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NOTE

***BEGONIA FLAVIFLORA* HARA (BEGONIACEAE): A NEW RECORD TO THE FLORA OF BHUTAN**

Phub Gyeltshen, Sherab Jamtsho, Sangay Wangchuk & Dhan Bahadur Subba

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Begonia flaviflora Hara (Begoniaceae): a new record to the flora of Bhutan

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The genus *Begonia* L. (Begoniaceae) is one of the largest genera of angiosperm in the world, estimated to comprise up to approximately 2,500 species (Tian et al. 2018), of which about 1991 are currently accepted species (Hughes et al. 2015), currently divided into 70 sections and distributed mostly in the tropical and subtropical zones in the world (Doorenbos et al. 1998; Moonlight et al. 2018). In Asia, around 959 species in 19 sections have been recorded with maximum occurrences in southeastern Asia (Shui et al. 2002; Moonlight et al. 2018). *Begonia* sect. *Platycentrum* (Klotzsch) A. DC. is the largest section with 16 species in northeastern India (Camfield & Hughes 2018). Grierson (1991) described 20 species of *Begonias* in the Flora of Bhutan, of which only 13 species are recorded from Bhutan. No further study has been conducted on the genus in Bhutan since Grierson (1991) and the occurrence of remaining seven species including *B. flaviflora* are unknown.

During recent botanical exploration in Zhemgang District in August 2020, specimens of an interesting *Begonia* species were collected from the cool broadleaved forest. After substantial study on its morphological characteristics and reviewing the taxonomic literature (Clarke 1879; Hara 1970; Grierson 1991; Tsuechih et

al. 1999; Hughes et al. 2015; Camfield & Hughes 2018), and consultation of herbarium specimens available at Global Biodiversity Information Facility (<https://www.gbif.org/>), and Kew Science (<https://specimens.kew.org/>) including the type specimens, it was identified as *B. flaviflora* Hara, a new record to Bhutan. The addition of one species from the current study confirms 14 species of *Begonia* from Bhutan and more are likely to be found and confirmed with further exploration. Detailed morphological description, phenology, ecology, distribution and notes along with photographs are provided. The voucher specimens are deposited at the National Herbarium (THIM!), National Biodiversity Centre, Thimphu, Bhutan.

Begonia flaviflora H. Hara

J. Jap. Bot. 45: 91. 1970. A.J.C. Grierson In: Grierson & Long. Fl. Bhutan 2(1): 245–246 (1991); K. Tsuechih, C.-I. Peng & N.J. Turland. Fl. China 52(1): 174 (1999).

Begonia laciniata subsp. *flaviflora* Irmsch. Mitt. Inst. Allg. Bot. Hamburg. 10: 531. 1939.

Type: India, Sikkim, Darjeeling, 5 July 1969, Hara, Kurosawa & Ohashi 69218 (holotype: TI n.v.; isotype: BM000839167).

Editor: Anonymity requested.

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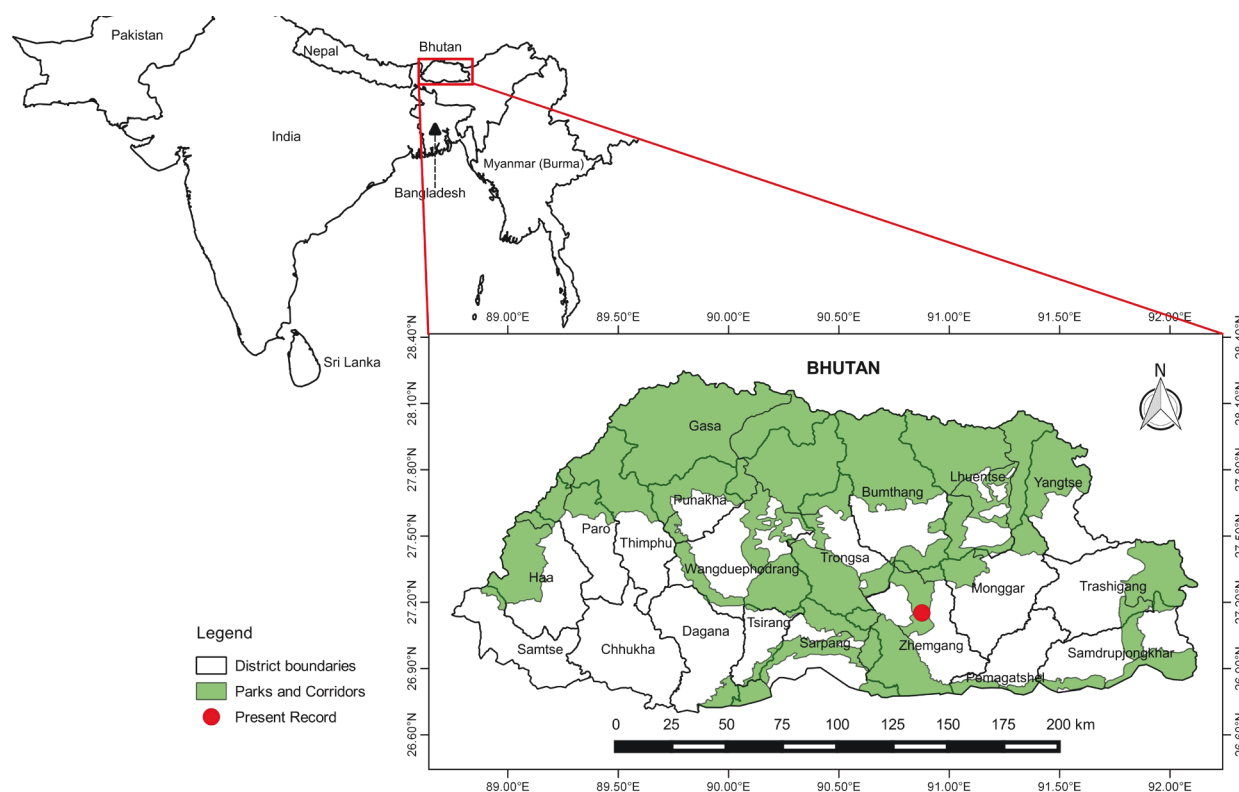


Figure 1. Distribution map of *Begonia flaviflora* Hara in Zhemgang District, Bhutan.

Begonia flaviflora var. *gamblei* (Irmsch.) Golding & Kareg. Phytologia 54: 496. 1984. *Begonia gamblei* (Irmsch.) F.A. Barkley & Golding Sp. Begon. Ed. 2: 44. 1974. *Begonia laciniata* subsp. *gamblei* Irmsch. Mitt. Inst. Allg. Bot. Hamburg. 10: 531. 1939. *Begonia flaviflora* var. *gamblei* H. Hara. Fl. E. Himalaya 1: 215. 1966. *Begonia flaviflora* var. *vivida* Golding & Kareg. Phytologia 54: 496. 1984

Plant monoecious, herbaceous, 30–80 cm tall. Rhizome oblong, 6–12 × 1–3 cm with several offsets giving rise to new shoots, adventitious roots growing from the rhizome. Stem erect, 20–40 cm long, with sparsely brownish pubescent, lowermost internodes 10–22 cm long and 6–7 mm wide, unbranching, 2–4 leaves per stem. Stipule persistent, ovate, 10–15 × 3–5 mm, papery, keeled, apex cuspidate (1–4 mm), margin entire. Leaves alternate; petiole cylindrical, 4–28 cm long, 3–8 mm thick, green, brownish pubescent surface; blade asymmetric, ovate to broadly ovate 10–20 × 8–23 cm, basifixed, apex acute to acuminate or shortly caudate, base deeply cordate, margin shallowly lobed and ciliate, venation palmate-reticulate, 7–8 veined; adaxial surface green or dark green with minute appressed white hairs, hairs less than 0.2mm long; abaxial surface glabrous,

sparsely brownish pubescent on veins, green with purplish colour along the veins and towards the margin. Inflorescences cymose, 1–2, terminal or axillary on long stem with 1–2 internodes, 2–4 flowers per peduncle, erect; peduncles cylindrical, 8–15 cm long, 2–3 mm wide, green to red, brownish pubescent. Floral bracts narrowly ovate, 2–3.5 × 1.5–2.5 cm, pinkish, glabrous, margin entire, base and apex truncate, adaxial surface is wrinkled and covered with soft hairs, veins numerous, deciduous. Staminate flower: pedicel up to 3cm long, pale red to pale greenish-yellow, brownish pubescent; tepals 4, golden yellow, glabrous, margin entire; outer 2, deltoid, 15–19 × 12–16 mm, cucullate, upper tepal's apex prominently recurved, lower tepal's apex slightly recurved, base truncate, 10–12 veined; inner 2, ovate-elliptic, 12–14 × 7–9 mm, cucullate, apex rounded to sub-acute, base slightly oblique-truncate, 9–11 veined; stamens numerous, 2–3 mm long, filaments free, anther obovate-oblong, golden yellow. Pistillate flower: pedicel up to 3 cm long, pale yellowish-green, light pinkish-green, brownish pubescent; tepals 5, unequal, golden yellow, glabrous, margin entire to slightly wavy; outer 2, ovate, 7–11 × 5–7 mm, concave, apex acute, base truncate, 12–13 veined; inner 3, ovate to ovate-elliptic,

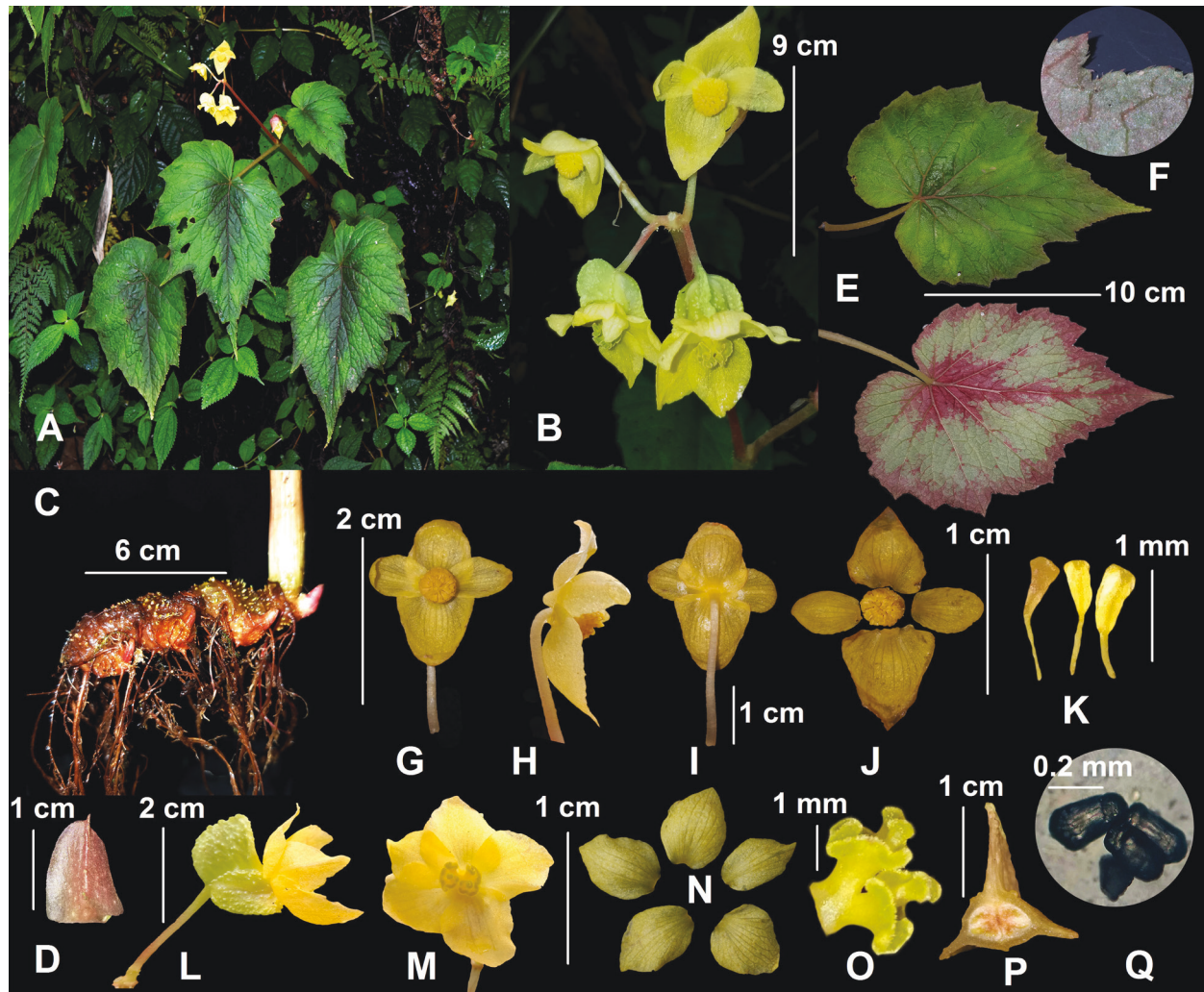


Image 1. *Begonia flaviflora* Hara; A—Habit | B—Inflorescence | C—Underground stem | D—Stipule (abaxial view) | E—Leaf | F—Leaf margin | G, H, I—Staminate flower | J—Tepals and androecium of male flower | K—Stamens | L&M—Female flower | N—Tepals of female flower | O—Style and stigma | P—Transverse section of ovary | Q—Seeds. © Phub Gyeltshen.

17.5–19 × 14–16 cm, concave, apex acute to subacute, base truncate; ovary yellowish-green, glabrous, with three unequal wings, 2 locules, placentation axillary, two branches per locule; styles 2, Y-shaped, 3–3.5 mm long, fused at base, golden yellow; stigma spiraled, papillose all around. Capsule trigonous-globose, 7–11 × 6–8 mm, yellowish-green; longest wing obovoid-oblong, 1.5–1.7 × 1.5–1.7 cm, slightly falcate at apex, crenate, narrow towards base, lateral wings 1.6–2.2 × 0.4–0.6 cm, tuberculate on surface of the ovary including its wings. Seeds numerous, white when young, oblong, c. 0.2–0.3 × c. 0.2 mm.

Specimens examined: THIM15583, 10 August 2019, Shingkar, Zhemgang, Bhutan, 27.152°N, 90.875°E, 1,914–2,399 m, P. Gyeltshen & S. Sherab 012–013.

Phenology: Flowering and fruiting July to August

Habitat and ecology: This species prefers moist soil in shady areas in broadleaved forest at 1,900–2,400 m elevation. Associated species includes *Pouzolzia hirta* (Blume) Hassk., *Pilea scripta* (Buch.-Ham. ex D. Don) Wedd., *Streptolirion volubile* Edgew., *Swertia bimaculata bimaculata* Hook. f. & Thomson ex C. B. Clarke, *Carpesium nepalense* Less., *Rubus calycinus* Wall., *Dichroa febrifuga* Lour. and *Impatiens pseudolaevigata* Gogoi, B. B. T. Tham & Lidén.

Distribution: India, China, Myanmar, Nepal, Malaysia, and new to Bhutan.

Notes: The new species is vegetatively similar to *Begonia palmata* but can be distinguished by yellow flower, smaller capsule and wings of the fruit. The key morphological differences between *B. flaviflora* and its closely related taxon *B. palmata* is presented in Table

Table 1. Comparison of key morphological characters of *Begonia flaviflora* and *B. palmata*.

Attributes	<i>B. flaviflora</i>	<i>B. palmata</i>
Habit	erect, 30–80 cm tall	erect, 45–100 cm tall
Rhizome	10–30 mm wide	5–15 mm wide
Stem	6–7 mm wide, brownish pubescent	5–15 mm wide, sparsely to densely tomentose to villose
Stipule	ovate, 3–5 mm wide	lanceolate, 3–10 mm wide
Petiole	4–28 cm long, brownish pubescent	1.5–19 cm long, densely tomentose to sparsely puberulous
Lamina	ovate to broadly ovate, 10–20 x 8–23 cm, base deeply cordate	narrowly to broadly ovate, 5–20 x 2–20 cm, base truncate, or base cordate to shallowly cordate
Abaxial surface	glabrous, brownish pubescent on veins	pubescent to pilose throughout or denser on veins
Bract	narrowly ovate, 20–35 x 15–25 mm	lanceolate or sub-orbicular or triangular, 6–17 x 3–13 mm
Staminate flower	tepals 4, golden yellow	tepals 4, white to pink
Pistillate flower	tepals 5, unequal, golden yellow	tepals 5, equal, white to pale pink
Style	2 or 3	2
Capsule	trigonous-globose, 7–11 mm long, longest wing obovoid-oblong, 15–17 mm long	oblong-ellipsoid, 7–18 mm long, longest wing triangular to rounded oblong, 9–20 mm long

1 using the descriptions (Grierson 1991; Camfield & Hughes 2018). The current distribution site is located within Biological Corridor-4 of the district with population less than 10 individuals and no threats have been observed in the field.

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