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Begonia chingipengii (sect. *Baryandra*, Begoniaceae), a new species from Luzon Island, Philippines

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Abstract

Begonia chingipengii from Gabaldon, Nueva Ecija, Luzon Island is described as a new species endemic to the Philippines. This is the latest addition to the newly delimited *Begonia* section *Baryandra*. It resembles *Begonia trichochila* but is distinguished by the variegated leaves with light green veins and midrib contrasting with the dark green adaxial surface and maroon abaxial surface, and its oblique leaf is elongated with an acuminate apex. The robust variegated leaves, large flowers and extensive inflorescence make it very attractive.

Introduction

The last comprehensive account of Philippine *Begonia* Linnaeus (1753: 1056) recording 59 species (Merrill 1912), is now over a century old. Golding & Wasshausen (2002) and Hughes (2008) listed 104 Philippine species. Globally, more than 1,500 species have been described and many more are being discovered. Asia, from the Himalayas to Southern China and Malesia, is second only to South America as a center of diversity for begonias (Tebbitt 2005). In Southeast Asia, the Philippines ranks first in the number of endemic begonias, followed by Borneo (Hughes, 2008). Recently Philippine *Begonia* species are delimited into two sections: *Baryandra* A. de Candolle (1859: 122) and *Petermannia* (Klotzsch 1855: 74) A. de Candolle (1859: 128) (Rubite 2012; Rubite *et al.* 2013).

In October 2011, after securing all the necessary permits, a joint botanical expedition, between the University of the Philippines Manila, Philippine National Herbarium (PNH) and the Herbarium, Biodiversity Research Center, Academia Sinica, Taiwan (HAST) was conducted. The group visited the following provinces: Nueva Ecija, Aurora, Batangas, and Palawan. In Barangay Malinao, Gabaldon, Nueva Ecija we crossed a long stretch of dry grassy fields before we reached the Maplud River, and on rocky slopes of the river bank and almost exposed to sunlight we discovered a very robust and handsome new species that we name *Begonia chingipengii*.

Material and methods

Chromosome preparations

Somatic chromosomes of *Begonia chingipengii* were examined using root tips from plants of the type collection. The methods of pretreatment, fixation and staining for chromosome observations follow Peng et al. (2012). Classification of the chromosome complements based on centromere position at mitotic metaphase follows Levan et al. (1964). Voucher specimens (*Peng et al. 23368*, type collection) are deposited at HAST.

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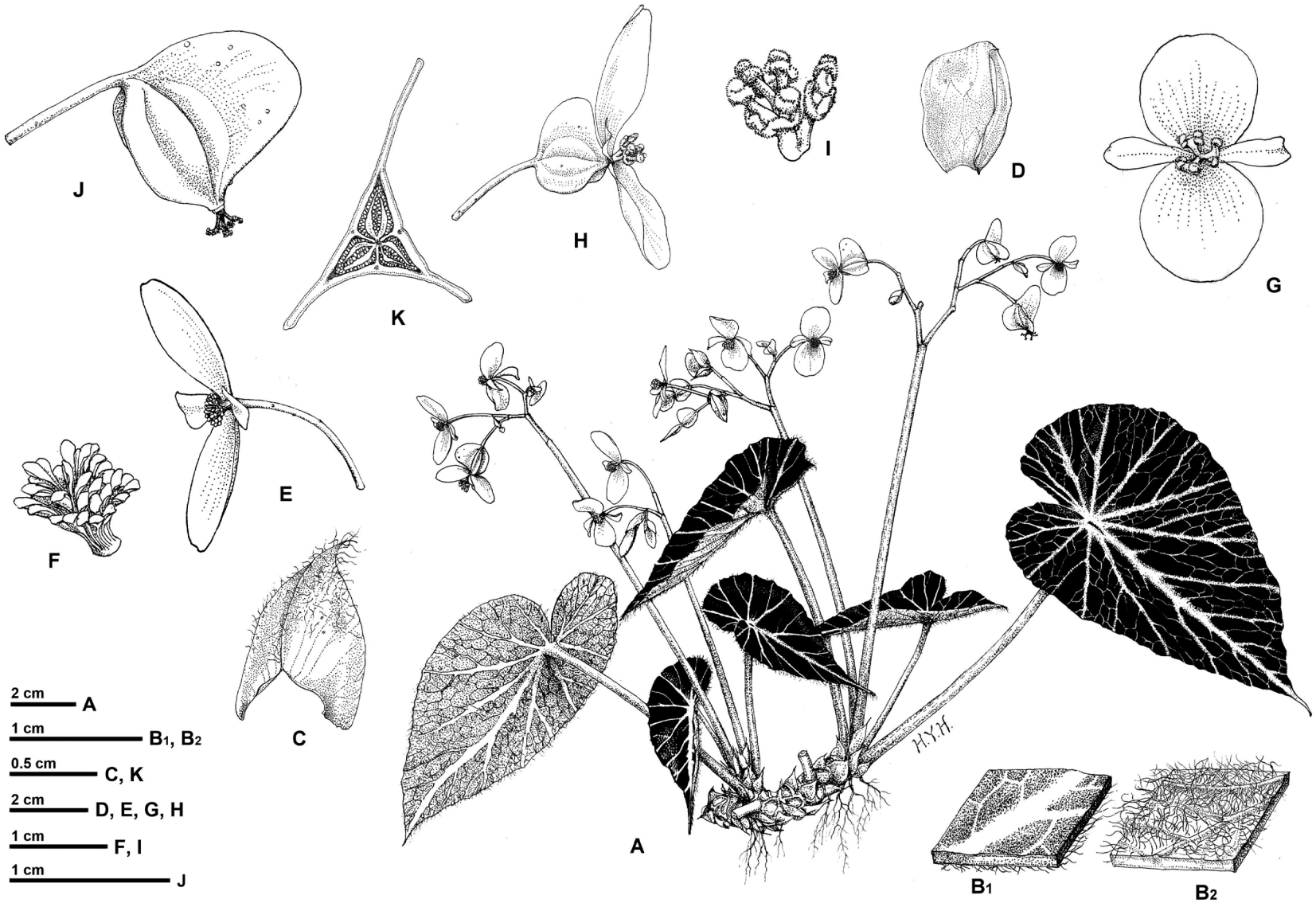

FIGURE 1. *Begonia chingipengii* R. Rubite. A, Habit; B1, Leaf adaxial surface, B2, Leaf abaxial surface; C, Stipule; D, Bract; E, Staminate flower; F, Androecium; G, Female flower, face view; H, Female flower, side view; I, Style and stigmas; J, Fruit; K, Cross section of young fruit. All from *Peng 23368* (HAST). Illustrated by Hang-Yau Huang.

Cryo scanning electron microscopy

Fresh leaves of *Begonia chingipengii* and *B. trichochila* Warburg in J.R. Perkins (1904: 53) were dissected and attached to a stub. The samples were frozen with liquid nitrogen slush, then transferred to a sample preparation chamber at -160°C and etched for 15 min at -85°C. After etching, the temperature dropped to -130°C for sample fracturing and coating. After coating, the samples were transferred to the SEM chamber and observed at -190°C with a cryo scanning electron microscope (FEI Quanta 200 SEM/Quorum Cryo System PP2000TR FEI). Voucher specimens (*B. chingipengii*: *C.-I Peng et al. 23368*; *B. trichochila*: *C.-I Peng et al. 20764*) are deposited at HAST.

Taxonomy

Begonia chingipengii R. Rubite, *sp. nov.* (Figures 1, 2)

Type:—PHILIPPINES. Luzon Island. Nueva Ecija: Gabaldon, Barangay Malinao, Maplud River, elev. ca. 415 m, on grassy, rocky slope, exposed to semi exposed, 25 October 2011, *Ching-I Peng*, *Chien-I Huang, Rosario R. Rubite & John Rey C. Callado 23368* (holotype PNH, isotype CAS, E, HAST, HUH, MO).

Monoecious perennial, rhizomatous herbs. *Rhizome* green, glabrous, prostrate, 18–20 mm in diameter, internodes 5–10 mm. *Stipules* pink to maroon, glabrous, ovate, 1.8–3 × 1.8–3.2 cm, asymmetric, prominently keeled and with brown curved hairs (1–2 mm), apex acute. *Leaves* alternate; *petiole* 22–35 cm long, 8–12 mm across, erect, terete, succulent, light brown to maroon, brown tomentose (2–3 mm), trichomes more dense at the junction with lamina; *blade* ovate, 16–19(–32) × 13–17 cm, adaxial surface glabrous and glossy, generally dark green with prominent light green midrib and veins (width of variegation on midrib 4–6 mm, on primary veins 3–4 mm, secondary veins 2–3 mm), abaxial surface maroon between the green veins, brown tomentose, base obliquely cordate, lobes rounded, sinus when young overlapping (1 cm), when mature open at about 8 mm, apex elongate acuminate, tip of primary veins slightly acute (about 1–2 mm), margin brown ciliate (2–3 mm), primary veins 10 or 11. *Inflorescences* 32–52 cm long, axillary, arising directly from the rhizome, dichotomously branched 5 times; *peduncle* pink, 26–45 cm long, 8–12 mm across, erect, densely brown- to maroon-hairy, hairs 2–3 mm; *bracts* caducous, orbicular, boat-shaped, pink, 1.2–1.4 × 1.8–2.2 cm, glabrous; *pedicels* pink, in staminate flowers 2.5–3.2 cm long, erect to ascending, in carpellate flowers 1.5–4.2 cm long, ascending to horizontal. *Male flowers*: *bracteoles* orbicular, boat-shaped, white, 0.8–1.2 × 1.4–1.8 cm, glabrous; tepals 4, dark pink or whitish, glabrous, outer pair orbicular, 1.4–2.2 × 1.2–1.6 cm, inner pair obovate, 0.8–1.2 × 0.4–0.8 cm; androecium actinomorphic, with 30–40 stamens, filaments 1–2 mm long, free; anthers yellow, rounded, ca. 0.5 mm long. *Female flowers*: tepals 4, dark pink or whitish, glabrous, outer pair orbicular 1.2–1.8 × 1.6–2.2 cm; inner pair obovate, folded, not retuse, 0.7–1.5 × 0.4–0.6 cm; ovary pink (pale green in cultivation), 8–18 × 6–12 mm, wings unequal, three-locular, placentae axile, bifid; styles three, 7–9 mm long, stigma yellow, twice coiled. *Capsule* glabrous, nodding, ca. 1.2–2 × 1–2.2 cm, unequally 3-winged, abaxial wing 1–2.1 × 0.8–1.6 cm, rounded; lateral wings 1.2–2 × 0.5–1 cm.

Chromosome cytology:—Somatic chromosomes at mitotic metaphase of *Begonia chingipengii* were determined to be $2n = 28$ (Figure 3). The 28 chromosomes gradually varied from ca. 1.0 to 2.2 µm in length. Several longer chromosomes were identifiable as metacentric and/or submetacentric, however, centromere positions of shorter chromosomes were uncertain. Satellites were not observed.

Recently, members of *Begonia* sect. *Diploclinium* (Lindley ex R. Wight 1852: 9) A. de Candolle (1859: 129) from the Philippine were transferred to sect. *Baryandra*, based on the analysis of morphological features and molecular data (Rubite 2012; Rubite *et al.* 2013). Among about 50 species in sect. *Baryandra*, six that were studied showed chromosome numbers ranging from $2n = 26$ to $2n = 56$, namely, $2n = 26$ in *B. fenicis* Merrill (1908: 421) (Oginuma & Peng 2002); $2n = 28$ in *B. gueritziana* Gibbs (1914: 82) (Hughes *et al.* 2011); $2n = 30$ in *B. blancii* M. Hughes & C.-I Peng (2011: 204) and *B. suborbiculata* Merrill (1912: 398) (Hughes *et al.* 2011); $2n = 36+2f$ in *B. parva* Merrill (1912: 402) (Legro & Doorenbos 1969); $2n = 44$ in *B. rhombicarpa* A. De Candolle (1859: 129) (Doorenbos *et al.* 1998 as *B. nigritarum*); $2n = 56$ in *B. fenicis* (Kokubugata & Madulid 2000). To our knowledge, however, $2n = 28$ and $2n = 30$ are the predominant chromosome numbers in *Begonia* sect. *Baryandra* in the Philippines (our unpublished data), with which that of *B. chingipengii* agrees.

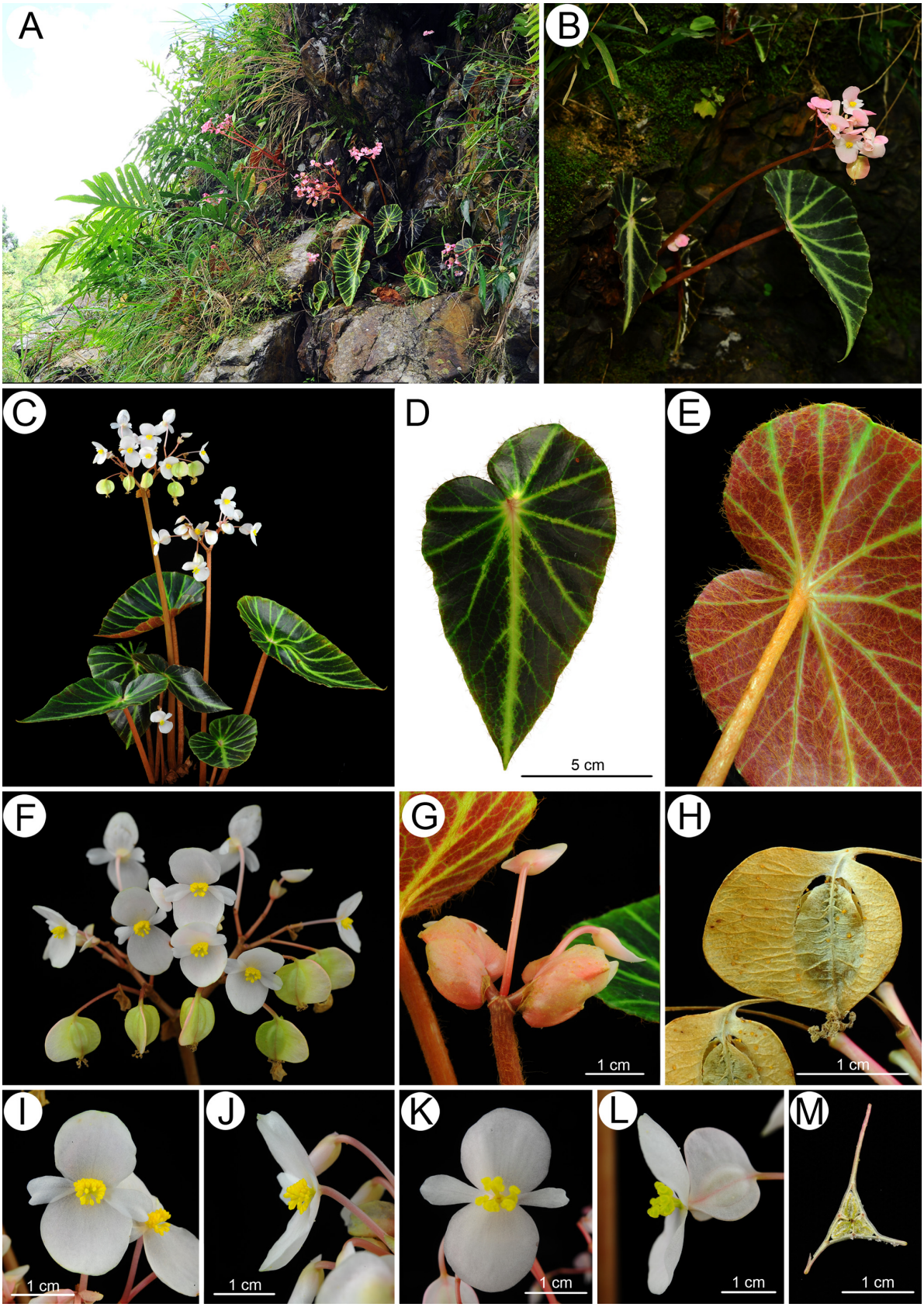

FIGURE 2. *Begonia chingipengii* R. Rubite. A, B, Habit and habitat; C, Cultivated plant at anthesis; D, Leaf adaxial surface; E, Leaf abaxial surface; F, Inflorescence; G, Bracts; H, Fruit; I, Staminate flower, face view; J, Staminate flower, side view; K, Carpellate flower, face view; L, Carpellate flower, side view; M, Cross section of ovary. [A-J, L-M from *Peng 23368* (HAST); K from *Peng 23397* (HAST)]

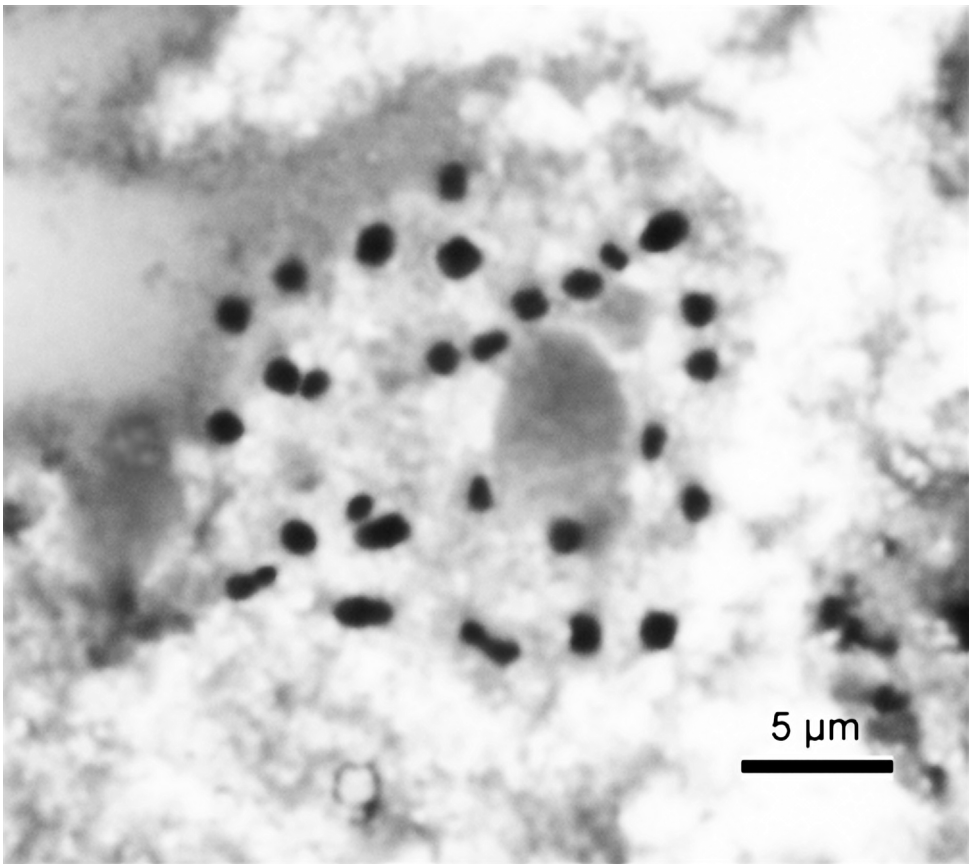

FIGURE 3. Somatic chromosomes at metaphase of *Begonia chingipengii* (2*n* = 28, from *Peng et al. 23368*, HAST).

Leaf anatomy:—Both surfaces have sparse glandular trichomes (Figure 4A, B); stomata on the abaxial surface helicocytic, 1–4 clustered (Figure 4B), slightly elevated; cross section ca. 0.46 mm thick, epidermis bi-seriate, with a layer of thick hypodermis (160–220µm) under upper epidermis and a thinner layer of hypodermis (ca. 100µm) under lower epidermis (Figure 4C).

Ecology:—Disturbed broadleaf forest; on rocky slope above stream.

Etymology:—The plant is named in honor of Dr. Ching-I Peng, the leader of the expedition, collaborator, mentor and supporter of R. R. Rubite in the studies of Philippine begonias.

Additional specimen examined (paratype):—PHILIPPINES. Luzon Island. Nueva Ecija: Gabaldon, Brgy. Malinao, elev.ca. 250 m, small waterfall NE of Stone & Resort, on moist rock or soil, semishaded, rare, 26 October 2011, *Ching-I Peng, Chien-I Huang, Rosario R. Rubite & John Rey C. Callado 23397* (HAST).

Notes:—Many Philippine begonias when cultivated tend to be stunted in growth and would lose the variegated leaves, becoming all green but not *B. chingipengii*. It continues to produce large beautiful variegated leaves.

Discussion

This new species is the most recent addition to the newly delimited section *Baryandra* (Rubite *et al.* 2013; Nakamura *et al.* 2013), bringing the total in this section to 51. *Begonia chingipengii* resembles *B. trichochila*, but is distinguished by the variegated leaves with light green veins and mdirib contrasting with the dark green adaxial surface and maroon abaxial surface, while *B. trichochila* is all green. The oblique leaf is elongated into an acuminate apex, while that of *B. trichochila* is oblique but more rounded at the apex. The leaves, flowers and fruits of *B. chingipengii* are all larger (Table 1).

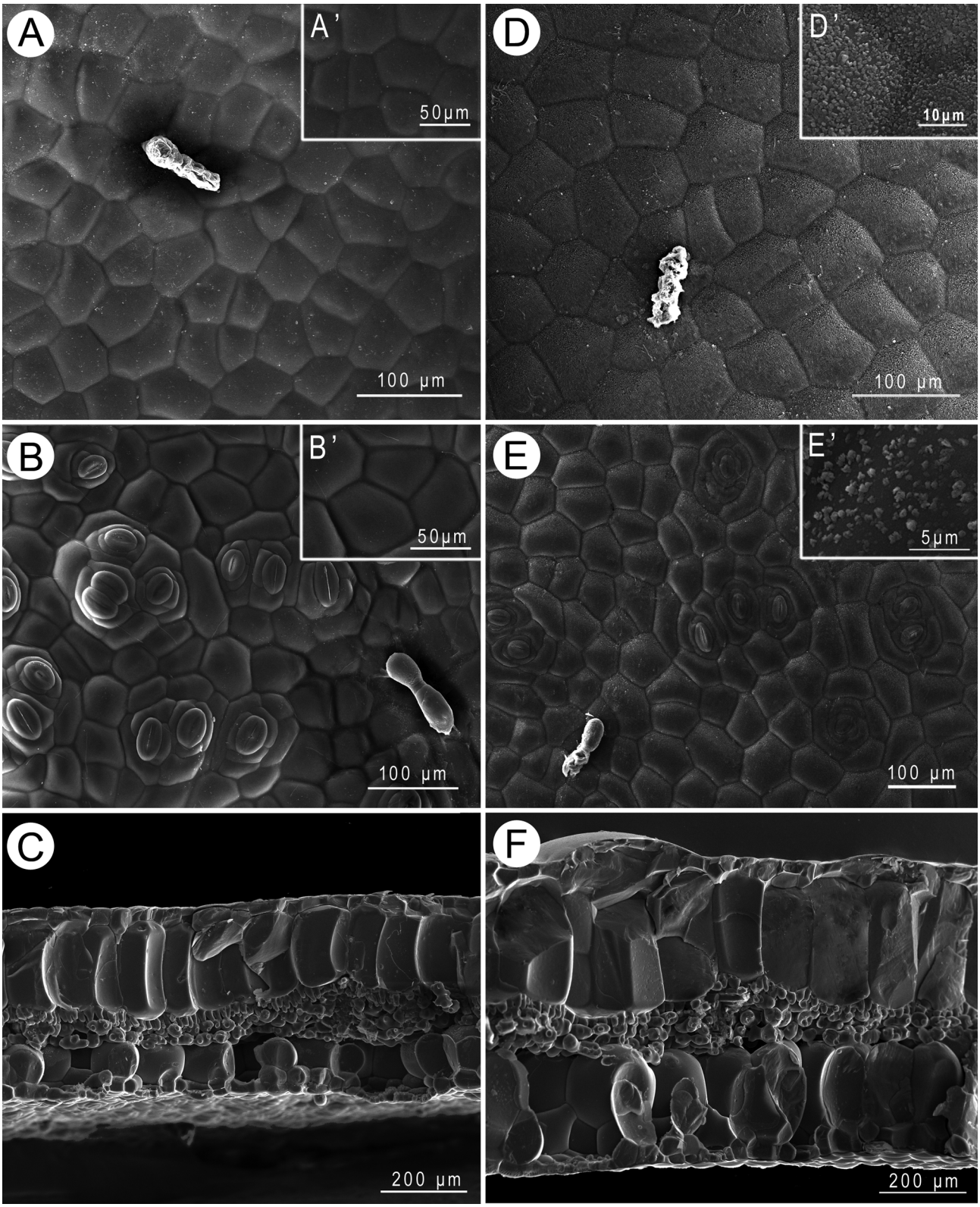

FIGURE 4. Leaf SEM microphotographs of *Begonia*. A-C, *B. chingipengii*; D-F, *B. trichochila*; A, D, Adaxial surfaces, A', B', showing epidermis without wax; D', E', showing epidermis wax; B, E, Abaxial surfaces; C, F, Cross section.

TABLE 1. Comparison of *Begonia chingipengii* and *B. trichochila*

	B. chingipengii (Figures 1, 2)	*B. trichochila*
Stipule	1.8–3 × 1.8–3.2 cm, pink to maroon, keel with sparsely brown hairs (1-2 mm)	0.8–1.5 × 0.5–1.0 cm, brown, keel with long dark brown hairs (2-8 mm)
Petiole	22–35 cm long, 0.8–1.2 cm across, light brown to maroon	9–25 cm long, 0.5–0.7 cm across, red to green
Leaf blade		
Size	16–19(–32) × 13–17 cm	7–15 × 6–12 cm
Shape	Ovate	Ovate to suborbicular
Adaxial surface	Dark green with light green midrib and veins, glabrous and glossy	Green, glabrous
Abaxial surface	Maroon between the green veins	Light green
Margin	Repand to slightly dentate with brown hairs (2–3 mm)	Slightly dentate with dark brown hairs (1–1.5 mm)
Cross section	Ca. 0.46 mm thick	0.7–0.8 mm thick
Inflorescence		
Peduncle	Pink, 26–45 cm long, 8–12 mm across, densely hairy, brown to maroon color	Red, 25–33 cm long, 5 mm across, scattered brown hairs
Bract	Pink, orbicular boat-shaped, 1.2–1.4 × 1.8–2.2 cm	Green, oblong, 0.5–0.6 × 0.3–0.4 cm
Male flower	Tepals dark pink or whitish, glabrous	Tepals pink
Female flower	Outer tepals orbicular, 1.2–1.8 × 1.6–2.2 cm	Outer tepals rounded, 1.0–1.2 × 1.0–1.2 cm
Ovary	Green, pinkish, rounded in outline	Green, oblong in outline

Like a number of other species of *Begonia* in the Philippines (e.g. *B. blancii* and *B. suborbiculata*, Hughes et al. 2011) and some species in southern China [e.g. *B. leprosa* Hance (1883: 202), Peng *et al.* 2010; *B. peltatifolia* H. L. Li (1944: 209) and *B. pseudodryadis* C. Y. Wu (1995: 276), Peng, unpublished data], the clustered stomata of *B. chingipengii* (Figure 4B) and *B. trichochila* (Figure 4E) are likely to be a way in which the species copes with periodical drought or fluctuating environment (see discussion in Gan *et al.* 2010; Hughes *et al.* 2011).

In the area where *B. chingipengii* was collected, only two small populations were seen. The following day the expedition group progress farther but failed to find any other population. This is the nature of Philippine begonias—they tend to be very narrowly endemic, characterized by small populations and are often confined to a particular locality.

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