

Begonia liuyanii (sect. *Coelocentrum*, Begoniaceae), a new species from limestone areas in Guangxi, China

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Abstract. *Begonia liuyanii*, a new species of sect. *Coelocentrum* from limestone areas in southwestern Guangxi Zhuang Autonomous Region, China, is described and illustrated. A somatic chromosome number of $2n = 30$ was determined. *Begonia liuyanii* is similar to *B. filiformis* in having small flowers and glandular-hispid inflorescences but is distinguishable by its larger leaves ($16-38 \times 12-32$ cm vs. $9-22 \times 9-14$ cm), sparsely setose (vs. tomentose) upper surface of the leaves, maculation absent (vs. with white maculation in intercostal area on adaxial leaf surface), and usually thyrsoid (vs. cymose) inflorescence.

Keywords: *Begonia filiformis*; *Begonia liuyanii*; *Begonia masoniana*; Begoniaceae; China; Chromosome number; Guangxi; Limestone flora; New species; Rare species; sect. *Coelocentrum*.

Introduction

Towards a taxonomic revision of Chinese *Begonia*, we have made many field expeditions in recent years. Our surveys have resulted in the discovery of a number of new species, e.g., *B. coptidifolia* H. G. Ye, F. G. Wang, Y. S. Ye & C.-I Peng (Ye et al., 2004), *B. curvicarpa* S. M. Ku, C.-I Peng & Yan Liu and *B. luochengensis* S. M. Ku, C.-I Peng & Yan Liu (Ku et al., 2004) and *B. fangii* Y. M. Shui & C.-I Peng (Peng et al., 2005). Tropical limestone areas are rich in species and, in a taxonomic sense, are among the least studied types of habitat in the world (Wong et al., 2003). In southern China, all the species of *Begonia* sect. *Coelocentrum* Irmsch. grow on limestone between 300 and 1,300 m elevation (Shui et al., 2002). In this paper we report the discovery of yet another new species in sect. *Coelocentrum*, *B. liuyanii* C.-I Peng, S. M. Ku & W. C. Leong, from southwestern Guangxi Zhuang Autonomous Region, an area noted for its karst landscape and cave systems. A careful study of the literature, herbarium specimens and plants, both in the wild and in cultivation in the experimental greenhouse, reveals that *B. liuyanii* is sharply distinct from such congeners as *B. filiformis* Irmsch. and *B. masoniana* Irmsch. ex Ziesenh.

Species Description

Begonia liuyanii C.-I Peng, S. M. Ku & W. C. Leong, sp. nov.—TYPE: China. Guangxi Zhuang Autonomous Region, Longzhou Xian, Jinlong Zhen, Nonggang Nature Reserve, $22^{\circ}28'34''$ N, $106^{\circ}54'17''$ E, elev. ca. 200 m, broadleaved forest on mountain slope, 12 Sep 2003;

type specimen pressed from plant cultivated in an experimental greenhouse, *Wai-Chao Leong 3624-A* (holotype: HAST; isotypes: A, IBK). 劉演秋海棠

Figures 1, 2, 3

B. filiformis similis ob sed floribus parvis et inflorescentiis glanduloso-hispidis, foliis majoribus ($16-38 \times 12-32$ cm vs. $9-22 \times 9-14$ cm), supra sparse setosis (vs. tomentosis), haud maculatis (vs. supra inter costas albo-maculatis) differt.

Plant monoecious; epipetric; perennial; rhizomatous. Rhizome stout, 10-20 cm long, 1-2.5 cm thick, internodes 0.8-1.3 cm long, brown, villous when young, glabrate when old, with few white, prominently raised, sometimes spine-like, small protrusions. Stipules caducous, narrowly triangular (rarely oblong ovate with apex obtuse), ca. 2-2.5 cm long, 1-1.3 cm wide, brownish, herbaceous, abaxially lanulose-villous, margin ciliate, weakly to strongly keeled, apex aristate, arista 5-7 mm long, horn-like. Leaves 2-5, alternate, simple, asymmetric, unlobed, widely ovate or suborbicular, base strongly oblique-cordate, margin inconspicuously irregularly repandly denticulate and shortly ciliate, apex shortly acuminate, 23-38 cm long (basal lobes included), 16-32 cm wide, adaxially green or dark green, abaxially pale (reddish when young), lacking maculation, subcoriaceous, surface somewhat nitid, flat or somewhat rugose, adaxially sparsely setose (trichomes conical or needle-like with base slightly swollen, nearly erect, straight or slightly curved at apex, 0.5-1 mm long, whitish-hyaline), abaxially lanuginous, particularly pronounced on veins; venation basally 6-7-palmate, midrib distinguishable, pinnate along midrib, with 1-3 major lateral veins on each side, other primary veins dichotomously branching or nearly so, tertiary veins percurrent or reticulate, divergence angle $60-85^{\circ}$, minor veins reticulate, all veins on abaxial surface prominently raised; petiole terete, 13-22 cm long, 5-10 mm

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Figure 1. *Begonia liuyanii* C.-I Peng, S. M. Ku & W. C. Leong. A, Habit. B, Stipule, triangular, apex with horn-like arista, abaxial surface; B', adaxial surface; B'', lateral view. C, Stipule, oblong ovate with obtuse apex, abaxial surface; C', adaxial surface. D, Bract at first node of inflorescence; D', at summit of inflorescence. E, Portion of glandular-hispid peduncle. F, Staminate flower, face view; F', back view. G, Stamen, dorsal view; G', ventral view. H, Carpellate flower, face view; H', lateral view. I, Fruit with crescent-shaped abaxial wing; I', fruit with triangular abaxial wing. J: a-e, Serial cross sections of immature fruit. K, Seeds. (All but F, F' and I' from a living plant (Peng 18820, HAST) cultivated in the experimental greenhouse; F, F' and I' from Leong 3624 (HAST).



Figure 2. *Begonia liuyanii* C.-I Peng, S. M. Ku & W. C. Leong. A, Habitat, showing a population of *B. liuyanii* (Leong 3624, HAST) on rocky limestone slope in broadleaved forest. B, Habit, showing a fruiting individual (Leong 3398, HAST).

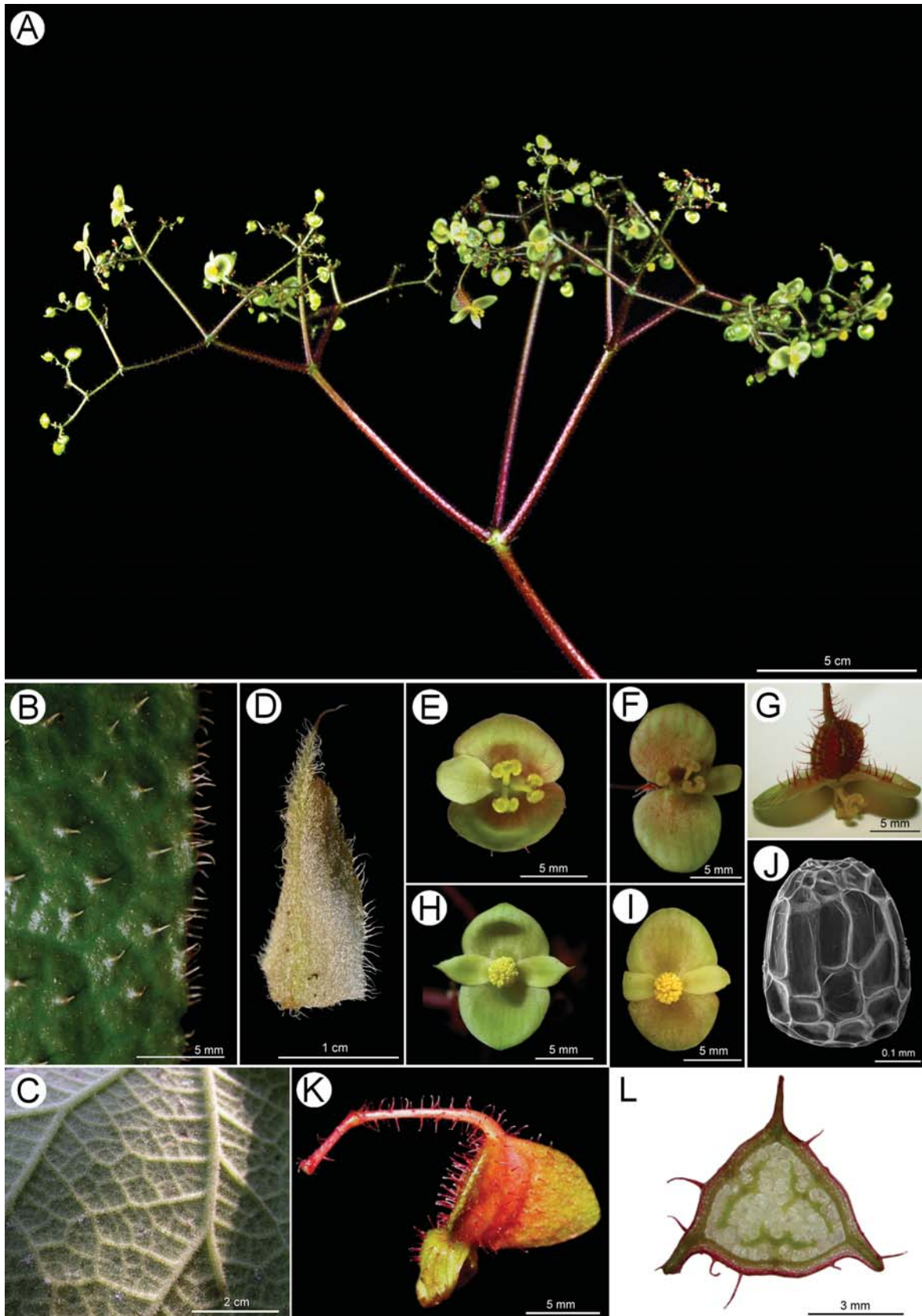


Figure 3. *Begonia liuyanii* C.-I Peng, S. M. Ku & W. C. Leong. A, Inflorescence diffusely thyrsoid. B, Leaf, adaxial surface showing setae. C, Leaf, lanulose abaxial surface. D, Stipule. E-G, Carpellate flowers. H-I, Staminate flower. J, Seed SEM microphotograph. K, Fruit. L, Middle cross section of an immature fruit showing parietal placentation. (A, D-G, I, J, L from Peng 18820; B, C, H, from Leong 3398; K from Leong 3624. All at HAST).

thick, brown, villous or lanuginous. *Inflorescences* axillary, 1-3, arising directly from rhizomes, diffusely thyrsoid (rarely cymose), branched 3-6 times; staminate flowers 10-30, carpellate flowers 3-20; peduncle well developed, terete, erect, 20-41 cm long, 2-5 mm thick, sanguineous, covered with sanguineous glandular-hispid trichomes (trichomes 1.5-1.8 mm long); pedicels sanguineous, glandular-hispid with sanguineous trichomes, ascending to pendent in staminate flowers (0.7-1.2 cm long), horizontal to pendent in carpellate flowers (1.5-2.5 cm long). Bracts caducous, ovate or oblong, margin glandular-ciliate or entire, apex acute, 1-3 mm long, 1-2.5 mm wide, greenish or reddish, herbaceous. *Staminate flowers*: tepals 4, margin entire, outer two orbicular or widely depressed ovate, base rounded or slightly cordate, apex rounded or obtuse, rarely acute, 7-9 mm long, 8-9 mm wide, abaxially yellowish, greenish yellow or reddish, adaxially whitish, yellowish or sometimes reddish, abaxial surface sparsely red glandular-hispid; inner two tepals obovate, oblong or lanceolate, base cuneate, apex acute, acuminate or obtuse, ca. 5-6 mm long, 3 mm wide, whitish or yellowish, glabrous; androecium actinomorphic, spherical, stamens ca. 30-40, shortly golf-club shaped; filaments slightly fused at base, subequal, ca. 0.4-0.5 mm long; anthers 2-locular, slightly compressed, obovoid, apex truncate or slightly emarginate, ca. 0.6-0.7 mm long, 0.45 mm wide, yellowish. *Carpellate flowers*: tepals 3, margin entire, persistent, slightly thickened in fruit; outer two tepals widely depressed ovate, 5-7 mm long, 6-7 mm wide, yellowish or reddish, abaxially sparsely red glandular-hispid; inner tepal obovate, base cuneate, apex rounded, ca. 3 mm long, 2 mm wide, yellowish, glabrous; ovary trigonous-ellipsoid, 5-7 mm long, 4-4.5 mm across, reddish, red glandular-hispid, 3-winged; wings unequal; lateral wings narrower, ca. 1-2 mm high, red glandular-hispid; abaxial wing crescent shaped or triangular, ca. 3-7 mm high, 5-7 mm wide; locule 1; placentation intruded parietal (axile near base); placentae 3, each 2-branched; styles 3, fused at base, yellow, ca. 1.5 mm long, apically split into C-form; stigmas in a spiraled band. *Fruit* dehiscent capsules, nodding, reddish when fresh, 8-11 mm long, 5 mm wide (wings excluded), apex with persistent styles; lateral wings 2-4 mm high; abaxial wing crescent-shaped or triangular, 4-10 mm high. *Seeds* many, brown, usually widely ovoid-ellipsoid, sometimes ellipsoid, (0.35-) 0.4-0.47 mm long, 0.25-0.3 mm across, chalazal end rounded, micropylar end obtuse, outer periclinal walls of mature seeds concave; collar cells elongated, straight, nearly rectangular, 12-15 cells in a ring, occupying 1/3 -1/2(-2/3) of seed length; anticlinal walls between collar cells raised, straight or slightly undulate; testa cell nearly isodiametric-polygonal. Somatic chromosome number, $2n = 30$ (Figure 4).

Additional specimens examined. **CHINA.** Guangxi Zhuang Autonomous Region, Longzhou Xian, Shanglong Xiang, from Banhua to Nonggang Nature Protected Area, ca. 10 km from the entrance of the Area, 22°29'19" N, 106°54'26" E, elev. ca. 200 m, 31 Aug 2002, *Wai-Chao Leong* 3398 (HAST), 3398-A (HAST, flowering specimen pressed from a plant in cultivation, 24 May 2005); Guangxi

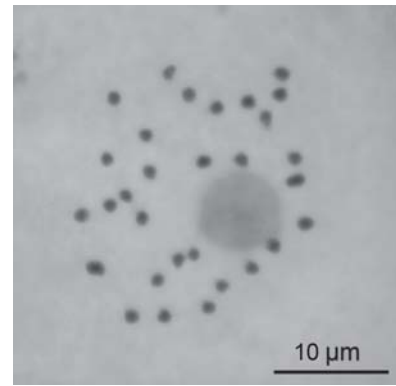


Figure 4. Mitotic chromosome spread of *Begonia liuyanii* ($2n=30$, from *Leong* 3624, HAST).

Zhuang Autonomous Region, Longzhou Xian, Jinlong Zhen, Nonggang Nature Reserve, 22°28'34" N, 106°54'17" E, elev. ca. 200 m, broadleaf forest on mountain slopes, 12 Sep 2003, *Wai-Chao Leong* 3624 (HAST); Guangxi Zhuang Autonomous Region, Longzhou Xian, Shanglong Xiang, Xinliang Cun, 23°29'19" N, 106°54'24" E, elev. ca. 200 m, 6 Mar 2005, *Ching-I Peng* 20388 (HAST). Guangxi Zhuang Autonomous Region, exact locality unknown, specimen pressed from a living collection presented by Yan Liu, 2 Jun 2002, *Ching-I Peng* 18820 (HAST).

Ecology. Broadleaved forests; on shaded, rocky limestone slopes, ca. 200 m elevation.

Etymology. The specific epithet commemorates Mr. Yan Liu, Curator of the IBK Herbarium, Guangxi Institute of Botany, a keen botanist who first collected this rare species and who accompanied us on a number of field expeditions in Guangxi Zhuang Autonomous Region, China.

Distribution. Southwestern Guangxi, China (Figure 5).



Figure 5. Distribution of *Begonia liuyanii* (star), *B. fliformis* (solid circle) and *B. masoniana* (open circle) in Guangxi Zhuang Autonomous Region, China.



Figure 6. Holotype of *Begonia filiformis* Irmsch. (Morse 575, K), inset (middle left) showing a staminate flower in fragment packet.

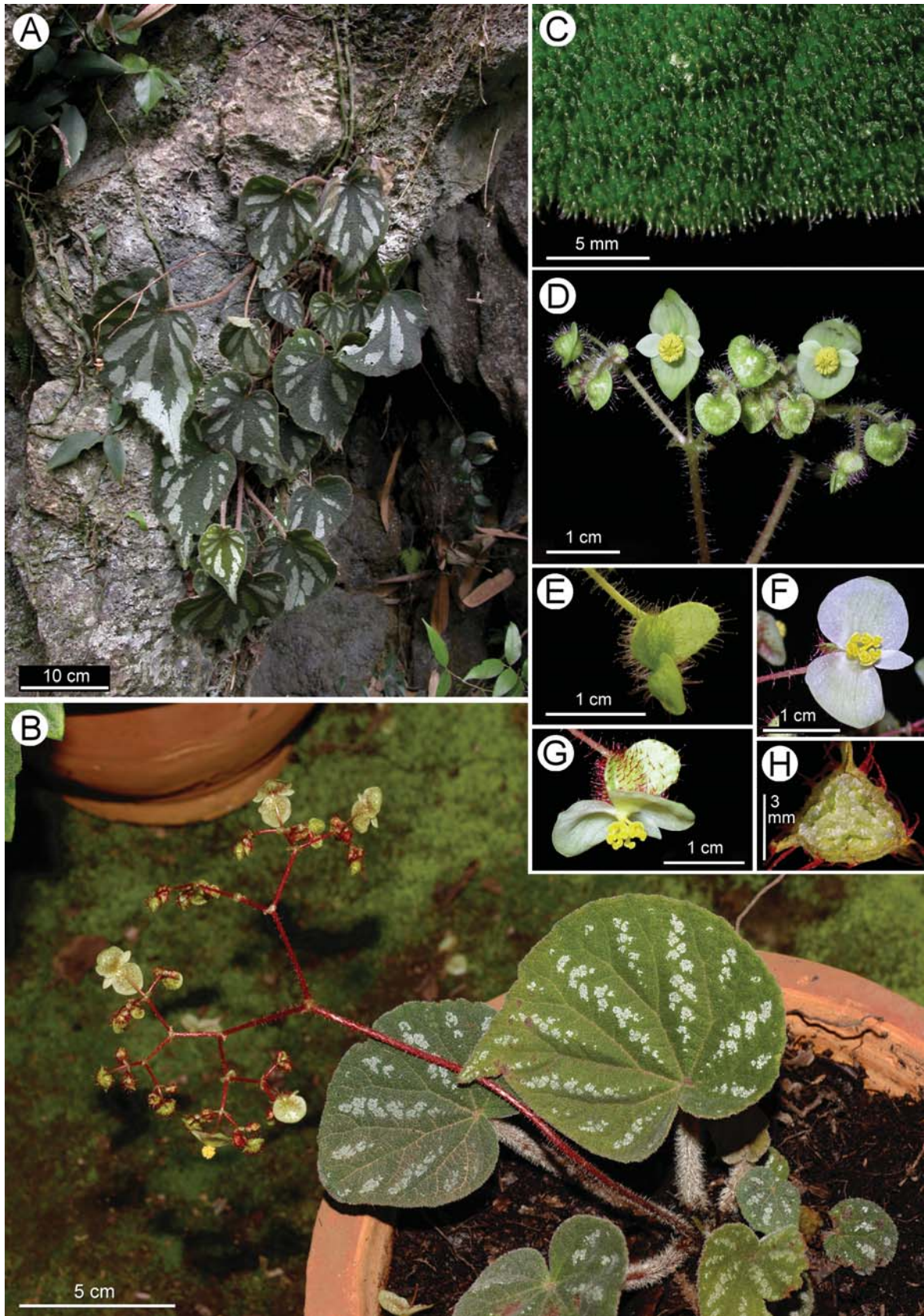


Figure 7. *Begonia filiformis* Irmsch. A, Habitat and habit, showing plants on limestone face. B, Cultivated plant in Kunming Botanical Garden, Yunnan. C, Portion of tomentose leaf. D, Inflorescence at early phase of flowering. E, Carpellate flower bud. F, G, Carpellate flowers. H, Middle cross section of an ovary. (A, C-E, from Peng 20332, HAST; B, F-H, from Hong-Zhe Li HZ-051, KUN)

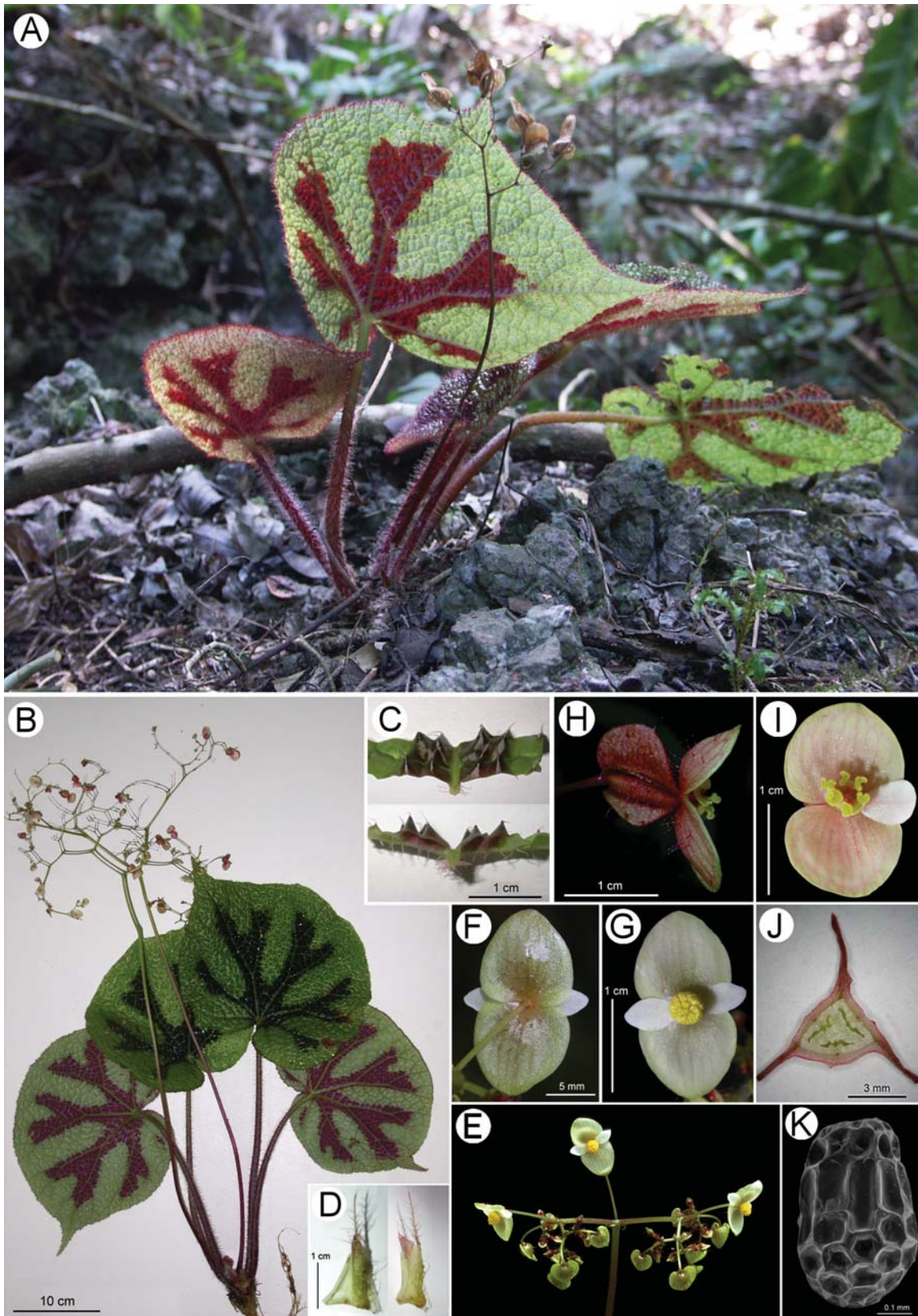


Figure 8. *Begonia masoniana* Irmsch. ex Ziesenh. A, Habitat and habit showing fruiting plant on limestone. B, Habit, showing plant at late anthesis. C, Portion of leaf showing bullate surface and trichomes. D, Stipule strongly keeled with horn-like appendage. E, Inflorescence. F, Staminate flower, back view. G, Staminate flower, face view. H, Carpellate flower, side view. I, Carpellate flower, face view. J, Middle cross section of an ovary. K, Seed SEM microphotograph. (A from Peng 19795, B from Leong 3658-A, C-K from Leong 3658; all at HAST)

Table 1. Comparison of *Begonia liuyanii* with *B. filiformis* and *B. masoniana*.

Characters	<i>B. liuyanii</i>	<i>B. filiformis</i>	<i>B. masoniana</i>
Leaf			
Shape	Broadly ovate to suborbicular; unlobed	Ovate, broadly ovate or suborbicular; unlobed	Broadly ovate to suborbicular; unlobed or rarely shallowly sharply 2-4 lobed
Size (cm)	ca. 16-38 × 12-32	ca. 9-22 × 9-14	ca. 10-25 × 9-20
Texture	Subcoriaceous	Chartaceous	Herbaceous
Upper surface	Flat or slightly rugose; somewhat nitid	Rugose or rugulose; dull	Strongly bullate; nitid
Maculation	Lacking	White maculation in intercostal areas on upper surface	Wide blackish-brown (red abaxially) bands along main veins on upper surface
Indumentum			
Leaf adaxial surface	Sparsely setose	Tomentose or setose-tomentose	Sparsely long setose or hirsute
Peduncle	Glandular-hispid	Glandular-hispid	Sparsely glandular-pilose, rarely subglabrous
Inflorescence			
	Usually thyrsoid (cymose in weakly developed inflorescence); many-flowered	Usually dichasial cymose; with a moderate number of flowers	Cymose, usually branching asymmetrically and thus cincinnus-like; many-flowered

Phenology. Flowering April to August (rarely to September); fruiting May to September.

Notes. Among the two dozen or so congeners in *Begonia* sect. *Coelocentrum*, *B. liuyanii* (Figures 1, 2, 3) shares with *B. filiformis* (Figures 6, 7) and *B. masoniana* (Figure 8) characteristically small flowers and actinomorphic androecia. A comparison of their salient features is shown in Table 1. All three species occur allopatrically in southwestern Guangxi (Figure 5). They are all rare species, known only from very few collections. Important morphological characters of *Begonia* do not usually preserve well in herbarium specimens. Colored images of all three species are provided to aid in identification.

Acknowledgments. We thank Qiner Yang (PE) for his assistance with the Latin diagnosis; Yan Liu (IBK) and Huan-Yu Chen (HAST) for field assistance; Hong-Zhe Li (KUN), Chien-I Huang, Mao-Lun Weng (HAST) and Wei-Hsin Hu (TNM) for providing handsome images (Hu: Figure 3: J; Huang, Figure 7: B; Li, Figures 7: F-H; Weng: Figures 3: A, 8: E) and the curators of IBK, K and KUN for facilitating our examination of herbarium collections. We are grateful to David E. Boufford, Bruce Bartholomew and Thomas Lammers for useful comments on the manuscript. This study was supported in part by grants from the Research Center for Biodiversity, Academia Sinica, Taiwan, to Ching-I Peng (HAST).

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中國廣西石灰岩地區秋海棠屬側膜組一新種：劉演秋海棠

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本文報導中國廣西壯族自治區西南部石灰岩地區的秋海棠屬側膜組 (*Begonia* sect. *Coelocentrum*) 的一個新種：劉演秋海棠 (*Begonia liuyanii*)，提供線繪圖與照片以資辨識，並報導其染色體數 ($2n = 30$)。劉演秋海棠的花朵小型、花序密佈直硬之腺毛，與同為側膜組的絲形秋海棠 (*B. filiformis*) 略似。二者主要差別在於：劉演秋海棠的葉片較大 (長 16-38 公分，寬 12-32 公分)、上表面具有散生的剛毛、葉面全綠無斑紋、花序通常為聚繖圓錐狀花序等；而絲形秋海棠葉片較小 (長 9-22 公分，寬 9-14 公分)、上表面被絨毛、葉上表面主脈之間具白色斑紋 (此一特徵在烘乾後之臘葉標本有時不明顯)、花序為典型之聚繖花序。本文並提供同屬側膜組，較為近似之絲形秋海棠 (*B. filiformis*) 與在園藝上廣泛栽培極具觀賞價值的鐵甲秋海棠 (*B. masoniana*) 之彩色照片，以資辨識。

關鍵詞：絲形秋海棠；劉演秋海棠；鐵甲秋海棠；秋海棠科；中國；廣西；石灰岩植物；染色體數；新種；稀有植物；側膜組。