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A new species and record for the genus *Begonia* (Begoniaceae) from Vietnam

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ABSTRACT: A new species and record of *Begonia* L. from the central highlands is described and illustrated. The new species, *B. mangdenensis* is assignable to *Begonia* sect. *Platycentrum* based on the axillary inflorescence, 4-tepaled staminate flower and 5-tepaled pistillate flower with ovary two locules each with two placentas. *B. mangdenensis* is most similar to *B. lamdongiana*, but it is different in its variegated (vs. uniformly green) and velvetly (vs. slightly waxy) upper surface of lamina, villous (vs. glabrous) peduncle, first pair of bracts glabrous (vs. puberulous or hirsute) in abaxial surface, bracts margin entire and ciliate (vs. denticulate or laciniate to biserrate, ciliate). In addition, *B. yui* Irmsch., previously known from China, is newly recorded from Vietnam.

KEY WORDS: *Begonia mangdenensis*, *Begonia lamdongiana*, *Begonia yui*, endemism, *Platycentrum*, *Tubibracteolea.*

INTRODUCTION

The botanical diversity of Vietnam, especially the Central Highlands of South Vietnam and limestone hills along the boundary of Sino-Vietnam, is proven to be high in number of new taxa and endemic species (Hai *et al.*, 2018; Hareesh *et al.*, 2019; Hoang *et al.*, 2021; Lin *et al.*, 2021a,b; Luu *et al.*, 2017; Pham *et al.*, 2019,2021; Radbouchoom *et al.*, 2019; Shui *et al.*, 2019b), which reveals an astonishing number of new discoveries as unexplored areas are being visited. *Begonia* Linnaeus (1753: 1056) is the sixth largest flowering plant genus comprised of over 2,000 species (Hughes 2015−present). It is expectable that the number of *Begonia* species will increase rapidly globally along with more extensive botanical exploration of Southeast Asia in the future. During the first author's extensive botanical exploration of Vietnam, two unknown begonias are discovered. After careful study of plants collected from the field, as well as detailed comparison with herbarium specimens and relevant literature, A new species is described as *B. mangdenensis*, the other one is *B. yui* Irmsch., a new record species to the country.

TAXONOMIC TREATMENT

Begonia mangdenensis T.S. Hoang & C.W. Lin, ***sp. nov.*** **Figs. 1, 2 & 3A-E**

***TYPE*:** VIETNAM. Kon Tum Province, Kon Plong District, Mang Den Commune, 108°15'06"E, 14°34'21"N, 1,009 m alt., on the moist rocky along the stream banks in broad-leaved evergreen forests, 27 August 2019, *Hoang Son 7548* (Holotype: VAFS; Isotypes: VNMN).

***Diagnosis*:** Similar to *Begonia lamdongiana* C.W. Lin, T.C. Hsu & Luu in its habit and lanceolate laminae, 4-tepaled staminate flower and 5-tepaled pistillate flower, glabrous ovary. However, *B. mangdenensis* is different in having maculation (vs. uniformly green) leaves adaxial surface velvety (vs. slightly waxy), veins strongly sunken (vs. slightly prominent) adaxially and glabrous (vs. puberulous or hirsute in the first pair) bracts.

Monoecious rhizomatous herb. **Rhizome** stout, to 10 cm or more long, 0.7−1 cm thick, internodes congested, sparsely villous; erect stems seen only at anthesis, *ca*. 2 nodes, internodes 1–6 cm long, *ca*. 0.3 cm thick, villous. **Stipules** often caducous, yellowish-red, widely triangular-ovate, 0.5–0.8 cm long, 0.7–1 cm wide, herbaceous, strongly keeled, abaxially sparsely hirsute, margin entire, apex aristate, arista *ca*. 0.2 cm long. **Leaves** alternate, petiole terete, yellowish-red, (5−)8−18 cm long, 2.5−4 mm diameter, villous; leaf blade asymmetric, oblique, lanceolate to ovate, 7−12 cm long, 3.2–7 cm wide, broad side 1.8–4 cm wide, basal lobes cordate, 1–3.2 cm long, apex attenuate, margin denticulate and puberulous; leaf thick chartaceous, succulent, adaxially deep emerald green, blackish-brown zone along veins, sometimes embellished with irregular silvery white spots, surface very sparsely puberulous; abaxially pale green, purplish-red zone along veins, sparsely puberulous on all veins; venation basally *ca*. 6 palmate, midrib distinct, *ca*. 3 secondary veins on each side, other primary veins branching dichotomously or nearly so, tertiary veins reticulate; leaves of erect stem similar terrestrial leaves but smaller. **Inflorescences** axillary, bisexual, cymose panicle arising directly from rhizome or on a short stem, up to 2 orders of branching; peduncle yellowish-green, 5–15 cm long, villous. **Bracts** caducous, pale yellow-green, ovate, 0.6–1.5 cm long,

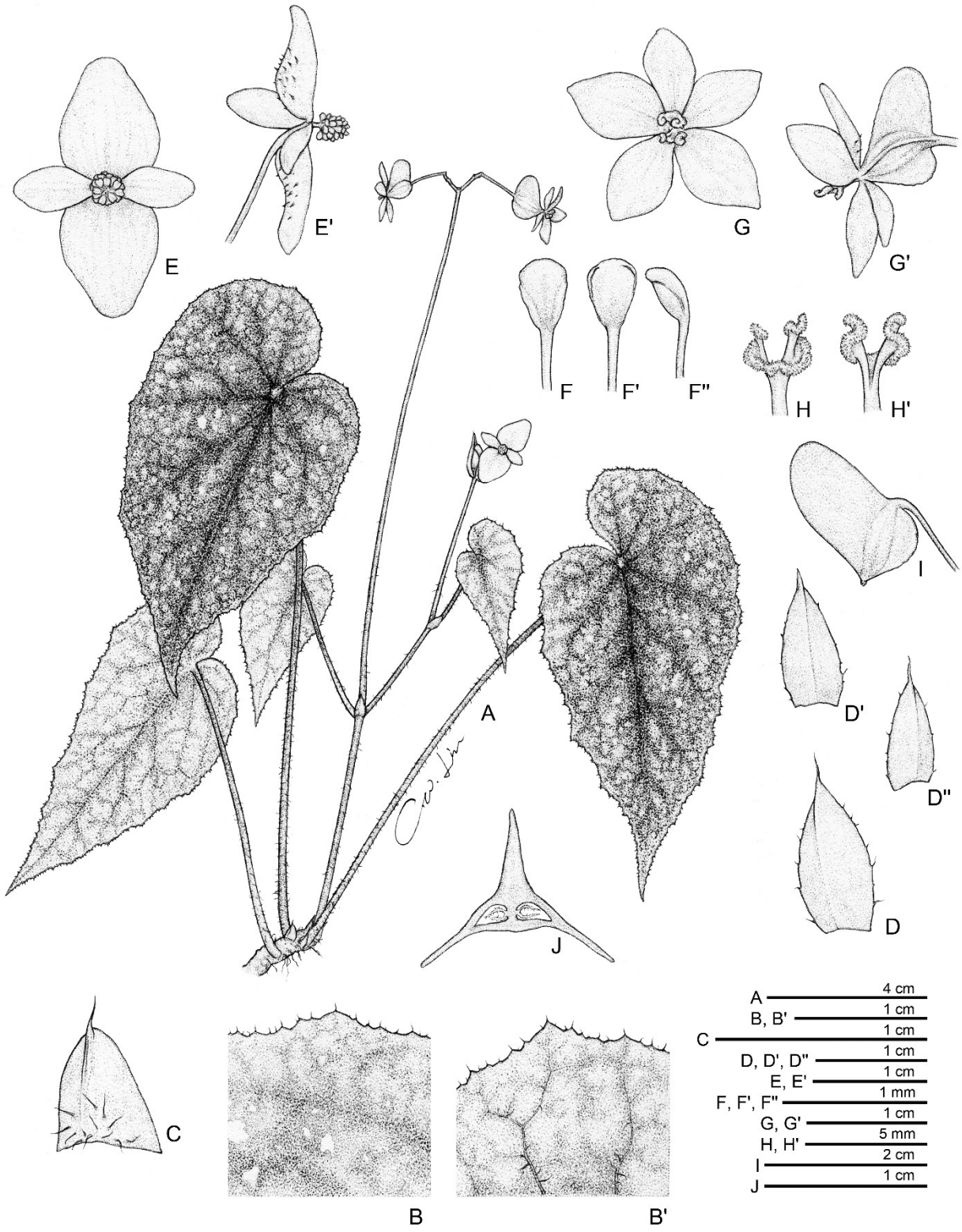

Fig. 1. ***Begonia mangdenensis*** T.S. Hoang & C.W. Lin. **A**. Habit; **B**, **B'**. Portion of leaf, upper and lower surfaces; **C**. Stipules; **D**, **D'**, **D"**. Bracts; **E**, **E'**. Staminate flower, face and side views; **F**, **F'**, **F"**. Stamens, ventral, dorsal and side views; **G**, **G'**. Pistillate flower, face and side views; **H**, **H'**. Style and stigmatic band, dorsal and ventral views; **I**. Capsule; **J**. Cross section of an immature capsule.

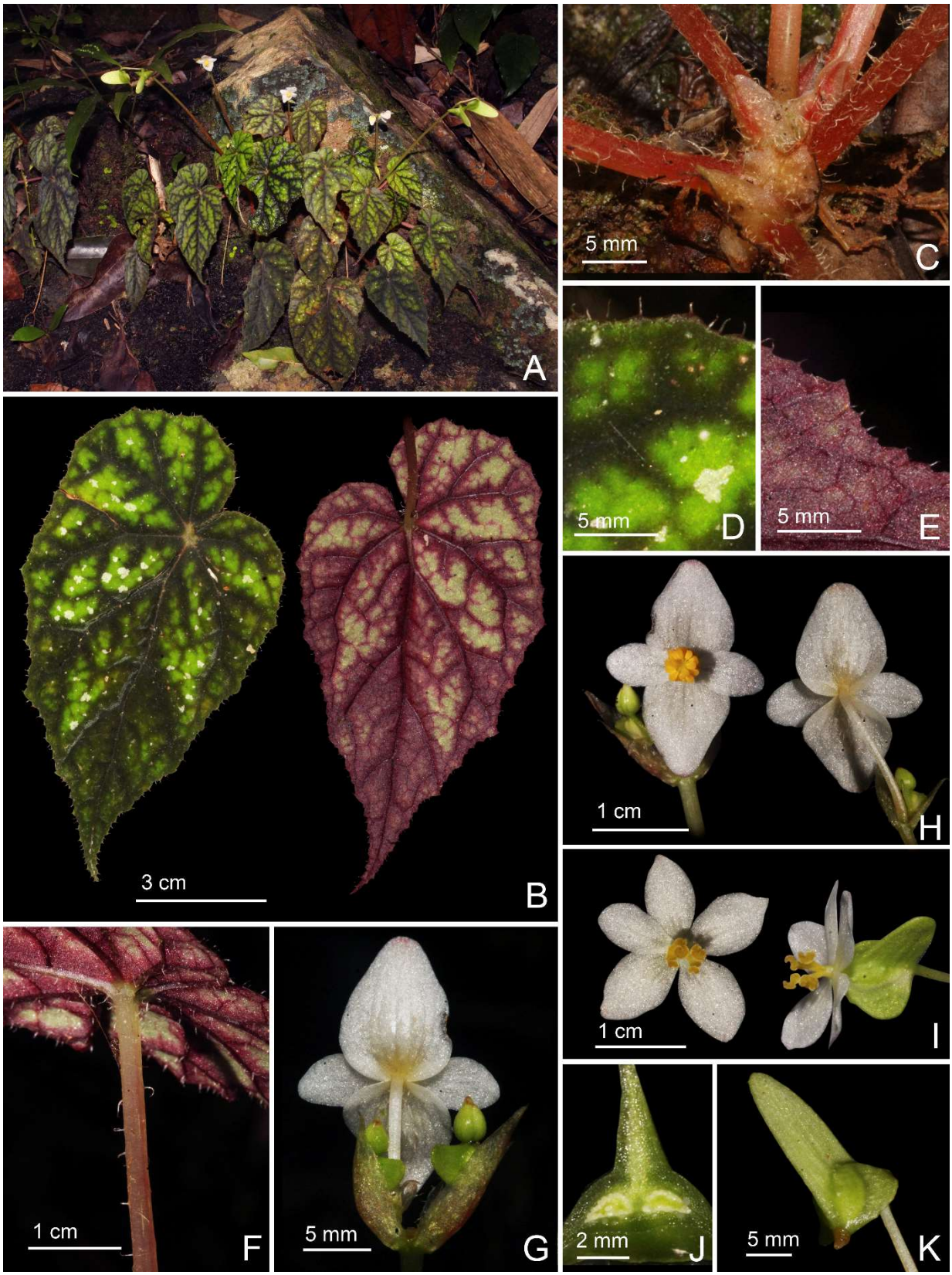

Fig. 2. ***Begonia mangdenensis*** T.S. Hoang & C.W. Lin. **A**. Habit and habitats; **B**. Leaf, upper and lower surface; **C**. Rhizome, showing stipules and petioles; **D**, **E**. Portion of leaf, upper and lower surfaces; **F**. Distal part of petiole, showing villous; **G**. Inflorescence, showing bracts; **H**. Staminate flower, face and back views; **I**. Pistillate flower, face and side views; **J**. Cross section of an immature capsule; **K**. Capsule.

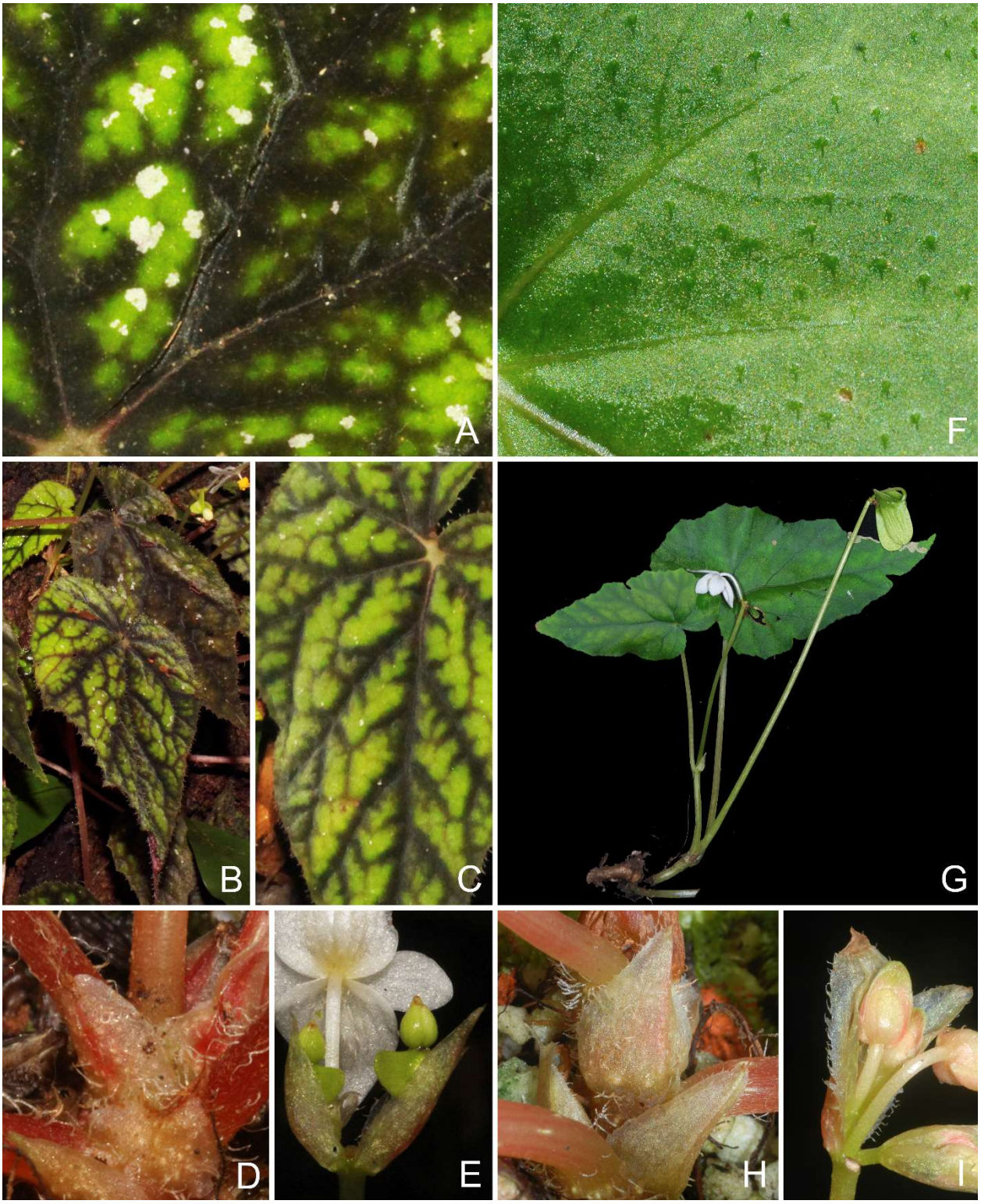

Fig. 3. ***Begonia mangdenensis*** T.S. Hoang & C.W. Lin. (**A**–**E**). **A**. Portion of leaf, **B**. Leaves, showing strongly velvety, subglabrous adaxial surface, and veins strongly sunken, **C**. Showing very sparsely puberulous on upper surface; **D**. Stipules, showing entire margin; **E**. Bracts, showing, showing sparsely ciliate margin. ***Begonia lamdongiana*** C.W.Lin, T.C.Hsu & Luu. (**F**–**I**). **F**. Portion of leaf, showing slightly waxy and scabrous adaxial surface, and veins slightly prominent; **G**. Habit; **H**. Stipules, showing ciliate margin; **I**. Bracts, showing biserrate and ciliate margin.

Table 1. Comparison of ***Begonia mangdenensis*** T.S. Hoang & C.W. Lin and ***B. lamdongiana*** C.W.Lin, T.C.Hsu & Luu.

	B. mangdenensis	***B. lamdongiana***
Stipule		
margin	entire	entire to minutely denticulate and ciliate
Leaf		
adaxial texture	strongly velvety, bullate	slightly waxy, flat
adaxial vestiture	very sparsely puberulous	sparsely minutely scabrous
maculation	blackish-brown zone along veins, sometimes embellish with irregular silvery white spots	absent, uniformly green
adaxial veins	strongly sunken	slightly prominent
Bracts		
abaxially (first pair)	glabrous	puberulous or hirsute
margin	entire and sparsely ciliate	denticulate or laciniate to biserrate, ciliate

0.3–0.8 cm wide, glabrous, margin entire and sparsely ciliate. **Staminate flower:** pedicel *ca*. 1.3 cm long, glabrous or nearly so, tepals 4, white, outer 2 widely ovate, 1–1.2 cm long, 0.7–0.9 cm wide, adaxially strigose, inner 2 elliptic, *ca*. 0.7 cm long, 0.35 cm wide, glabrous; androecium actinomorphic, *ca*. 0.3 cm across; stamens golden yellow, 45–55; filaments *ca.* 1 mm long, shortly fused at base; anthers obovate, *ca*. 0.8 mm long, 2-locular, apex rounded,. **Pistillate flower:** pedicel 1–2.3 cm long, glabrous, tepals 5, white, outer 3 ovate to elliptic, 0.9–1.1 cm long, *ca*. 0.6 cm wide, adaxially glabrous or with very sparsely strigose, inner 2 ovate to obovate, 0.8–1 cm long, 0.4–0.6 cm wide; ovary trigonous-ellipsoid, *ca*. 0.5 cm long, 0.3 cm thick (wings excluded), pale green, glabrous; 3-winged, wings unequal, pale green, lateral wings narrower, narrowly crescent-shaped, 0.2–0.4 cm wide, abaxial wing crescent-shaped, 0.6–0.8 cm wide, margin entire; ovary 2-locular, placenta bilamellate; styles 2, fused at base, golden yellow, *ca.* 0.5 cm long, stigma spirally twisted. **Capsule** tepals persistent; capsule trigonous-ellipsoid, *ca*. 1 cm long, 0.6 cm thick (wings excluded), greenish when fresh; wings unequal, lateral wings *ca*. 0.5 cm wide, abaxial wing lingulate to crescent-shaped, *ca*. 1.5 cm wide.

***Distribution and ecology*:** The new species is currently known from Mang Den Commune, Kon Plong District, Kon Tum Province, Central Highland Vietnam and probably also occurs in adjacent areas. The new species grows on the humid, moist rocky banks of streams in broad-leaved evergreen forests, at elevations of *ca*. 1,000 m, together with dominant plants of Orchidaceae (*Habenaria rhodocheila* Hance), Poaceae (*Bambusa* sp.), Rubiaceae (*Argostemma* sp.), Urticaceae *(Elatos*tema sp.), Myrtaceae (*Syzygium* spp.), and Melastomaceae (*Sonerila* sp.)

Etymology: The specific epithet refers to Mang Den in Mang Den Commune, Kon Plong District, Kon Tum Province, Central Highlands, Vietnam, where the new species was found.

Vietnamese name: Thu hải đường Măng Đen.

***Conservation*:** *B. mangdenensis* grows along streams in Mang Den Commune, Kon Plong District, Kon Tum Provine. There is a continuing decline in quality of habitat as local people often build camps near the streams and use *B. mangdenensis* as an edible vegetables. The EOO is 1610 km² and the AOO is 24 km². From our field observations, the number of mature individuals in each population is estimated less than 2500. Although more than five subpopulations, considering the habitat specificity of the species and consequent threat in both countries, it is assessed here as Endangered (EN) B1b(iii) + B2b(iii), following the IUCN criteria (2019).

***Notes*:** *Begonia mangdenensis* resembles *B. lamdongiana* C.W. Lin, T.C. Hsu & Luu (Lin *et al.*, 2021a), which is also a member of sect. *Platycentrum*, in the lanceolate laminae, 4-tepaled staminate flower and 5-tepaled pistillate flower, glabrous ovary.

However, *B. mangdenensis* is sharply distinct from *B. lamdongiana* by the maculation (vs. uniformly green) leaves adaxial surface velvety (vs. slightly waxy), veins strongly sunken (vs. slightly prominent) adaxially and glabrous (vs. puberulous or hirsute in the first pair) bracts. Geographically, *B. mangdenensis* is endemic to Kon Tum Provine in Central Highlands, whereas *B. lamdongiana* distributed in Lam Dong Province, more than 200 km away from Kon Tum Provine. A comparison of *B. mangdenensis* and *B. lamdongiana* are presented in Figure 3 and Table 1.

Begonia yui Irmsch, Notes Roy. Bot. Gard. Edinburgh 21(1): 36. 1951. ***Type***: CHINA. Yunnan, Mien-ning, Po-Shang, alt. 2,500 m., 8 October 1938, *T.T. Yu 17943* (Holotype, KUN).

Figs. 4 & 5

Vietnamese name: Thu hải đường Yu.

***Distribution and ecology*:** *Begonia yui* is currently known from Hoang Lien National park, Sapa Town, Lao Cai Province and probably also occurs in adjacent areas. It grows on the humid, moist rocky in broad-leaved evergreen forests, at elevations of *ca*. 2,051 m, together with dominant plants of Orchidaceae (*Liparis* sp.), Poaceae (*Arundinaria* sp.), Gesneriaceae (*Lysionatus serratus*), Urticaceae (*Elatostema* sp.), Asteraceae (*Synotis* sp.), Melastomaceae (*Sonerila finetii*), Selaginellaceae (*Selaginella* sp.) and Thelypteridaceae (*Thelypteris* sp.).

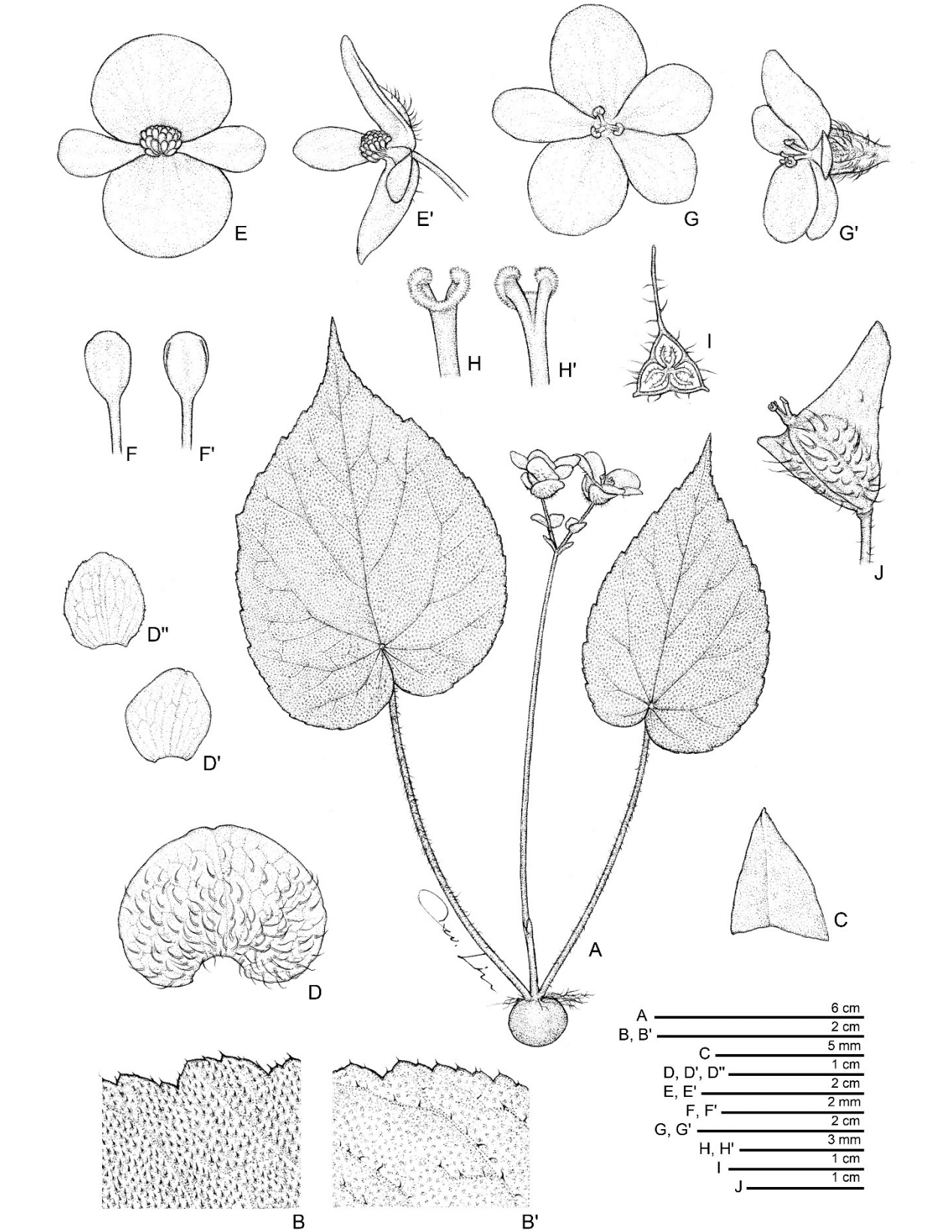

Fig. 4. ***Begonia yui*** Irmscher. **A**. Habit; **B**, **B'**. Portion of leaf, upper and lower surfaces; **C**. Stipules; **D**, **D'**. Bracts, **D"**. Bracteole; **E**, **E'**. Staminate flower, face and side views; **F**, **F'**. Stamens, dorsal and ventral views; **G**, **G'**. Pistillate flower, face and side views; **H**, **H'**. Style and stigmatic band, dorsal and ventral views; **I**. Cross section of an immature capsule; **J**. Capsule.

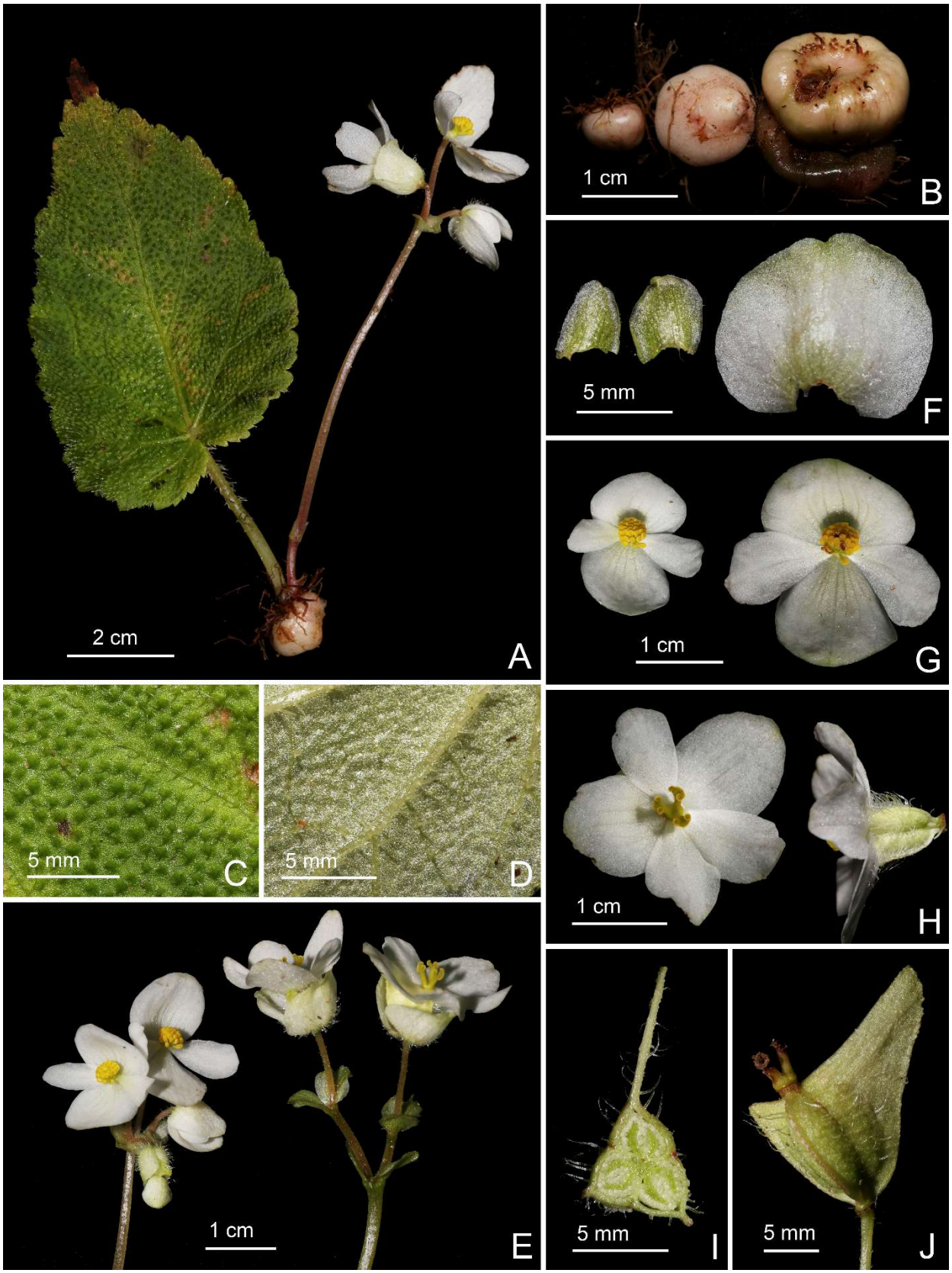

Fig. 5. ***Begonia yui*** Irmscher. **A**. Habit; **B**. Tubers; **C**, **D**. Portion of leaf, upper and lower surface; **E**. Inflorescence; **F**. Bracts and bracteole; **G**. Staminate flowers, face view; **H**. Pistillate flower, face and side views; **I**. Cross section of an immature capsule; **J**. Capsule.

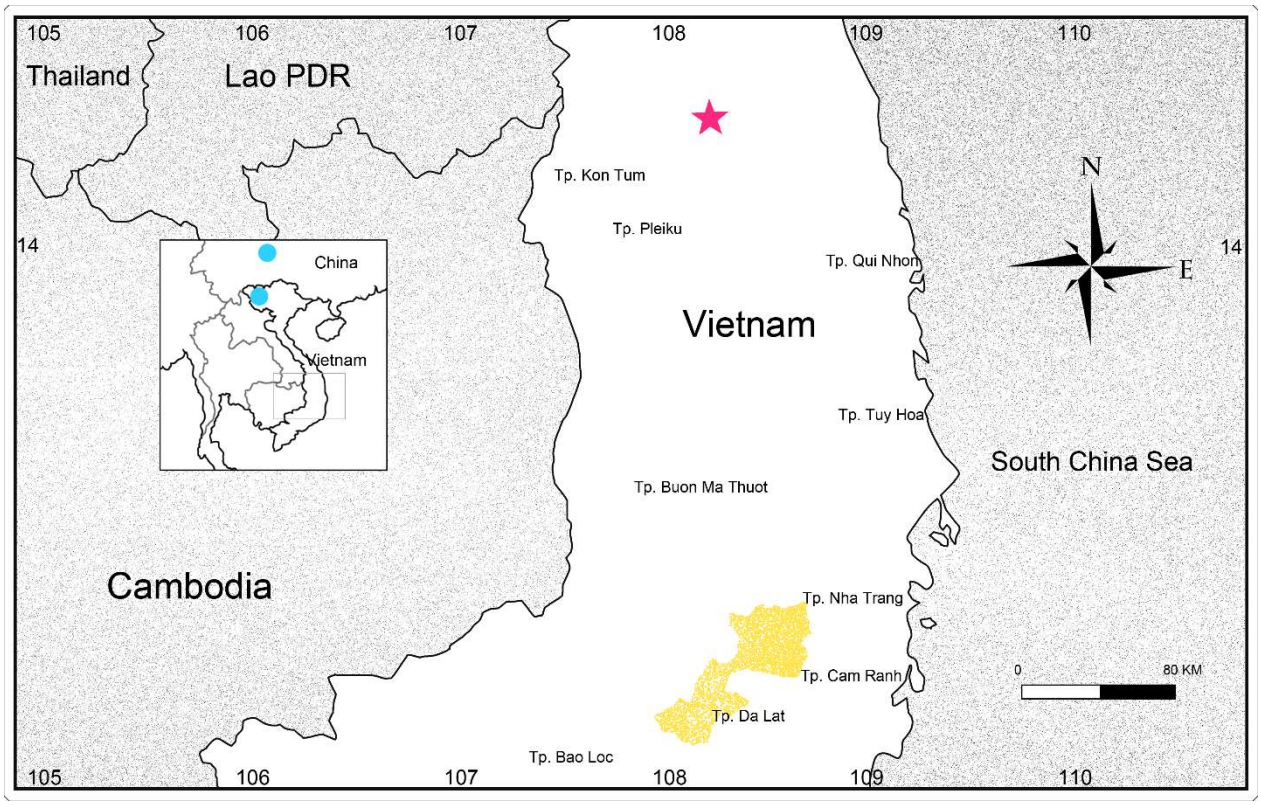

Fig. 6. Distribution map of ***Begonia mangdenensis*** (pink star), ***B. lamdongiana*** (yellow zone) and ***B. yui*** (blue circles).

Conservation status**:** Critically Endangered CR B2ab(ii, iii) D. One small subpopulation, with a total of 20 mature individuals of *B. yui* were found in a total area of occupancy of less than 5 km^2 in Hoang Lien National Park. Although this species is being protected by Hoang Liên National Park, this population is, however, vulnerable and may be impacted by a continuous decline of habitat area, extent and quality. Indeed, this habitat is compromised by destructive human activities, such as harvesting of timber and non-forest products. According to the IUCN Red list criteria (IUCN, 2019), this qualifies it as Critically Endangered CR B2ab(ii, iii) D which is therefore proposed here. Further field work of the area around Hoang Lien National Park is needed to understand the situation better and amend the conservation status.

Specimen examined: VIETNAM. Lao Cai Province, Sapa Town, Hoang Lien National Park, 103°46'47"E, 22°20'01"N, 2,051 m alt., on the moist rocky in broad-leaved evergreen forests, 25 October 2020, *Hoang Son 10083* (VAFS, VNMN).

Notes**:** *Begonia yui* is recognized by its tuberous habit with a winter dormant period, subsymmetric, hairy foliage and by its pistillate flower with a pair of boat-like (tubal) bracteoles. It is the type species of sect. *Tubibracteolea* Y.M. Shui & W.H. Chen (Shui *et al*., 2019a: 205) and diagnostic characters in have tuberous and epiphytic habit and tubal bracteoles at the based of the ovaries. This is a small section only two species distributed by Shui's system (Shui *et al*., 2019a), *B. phrixophylla* Blatt. & McCann endemic to India and *B. yui* occur in China, Shui description *B. yui* that are distributed in China and Vietnam. However, Vietnamese specimen is not seen at any literature reference, so that we are confirming Shui's record in here.

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