



Begonia willemii, a new species of *Begonia* from Sulawesi, Indonesia

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ABSTRACT: A new species of *Begonia* sect. *Petermannia* (Begoniaceae), *B. willemii* Ardi, Girm. & D.C.Thomas, is described from Sulawesi, Indonesia. The species is a calciphile endemic to Sulawesi. It is morphologically similar to *Begonia gemella* but can be easily differentiated by its smaller leaves, a sparse, bristly indumentum on the adaxial lamina surface, simple monochasial male inflorescences, longer pedicels, fewer stamens and two-tepaled female flower. Its conservation status is provisionally assessed as Near Threatened (NT).

KEY WORDS: *Begonia gemella*, *Begonia manuselaensis*, *Begonia sidolensis* endemic, karst, limestone, Petermannia.

INTRODUCTION

As part of an ongoing revision of *Begonia* (Begoniaceae) from Sulawesi, Indonesia, recent extensive fieldwork has resulted in a significant number of new species discoveries (Ardi *et al.* 2018; Thomas and Ardi 2020). Currently 58 species are known from the island, and 55 of them are endemic species to Sulawesi (Thomas *et al.*, 2013, continuously updated). In this paper we report an additional new species, *Begonia willemii*. Like the majority species in the island, it is classified in *Begonia* sect. *Petermannia* as it exhibits typical characters of the section: protogynous inflorescences, three-locular ovaries with bilamellate placentae, and anthers with unilaterally positioned slits (Doorenbos *et al.*, 1998; Moonlight *et al.*, 2018). A careful examination of herbarium material (B, BO, E, K, L, SING) and images of specimens from numerous other herbaria available in the *Begonia Resource Centre* (Hughes *et al.*, 2015, continuously updated) indicates that this species has a restricted distribution and is endemic to lowland limestone habitats in Sulawesi.

TAXONOMIC TREATMENT

Begonia willemii Ardi, Girm. & D.C.Thomas, *sp. nov.*

Fig. 1

Sect. *Petermannia*

Type: Indonesia, Central Sulawesi, Luwuk Banggai District, Hanga-hanga waterfall, 4 June 2016. Deden Girmansyah Deden 2470 (holotype BO!; isotype CEB!, E!).

The creeping growth habit, the relatively small leaf laminas, and the monochasially branching male inflorescences are similar to *Begonia gemella* Warb. ex

L.B.Sm. & Wassh. (1983) from Minahasa, Sulawesi, but *B. willemii* can be distinguished by a smaller leaf lamina (3–8 × 2.5–6 cm versus 5–9.5 × 4.5–8 cm for *B. gemella*) with a sparse indumentum of red bristle hairs between the veins on the adaxial surface (versus glabrous), male flowers in simple monochasial cymes (versus thyrses composed of up to 3 monochasial cymes), longer male flower pedicels (2–4 cm versus 1.5–1.8 cm long), fewer stamens (c. 19–23 versus ca. 75–77), and female flowers consistently with two tepals (versus five tepals).

Perennial, monoecious evergreen? Herb, to c. 1 m long. **Stem** creeping, internodes 1–5 cm long, reddish-greenish, slightly swollen at the nodes, brownish-reddish, glabrous except for microscopical glandular hairs. **Leaves** basifixed, alternate; *stipules* persistent, 4–6 × 2.7–4 mm, anisophyllous, ovate to elliptic, with an abaxially slightly prominent midrib, apex mucronate projecting up to 2 mm, margin entire, cream-coloured, glabrous; *petioles* 3–13 cm long, terete, stem, reddish-greenish, glabrous; *lamina* 3–8 × 2.5–6 cm, asymmetric, broadly ovate to ovate, base cordate and lobes sometimes overlapping, apex acuminate, margin serrate-biserrate, adaxial surface green or green-purplish, with a sparse indumentum of red bristles between the veins, abaxially pale green, sparsely hairy on the veins; venation palmate-pinnate, primary veins 5–6, actinodromous, secondary veins craspedodromous. **Inflorescences** protogynous, female flower usually in a mixed inflorescence with 1 or rarely 2 male flowers, peduncles c. 0.5–2 cm long; male flowers in mixed inflorescences with a single female flower or in purely male monochasia with short internodes and up to 6 flowers, peduncle 1.5–3 cm long, bracts persistent, stipule-like, 3–5 × 2–3 mm, ovate, reddish, translucent, midrib slightly prominent, a short bristle projecting at the

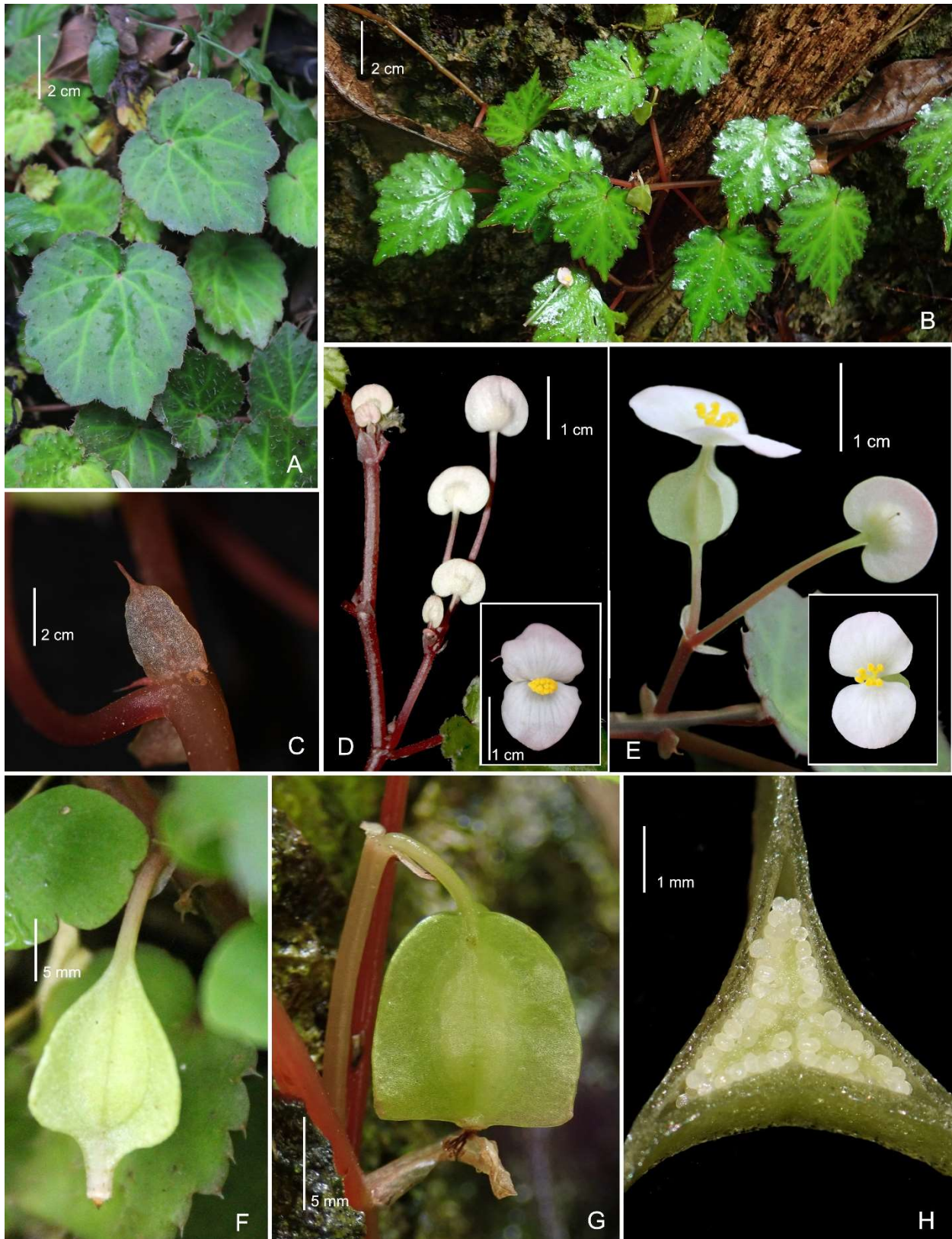


Fig. 1. *Begonia willemii*. **A.** Habit of Toli-toli population; **B.** Habit of Batutikar waterfall population; **C.** Stipule; **D.** Male flower; **E.** Androecium; **F.** Male inflorescence; **G.** Mixed female-male inflorescence; **H.** Fruit of Toli-toli population; **I.** Fruit of Batutikar population; **J.** Ovary, cross section of middle part. B–G, I, J from WI 415; A, H from ZF 42. (Photos B–G, I, J: W.H. Ardi; A, H: Zulfady).

Table 1. Comparison of *Begonia willemii*, *B. sidolensis* and *B. manuselaensis*.

Characters	<i>B. willemii</i>	<i>B. sidolensis</i>	<i>B. manuselaensis</i>
Stem	Glabrous	Sparsely hairy with white hairs to glabrous	Sparsely hairy with small red flattened scales
Stipules	Ovate to elliptic, 4–6 × 2.7–4 mm	Ovate to elliptic, c. 4–5 × 2–3 mm	Ovate to elliptic, c. 7–11 × 5 mm
Petioles	Glabrous, 3–10 cm long	Sparsely hairy, 0.5–2 cm long	Sparse indumentum of red, branched, scale-like hairs, 4–7.5 cm long
Male inflorescence	Monochasial cyme with shortly developed internodes and up to 6 flowers	Thyrse, composed of 2–3 monochasial partial inflorescences, each a monochasium with 2–3 flowers	Thyrse, composed of 1–2 monochasial partial inflorescences, each with 2(–4) flowers
Male flowers			
pedicels	2–4.7 cm long	1.3–1.6 cm long	3–6 cm long
tepals	Broadly ovate, 5–12 × 7–14 mm	Broadly ovate to suborbicular, 11–13 × 14–15 mm	Ovate to suborbicular, 11–19 × 14–16 mm,
Female flowers			
pedicels	0.7–0.9 cm long	0.5–0.7 cm long	1.6–4 cm long
tepals	2	5	5(–6)
Reference		Dayanti <i>et al.</i> 2020	Ardhaka <i>et al.</i> 2015

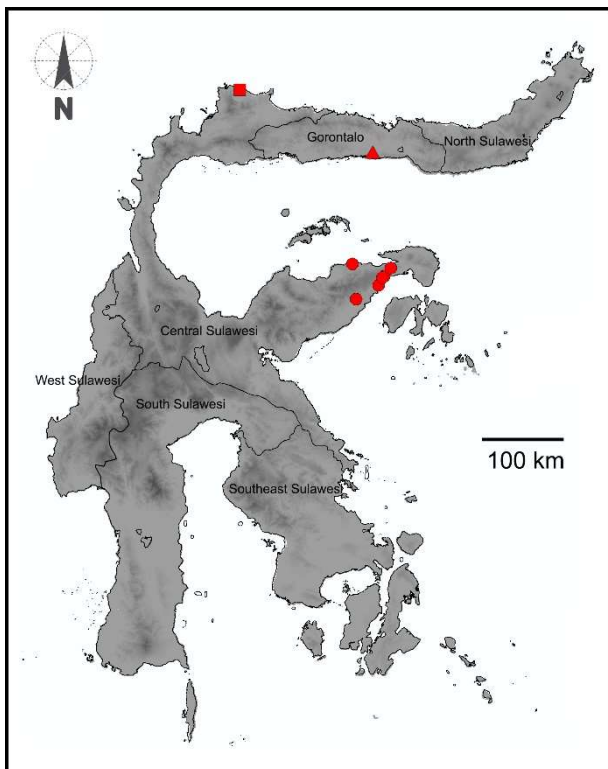


Fig. 2. Distribution map for *Begonia willemii*. Collections sites are indicated by circles (Luwuk-Banggai Regency), a square (Toli-toli Regency) and a triangle (Gorontalo Regency). Distribution points are from georeferenced collections from recently collected material and major herbarium collections (B, BO, E, K, KRB, L SING), the Begonia Resource Center (Hughes *et al.* 2015), and the Sulawesi Begonia Data Portal (Thomas *et al.*, 2013).

apex, bracteoles persistent, c. 3 × 2 mm, ovate. **Male flowers** pedicels 2–4 cm long, white-pinkish, glabrous; tepals 2, white to white tinged with pink, 5–10 × 7–12 mm, broadly ovate, base slightly cordate, apex rounded, outer surface glabrous; androecium of c. 19–23 stamens,

yellow, filaments up to c. 1 mm long, slightly fused at the very base, anthers c. 0.5–1 mm long, oblong to obovate, dehiscent through unilaterally positioned slits that are c. ½ as long as the anthers. **Female flowers** pedicels 7–15 mm long, reddish-greenish, glabrous; tepals 2, white, or white tinged with pink, 7–10 × 9–14 mm, broadly ovate, outer surface glabrous; ovary (excluding wings) 4–9 × 3–6 mm, ellipsoid, pale green, locules 3, placentation axile, placentae bilamellate, wings 3, equal, pale green, base rounded, apex truncate to rounded, sometimes beaked, up to 5 mm at the widest point (apically or subapically); style c. 3.5 mm long, basally fused, 3-branched, each stylodium bifurcate in the stigmatic region, stigmatic surface a spirally twisted papillose band, orange. **Fruits:** peduncles 1.1–3 cm long; pedicels 5–15 mm long, slightly recurved; seed-bearing part cylindrical to ellipsoid, 6–10 × 4–7 mm (excluding the wings), glabrous, dehiscent, splitting along the wing attachment, wing shape as for ovary, up to 7 mm at the widest point (apically or subapically). **Seeds** ellipsoid to obovoid, 0.35–0.38 mm long, collar cells more than a half of seed length.

Distribution. Endemic to Sulawesi (Fig. 2), Gorontalo Province (Gorontalo Regency) and Central Sulawesi Province (Luwuk Banggai and Toli-toli Regencies).

Habitat. Lowland limestone karst forest, disturbed forest, growing vertically on limestone rock, or terrestrially on the base of limestone cliffs, in half to full shade, at 10 to 50 m elevation.

Etymology. This species is named in honour of Willem Jan Jacobus Oswald de Wilde (1936–2021); a prominent tropical botanist, who has made outstanding contributions to the botanical knowledge of the Flora Malesia region.

Provisional IUCN conservation assessment. *Begonia willemii* is endemic to Sulawesi, where it has a



patchy but relatively wide distribution (EOO: 22534 km², AOO: 32 km²) closely associated with lowland limestone forest habitats. However, its range does not include any legally protected areas. Lowland forests have been declining on Sulawesi due to anthropogenic pressures, and lowland limestone forests are among the most threatened forest types on the island (Cannon *et al.*, 2007). Consequently, we assess this species as Near Threatened (NT) (IUCN, 2019).

Notes. Apart from the similarity to *Begonia gemella* Warb. ex L.B.Sm. & Wassh. as elaborated on in the diagnosis above, *B. willemii* is also similar to *B. sidolensis* Dayanti, Ramadanil & Ardi and *B. manuselaensis* Ardhaka & Ardi, both of which also have a growth habit characterised by a creeping stem and lax internodes, small leaf laminae and single female flowers. A detailed comparison of *B. willemii*, *B. sidolensis* and *B. manuselaensis* is presented in Table 1.

Additional specimens examined. INDONESIA. Sulawesi. **Gorontalo:** Gunung Boliohutu, 22 Apr 2002, *M. Mendum et al.* 155 (BO, E); Gorontalo Regency, Boliohutu, 14 Mar. 2008, *Kate Armstrong* 364 (E); **Central Sulawesi:** Buol, 15 Aug. 1894, Sarasin 683 (K); Buol, 15 Aug. 1894, *Sarasin* 689 (B); Luwuk Banggai regency, Hanga-hanga waterfall, 08 Feb. 2019, *Wisnu Ardi et al.* WI 413 (BO, SING, KRB); Luwuk Banggai regency, Batu tikar waterfall, 09 Feb. 2019, *Wisnu Ardi et al.* WI 415 (BO, SING, KRB); Luwuk Banggai regency, Batu tikar waterfall, 09 Feb. 2019, *Wisnu Ardi et al.* WI 416 (BO, SING, KRB); Luwuk Banggai regency, Salodik, 11 Feb. 2019, *Wisnu Ardi et al.* WI 422 (BO, SING); Luwuk Banggai regency, Bunta, 14 Feb. 2019, *Wisnu Ardi et al.* WI 428 (BO, SING, KRB); Toli-toli regency, 16 Jan. 2019, *Zulfadli ZF* 42 (BO, SING); Luwuk Banggai regency, Batui river, 17 Oct. 1989, *M. Coode* 5985 (E, L).

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