long, purplish. *Seeds* many, oblong, 0.5 mm long, brownish, glabrous, testa cells narrow, walls almost parallel, secondary testa cells absent or ill-developed, cell walls almost smooth.

Phenology. – Flowering and fruiting in June to October.

Specimina visa. – **India. Kerala:** Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 11.IX.2009, *Pramod CU 123592* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 20.VIII.2010, *Pramod CU 126555* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 1.VIII.2010, *Pramod CU 126510* (CALI); Kannur, Parassinikkadavu, 200 m, 29.IX.1982, *R. Ansari 73940* (MH); Kannur, 25.VII.1988, *E. Jayakumar CU 2152* (CALI); Kannur, Cheemeni, 8.X.1990, *C. T. Indu CU 4098* (CALI); Kannur, Thalipparamba, 30.XII.1988, *P. P. Sudhirkumar CU 2886* (CALI).

Etymology. – The species is named in honor of Hans-Peter Hofmann (Germany), who together with Eberhard Fischer (Germany) have made great contribution to the taxonomy of *Sopubia* and erected *Parasopubia*.

Habitat. – Parasopubia hofmannii grows in the crevices of hard laterite and also on the surrounding shallow soiled areas (Fig. 2A), along with species such as *Lepidagathis keralensis* Madhu. & Singh, *Cyanotis burmanniana* Wight, *Indigofera trifoliata* L., *Geissaspis tenella* Benth., *Desmodium triflorum* (L.) DC., *Polycarpaea corymbosa* (L.) Lam. and *Heteropogon contortus* (L.) Roem. & Schult.

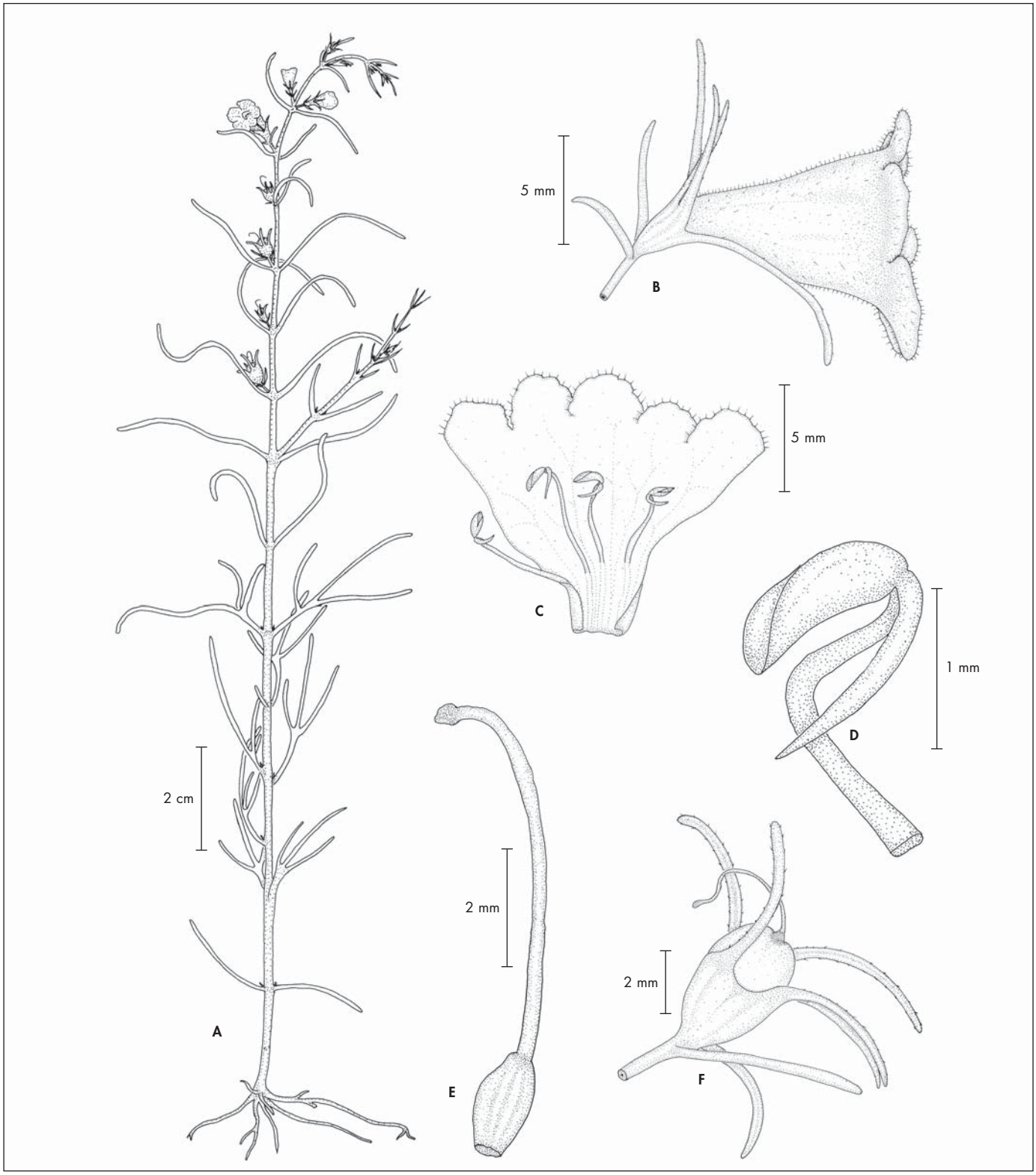

Fig. 1. – *Parasopubia hofmannii* Pradeep & Pramod. **A.** Habit; **B.** Flower; **C.** Corolla opened; **D.** Stamen; **E.** Pistil; **F.** Fruit. [*Pramod CU 126793, G*] [Drawn by C. Pramod]

Fig. 2. – A. Habitat of *Parasopubia hofmannii* Pradeep & Pramod. Flowering and fruiting branch: **B.** *Parasopubia delphinifolia* (L.) H.-P. Hofm. & Eb. Fisch; **C.** *Parasopubia hofmannii*. Flower: **D.** *Parasopubia delphinifolia;* **E.** *Parasopubia hofmannii*. Fruit: **F.** *Parasopubia delphinifolia;* **G.** *Parasopubia hofmannii*.

[Photos by authors]

Taxonomical notes. – *Parasopubia hofmannii* (Fig. 1A) differs from the one Indian species *P. delphinifolia* in its stouter habit with less branching, leaves with fewer segments (Fig. 2B-C), shorter campanulate flowers (Fig. 2D-E), obovate capsules with fruiting calyx tube reaching only up to the middle, and also by seeds with narrow testa cells and almost parallel and smooth walls, where secondary testa cells are absent or ill-developed (Fig. 2F-G; Fig. 3A-D). Being stouter, it is similar to the other Asian *P. bonatii,* but differs in having long-linear calyx lobes against the short and triangular calyx lobes in *P. bonatii.*

Parasopubia hofmannii var. ***albiflora*** Pradeep & Pramod, **var. nova** (Fig. 4, 5).

Typus: India. Kerala: Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 1.VIII.2010, *Pramod CU 126522* (holo-: G; iso-: MH, CALI).

Closely allied to P. hofmannii *var.* hofmannii, *but can easily be distinguished by its elegant white corolla, plant parts without purplish tinge and seeds with distinctly polygonal testa cells with secondary cells and slightly rugose walls.*

Erect annual herb, to 50 cm high. *Stem* stiff, terete at base, tetragonous and sulcate above, upwards with erecto-pendent branches, diameter 3 mm at base, glabrous, green; internodes 5-20 mm long. *Leaves* opposite, 1-6 cm long, lower leaves 3-linear segmented, upper leaves entire; margins entire, midrib depressed, strigose on margins, glabrous on both surfaces; segments 0.5 mm broad, filiform, green, terminal segments as long as lateral segments or longer; leaves reduced towards apex. *Flowers* axillary, solitary, 1-1.5 × 0.8-1.1 cm; pedicels up to 3 mm long. *Bracteoles* 2, linear/subulate, 0.5 × 2-6 mm, strigose on margins, glabrous on both surfaces, tip acute. *Calyx* 6 mm long, green; lobes 5, unequal, tube 2 mm long, 10-ribbed, glabrous; lobes linear-lanceolate, 2-4 mm long, acute, margins strigose, glabrous on both surfaces, green, persistent in fruits. *Corolla* campanulate, 1-1.2 × 0.7-1 cm, white, corolla tube narrow (1 mm) up to 2 mm of length of the tube, then expanding, lobes 5, suborbicular, 5 × 4 mm, minutely puberulous outside, glabrous within. *Stamens* 4, unequal, filaments attached below the middle of the corolla tube, white, glabrous, 2 longer (5 mm), 2 shorter (3 mm), arched, attached above longer stamens. *Anthers* 2, pendant from the apex of filament, all almost at same level, one perfect, oblong, shortly apiculate, 1.5-2 mm long, white, dehiscence from base, cuspidate; sterile anther lanceolate, 1.5-2 mm long, cuspidate. *Ovary* ellipsoid, 1.5 × 1 mm, green, glabrous, cells 2, placentation axile; ovules many. *Style* simple, 6 mm long, hyaline, glabrous; stigma subglobose, hyaline, glabrous. *Capsules* obovoid, 4-5 × 3-3.5 mm, green, much exceeding the calyx tube, emarginate at apex, apiculate with withered style, glabrous; fruiting calyx to 8 mm long, lobes 5-6 mm long, tube 2-3 mm long, green. *Seeds* many, oblong, 0.75 mm long, brownish, glabrous, testa cells polygonal, broad, secondary cells well developed with oblique walls, cell walls slightly rugose.

Phenology. – Flowering and fruiting in June to October.

Specimina visa. – **India. Kerala:** Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 11.IX.2009, *Pramod CU 123591* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 20.VIII.2010, *Pramod CU 126554* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 25.VII.2011, *Pramod CU 126690* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 1.VIII.2010, *Pramod CU 126507* (CALI); Kannur, Madayippara, 36 m, 12º01.792'N 75º15.246'E, 1.VIII.2010, *Pramod CU 126505* (CALI). **Tamil Nadu:** Madurai, Thandigudi, 1400 m, 22.X.1977, *M. Chandrabose 51625* (MH).

Taxonomical notes. – *Parasopubia hofmannii* var. *albiflora* is distinct in having elite white corolla and dark green plant parts against the purple corolla and purplish green plant parts of var. *hofmannii* (Fig. 2E; Fig. 5B). The interpretation of the SEM images of seeds can also lend further support for the establishment of the new variety. In var. *hofmannii,* the testa cells are very narrow with smooth walls and without or ill-developed secondary ridges (Fig. 3C-D). In var. *albiflora*, the testa cells are polygonal with slightly rugose walls and well developed secondary walls (Fig. 3E-F).

Key to the Indian taxa of *Parasopubia*

1. Corolla-funnel shaped (bellied); capsule elliptic, enclosed in the persistent calyx tube except at the tip; fruiting calyx lobes erect; lower leaves often with more than 5 lobes ..... ***P. delphinifolia***

1a. Corolla campanulate; capsule obovoid, much exceeding the persistent calyx tube; fruiting calyx lobes divergent; lower leaves often with less than 5 lobes..... 2

2. Corolla pale pink or mauve with deep pink blotches inside, plant parts often purplish, testa cells very narrow with fewer oblique secondary walls, walls smooth .... ***P. hofmannii*** var. ***hofmannii***

2a. Corolla white, plant parts green, testa cells wide, polygonal walls with oblique secondary walls, walls slightly rugose ..... ***P. hofmannii*** var. ***albiflora***

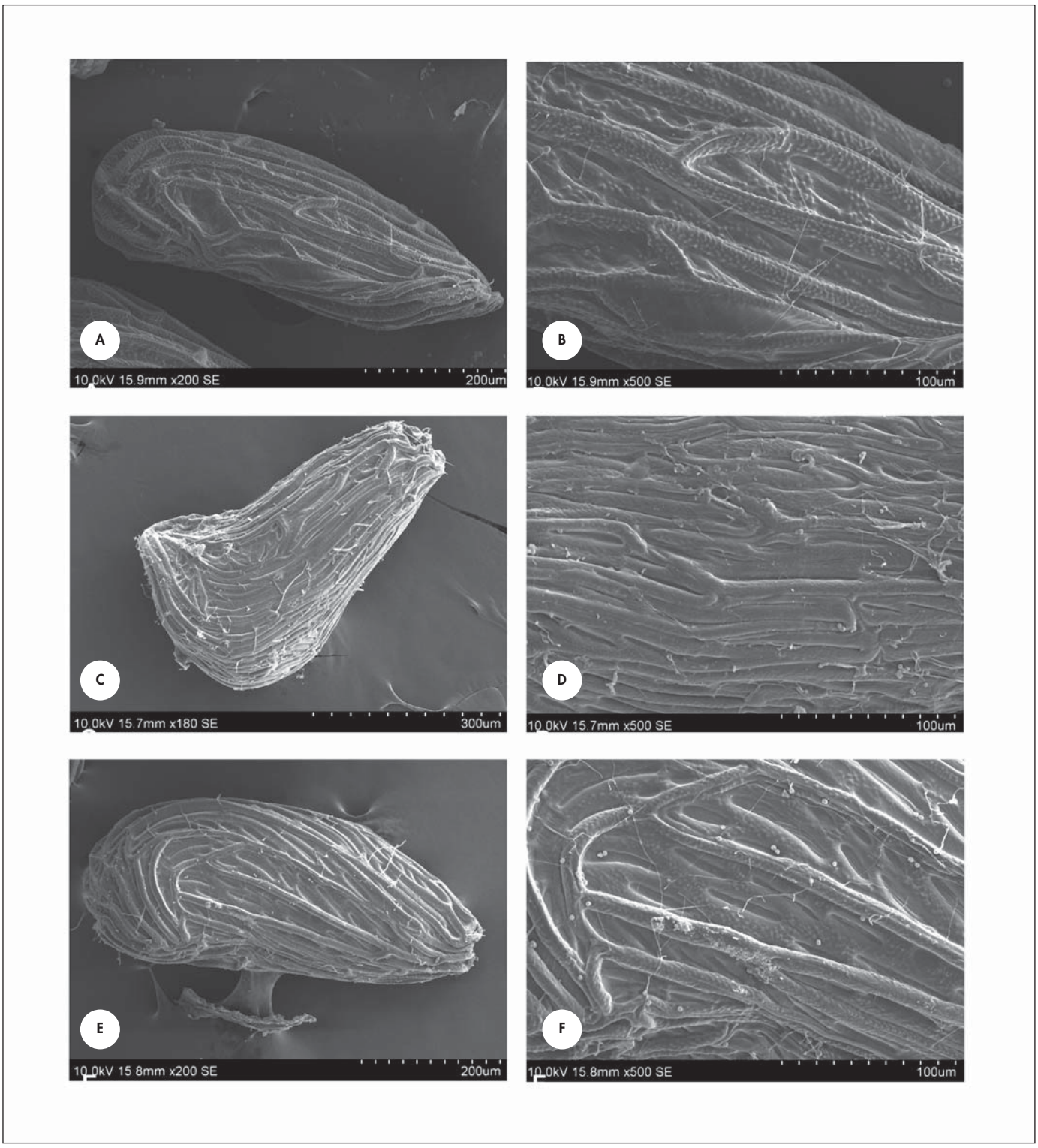

Fig. 3. – Seeds: **A-B.** *Parasopubia delphinifolia* (L.) H.-P. Hofm. & Eb. Fisch.; **C-D.** *Parasopubia hofmannii* Pradeep & Pramod var. *hofmannii*; **E-F.** *Parasopubia hofmannii* var. *albiflora* Pradeep & Pramod.

[**A-B:** *Pramod CU 123599*, CALI; **C-D:** *Pramod CU 126793*, G; **E-F:** *Pramod CU 126522*, CALI] [Photos by authors]

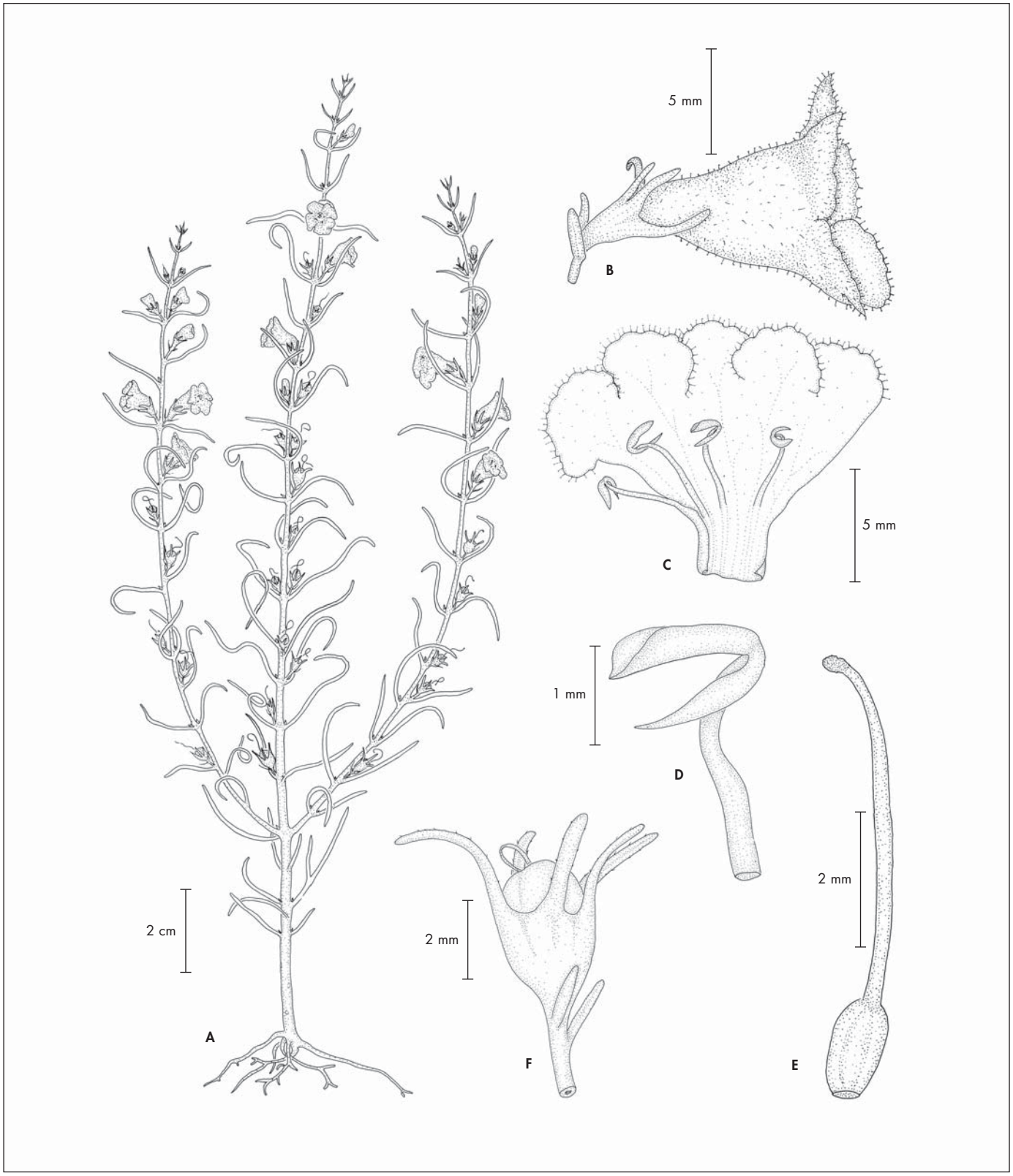

Fig. 4. – *Parasopubia hofmannii* var. *albiflora* Pradeep & Pramod. **A.** Habit; **B.** Flower; **C.** Corolla opened; **D.** Stamen; **E.** Pistil; **F.** Fruit. [*Pramod CU 126522*, CALI] [Drawn by C. Pramod]

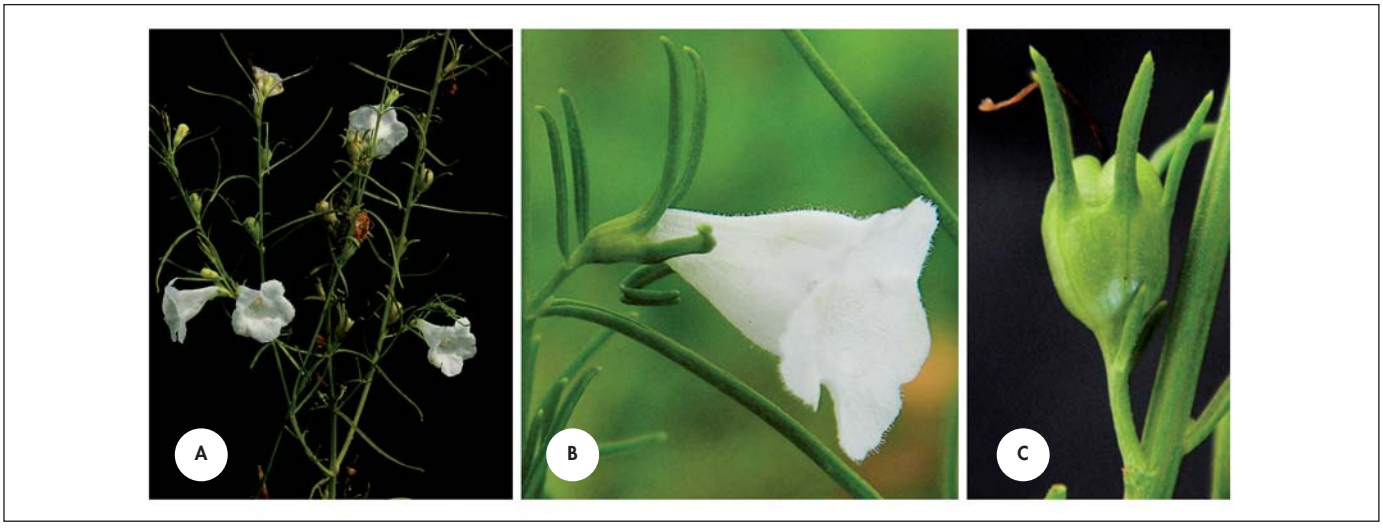

Fig. 5. – *Parasopubia hofmannii* var. *albiflora* Pradeep & Pramod. **A.** Flowering and fruiting branch; **B.** Flower; **C.** Fruit.
[*Pramod CU 126522,* CALI] [Photos by authors]

Acknowledgements

The authors are thankful to Mr. Balachandran K. and Manjusha Mathew, National Institute of Technology, Calicut, for SEM studies, Dr. G. V. S. Murthy (Scientist F & Head of Office), Dr. Sathyanarayana (Scientist D) and Mr. Vivek C. Paulose, Botanical Survey of India, Coimbatore for herbarium studies at MH, Dr. C. Kunhikkannan, IFGTB, Coimbatore, for herbarium studies at FRC, the curator of P for sending image of type specimen, Prof. M. Sabu, University of Calicut for laboratory facilities and Dr. K. P. Martin, USA, for literature. The second author is thankful to University Grants Commission, Govt. of India, for the financial assistance in the form of Minor Research project.

References

Bennett, J. R. & S. Mathews (2006). Phylogeny of the parasitic family Orobanchaceae inferred from phytochrome A. *Amer. J. Bot.* 93: 1039-1051.

Fischer, E., B. Schäferhoff & K. F. Müller (2012). The new monotypic genus Bardotia (Orobanchaceae) from Madagascar and remarks on the phylogenetic relationships of the African and Madagascan genera Parastriga, Radamaea, Rhamphicarpa and Sieversandreas. *Phytotaxa* 46: 19-33.

Hofmann, H.-P. & E. Fischer (1998). Preliminary revision of the genus Sopubia (Scrophulariaceae) in Madagascar. *Adansonia* 20: 299-312.

Hofmann, H.-P. & E. Fischer (2004). Generic delimitation of Sopubia Buch.-Ham. (Scrophulariaceae), revision of Petitmenginia Bonati and description of the new Asian genus Parasopubia. *Bot. Jahrb. Syst.* 125: 341-375.

Sasidharan, N. (2008). *Flowering Plants of Kerala*. CD-ROM. Kerala Forest Research Institute, Peechi, India.