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Caption: Malabar Slender Loris *Loris lydekkerianus malabaricus* © Dileep Anthikkad.



New distribution records of two *Begonias* to the flora of Bhutan

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Abstract: Two species of *Begonia* are collected and described for the flora of Bhutan—*panchtharensis* and *gemmipara*. A detailed description, ecology, distribution, notes and photographs of the recorded species are provided.

Keywords: Begoniaceae, *Begonia gemmipara*, *Begonia panchtharensis*, conservation status, description, ecology, morphology, Thimphu.

The genus *Begonia* L. (Begoniaceae) comprises of more than 2000 accepted species (Hughes et al. 2015), currently divided into 70 sections, distributed throughout tropical, subtropical (Doorenbos et al. 1998; Moonlight et al. 2018) and temperate regions of the world. In Asia, 959 species in 19 sections have been recorded, with maximum distribution in southeastern Asia (Doorenbos et al. 1998; Shui et al. 2002; Moonlight et al. 2018). In Bhutan, Grierson (1991) described 20 species of which 13 are known, and the addition of *Begonia flaviflora* Hara by Gyeltshen et al. (2021) increased the number of species to 14. The present report provides two additional new records of *Begonia* for Bhutan.

During a recent botanical exploration to central Bhutan between June and August 2020, small natural populations of *Begonia* species were observed in the shady and moist areas in cool and warm broadleaved

forests. The authors collected detailed field notes and specimens for further examination. After detailed study on its morphological characteristics and reviewing the literature (Clarke 1879; Hara 1971; Grierson 1991; Tsuechih et al. 1999; Rajbhandary et al. 2010; Camfield & Hughes 2018; Pradhan et al. 2019) and consultation of herbarium specimens available at the Global Biodiversity Information Facility (GBIF 2020), it was identified as *Begonia panchtharensis* Rajbhandary (sect. *Platycentrum* (Klotzsch) A.DC) and *Begonia gemmipara* Hook.f. & Thomson (sect. *Putyzeysia* (Klotzsch) A.DC.). Grierson (1991) incorporated brief descriptions of *B. gemmipara* in the Flora of Bhutan based on the specimens collected from Darjeeling and Sikkim states of India. *B. panchtharensis* is a recently described species and is so far known from Nepal and Sikkim state of India (Pradhan et al. 2019). Detailed morphological descriptions, phenology, ecology, distribution, notes, and photographs are provided based on the collected specimens. The voucher specimens are deposited at the National Herbarium (THIM), National Biodiversity Centre, Thimphu, Bhutan.

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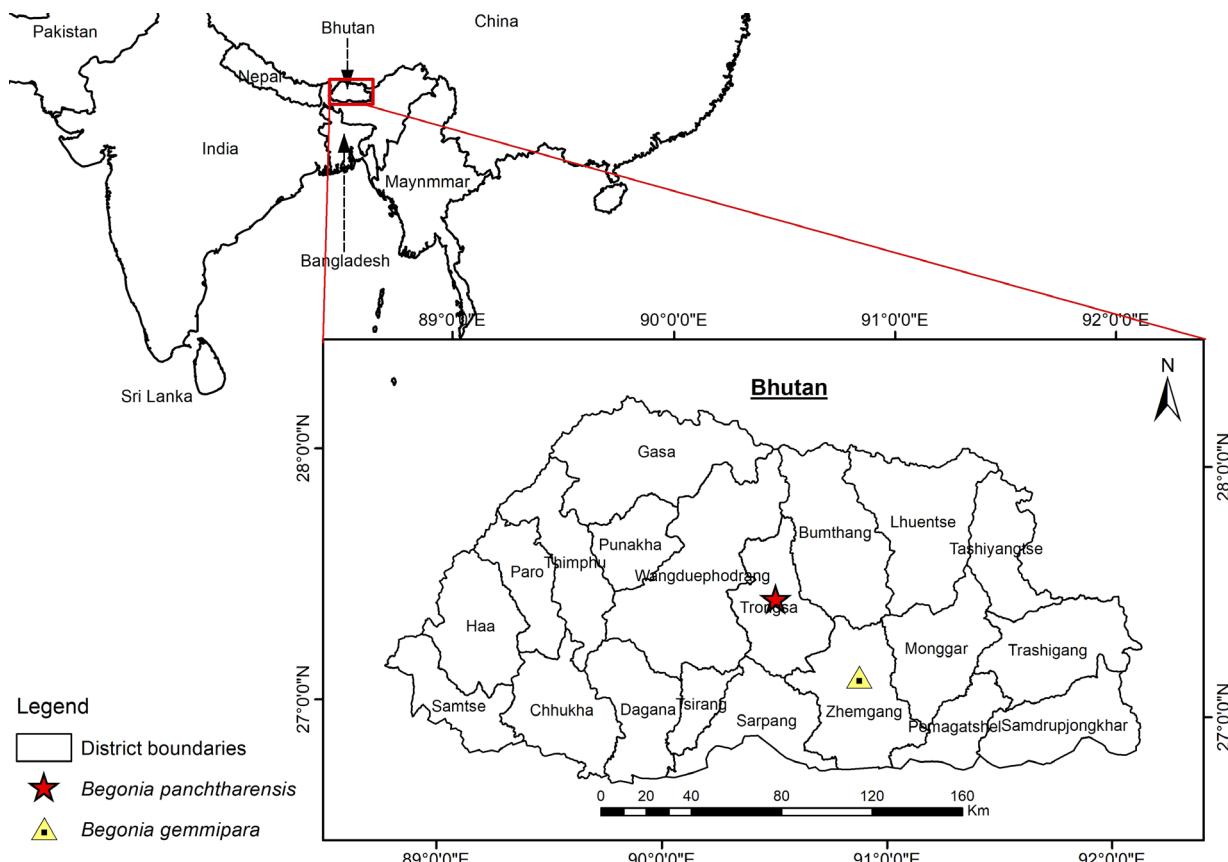


Figure 1. Distribution map for *Begonia panchtharensis* and *Begonia gemmipara* in Bhutan.

TAXONOMIC ENUMERATION

Begonia panchtharensis S. Rajbhandary

Gard. Bull. Singapore 62(1): 151–162. 2010

Type: Nepal, Panchthar, Tinubote, Sisire, Prangbung, VDC, 2,240–2,300 m, 2.x.2007, U. Thamsuhang s.n., vouchered as S. Rajbhandary S74 (holotype, E, isotype, KATH) (Image 1).

Plant monoecious, rhizomatous herb, 40–90 cm tall. Rhizomes, 10–25 long and 2–3.5 cm diameter covered with long adventitious roots. Stipules broadly ovate, 20–30 x 8.5–14 mm, caducous, membranous, pinkish-white with light green tinge, glabrous, red spotted on the abaxial surface, apex acuminate. Leaves arising from the rhizome; petioles 25–75 cm long x 7–12 mm wide, cylindrical with two parallel grooves on adaxial surface, glabrous, yellowish-green with red striated spots on the surfaces; blades slightly asymmetric, sub-orbicular, 20–42 x 18–40 cm, deeply lobed, adaxial surface dark green with sparsely white hirsute, abaxial surface pale green, glabrous with sparse white hairs on veins, base strongly cordate, margin irregularly serrulate or dentate, lobes 6–8, apex acuminate, palmately 6–8 veined.

Inflorescences terminal or axillary, cymose, dichotomously branched, 30–75 cm long, female inflorescences longer than male inflorescences; peduncles cylindrical, 25–48 cm long, glabrous, semi-woody, yellowish-green with red linear spots on the surface.

Floral bracts ovate-elliptic or elliptic, 2–3.5 x 1.5–2.0 cm, caducous, membranous, pinkish, glabrous, margin entire, apex acuminate, abaxial surface with circular or linear spots. Staminate flowers: pedicel 1.5–2.5 cm long, pale whitish-pink or white, glabrous with few red spots; tepals four, white to pale pink, 9–11 veined; outer two tepals broadly ovate, 15–24 x 10–15 mm, glabrous, apex sub-acute, base truncate, margin entire; inner two tepals oblanceolate to obovate, 20–22 x 10–12 mm, white, glabrous, apex obtuse, base cuneate, margin entire; stamens numerous, up to 5 mm long, distal filaments and anthers are longer than basal ones; filaments free, 2–3 mm long, obovate-oblong to elliptic-oblanceolate, 1.5–2 mm long, golden yellow, anther connectives extended. Pistillate flowers: pedicel up to 12–15 mm long, pale greenish-white or white with short linear red spots; tepals 5, unequal, white, glabrous, margin entire;

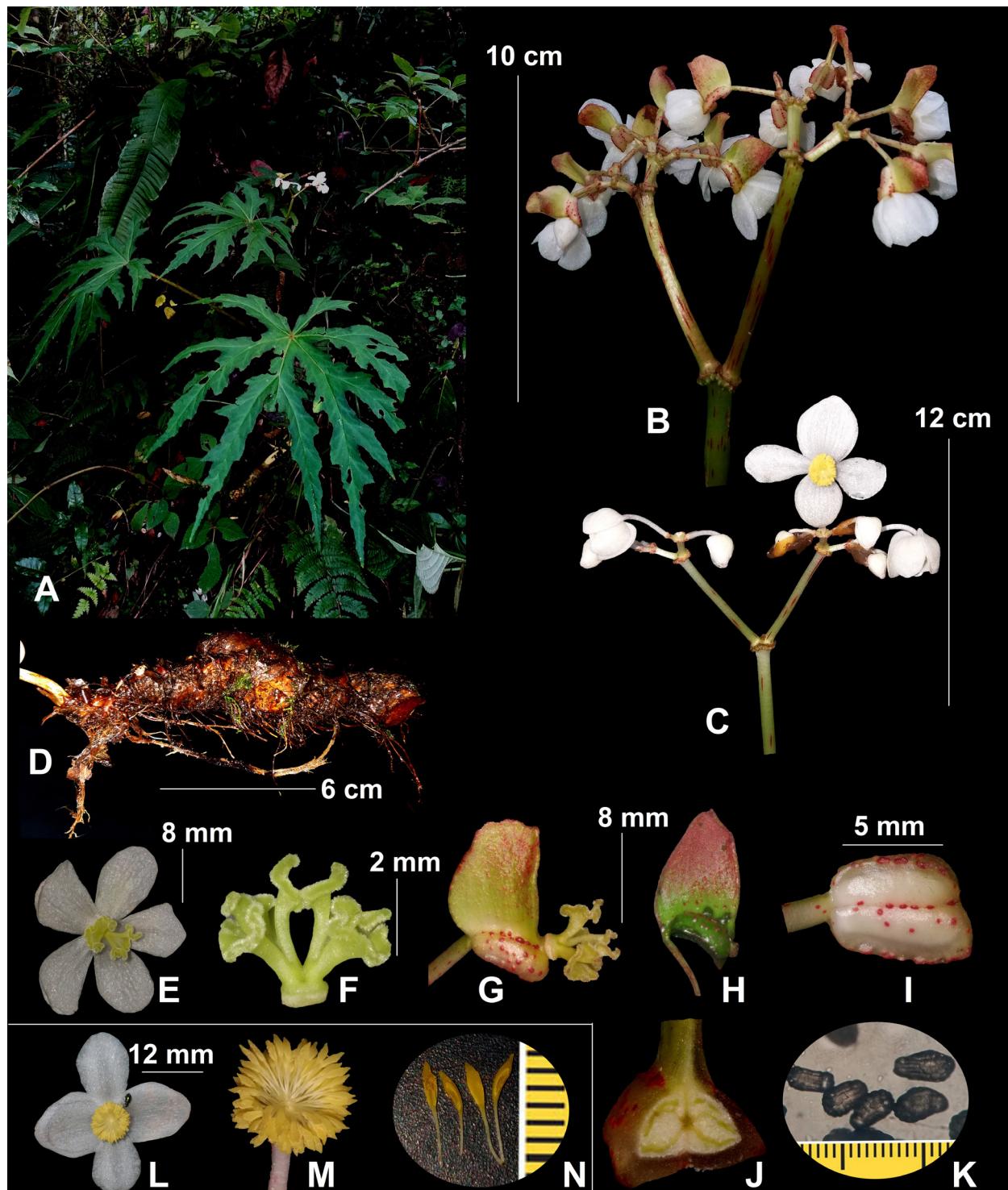


Image 1. *Begonia panchtharensis* Rajbhandary: A—Habit | B & C—Inflorescences (Female and male) | D—Rhizome | E—Pistillate flower | F—Styles | G, H & I—Fruits (Side and abaxial view) | J—Transversal section of ovary | K—Seeds | L—Staminate flower | M & N—Stamens. © Phub Gyeltshen

outer three tepals, obovate or ovate-elliptic, 15–16 x 9–12 mm, apex obtuse or rounded, base truncate, 8–9 veined; inner two tepals, obovate to oblanceolate, 13–15 x 7–11 mm, apex obtuse or rounded, base truncate;

styles 2, persistent, 3–5 mm long, fused at base, golden yellow; stigma inner margins thickened and spiraled, intermediate portions flat and undulated, papillose; ovary oblong, slightly curved downwards, 6.5–8.5 x

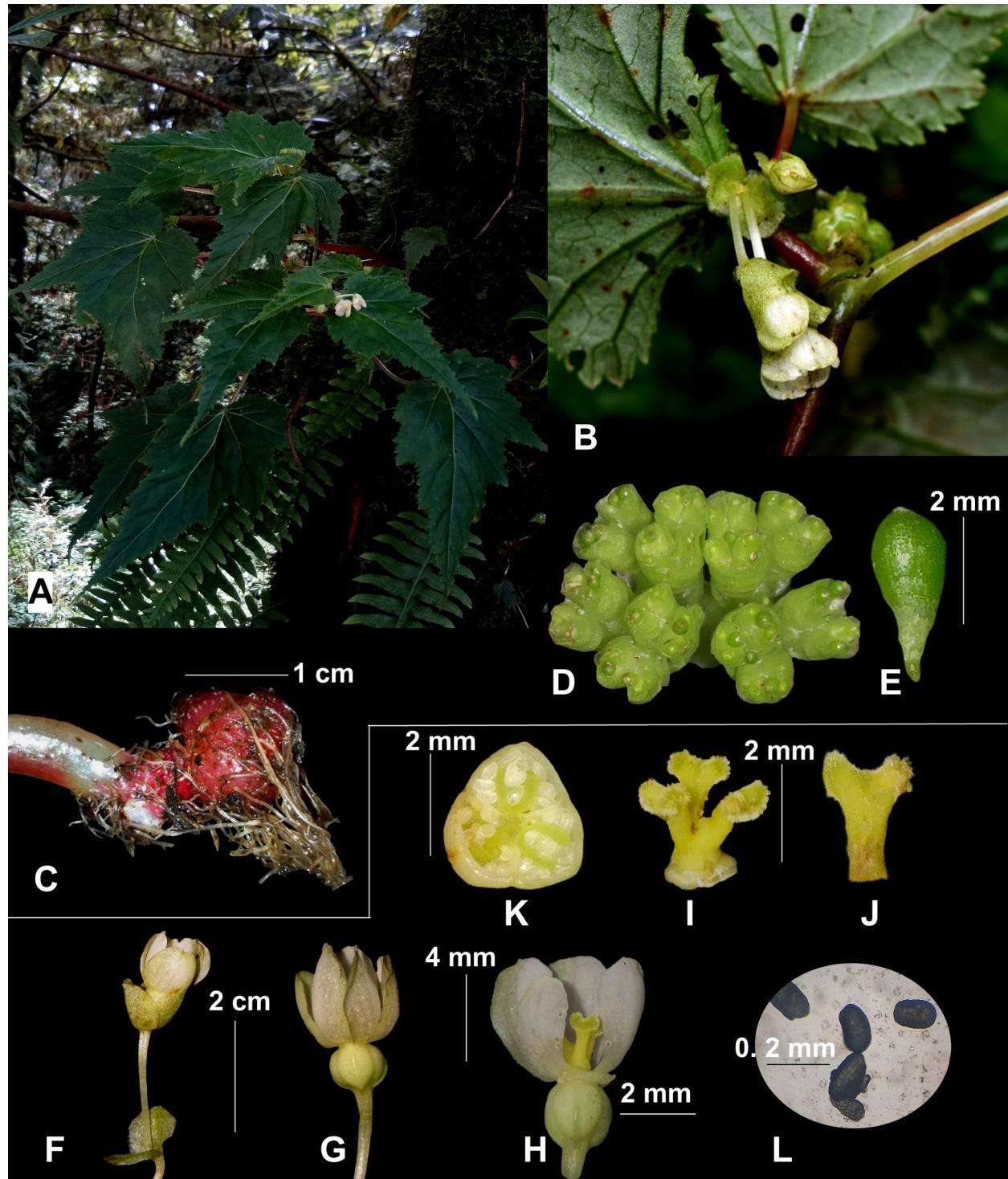


Image 2. *Begonia gemmipara* Hook.f. & Thomson: A—Habit | B—Inflorescences attached to stem | C—Tuber | D—Gemma-up like structure | E—Bulbil | F—Inflorescence | G—Inflorescence without bracts | H—Female flower showing ovary and styles | I & J—Styles | K—Transversal section | L—Seeds. © Phub Gyeltshen

4–5 mm, glabrous, red circular or linear granules on the surface with three unequal wings, dorsal wing longer than the two lateral underdeveloped ridge like wings, 2-locular, placentation axillary with two branches per

locule. Fruits nodding or pendant, 7–9 x 5–6 mm, slightly falcate, yellow-green, nodding; dorsal wing ovoid or ovoid-oblong, 8–10 x 11–15 mm, wavy, margin flushed with red spots to 2/3 of upper portions; lateral

wings 8–9 x 1 mm, red tubercles on the wings; seeds oblong, 0.5 mm long.

Specimens examined: Barcode No. THIM15584, 10.viii.2019, Bhutan: Trongsa, Tashidingkha, 27.4512°N, 90.4833°E, 1,898 m, coll. P. Gyeltshen, coll. no. 018 - 019.

Phenology: Flowering and fruiting July to September.

Habitat and ecology: The plant is lithophytes in the shady rocky areas in the warm broadleaved forest at 1,898–2,070 m elevation. The associated species includes *Globba clarkei*, *Elatostema* sp., *Sonerila khasiana*, *Begonia josephii*, and *Persicaria chinensis*.

Distribution: India, Nepal, and new to Bhutan (Fig. 1).

Notes: The current distribution sites are located within road buffer and the natural habitat could be disturbed or changed due to road expansion and maintenance in future. This species is encountered in the two locations with population less than 10 individuals in the field. Further study is recommended to understand its population trend and conservation status.

Begonia gemmipara Hook.f. & Thomson III.

Himal. Pl. t. 14. 1855

C.B.Clarke in Hook.f. Fl. Brit. India 2: 641. 1879; Hara in Flora of Eastern Himalaya 2:84.1971; Hara in Hara and Williams, Enum. Fl. Pl. Nepal 2: 181. 1979; Grierson in Grierson and Long, Flora of Bhutan 2(1): 237–246. 1991.

Putzeysia gemmipara (Hook.f. & Thomson) Klotzsch, Abh. Konigl. Akad. Wiss. Berlin 1854: 255 (1855).

Type: Holo: K000761398, 29.viii.1849, India, Sikkim, Lachoong, 2,743–3,048 m, coll. J.D. Hooker s.n. (Image 2).

Plant dioecious with tuberous herb, 18–35 cm tall. Tubercles globose, 1.5–2 cm diameter covered with numerous roots. Stems erect to slightly pendent, 18–35 cm long, glabrous, 4–5 leaves per plant. Stipules narrowly ovate to lanceolate, 5–10 x 4–7 mm, green, glabrous, apex sub-acute to obtuse, base truncate, margin entire, revolute. Leaves: petioles, 2–14 cm long, red to green, glabrous; lamina asymmetric, narrowly ovate to lanceolate, 9–17 x 6–13 cm, adaxial surface glabrous to sparsely hairs, abaxial surface glabrous, base oblique, apex acuminate, margin irregularly serrate or dentate, palmately 5–6 veined. Inflorescence terminal or axillary, dichotomously branched, 2.5–3 cm long; peduncles cylindrical, 4–5 mm long, glabrous, pale whitish-green, bract orbicular, 5.5–6 x 8–10 mm, connate at base, 5–6 veined. Floral bracts orbicular, 6–7 x 7–14 mm, green, glabrous, margin entire, 6–7 veined. Pistillate flowers: pedicel 8–10 mm long, pale yellowish-green to whitish, glabrous; tepals 5–6, unequal, white with

pale yellow tinge, glabrous, margin entire; outer tepals obovate or orbicular 6–8 x 5–7 mm, apex rounded, base truncate to obtuse, 4–6 veined; inner tepals obovate to oblanceolate, 6.5–7 x 5–6 mm, apex slightly oblique rounded, base cuneate, 1–3 veined; styles 3, distally U-shaped and V-shaped at base, 3–3.5 mm long, fused at base, golden yellow; stigma not spiraled, papillose; ovary triangular-globose, 4–4.5 x 3–3.5 mm, glabrous, wings underdeveloped, dorsal wing minute ridge like wing and lateral wings inconspicuous, three locules, placentation axillary with 2 branches per locule; seeds oblong, 0.5 mm long, white.

Specimens examined: Barcode No. THIM15585, 03.viii.2019, Bhutan: Zhemgang, Malaya, 27.14549°N, 90.86361°E, 2,628 m, coll. S. Jamtsho, coll. No. 05.

Phenology: Flowering and fruiting from late July to September

Habitat and ecology: This species is epiphytic on *Dodecadenia grandiflora* in the cool broadleaved forest at 2,628 m elevation.

Distribution: India, Nepal, and new to Bhutan (Fig. 1)

Notes: Three individual plants in a single location have been observed in the field are without staminate flowers, so we couldn't examine the morphological characters of the staminate flowers at present study and will supplement in the future studies. Further study on its population trend and distribution are required to determine the conservation status of the species. No threats have been observed in the field.

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