

Research note

Viola kwangtungensis Melch. (Violaceae): a New Record *Viola* in Taiwan

Chang-Tse Lu,¹⁾ Yu-Long Hung,²⁾ Chih-Hsiung Chen^{3,4)}

[Summary]

In this paper, a new record *Viola* species of Taiwan, *V. kwangtungensis* Melch., is reported. This newly recorded species was found at elevations of 1300~1600 m in Taiwan, growing in shady soil on a slope under a bamboo plantation. It is similar to *V. mucronulifera* Handel-Mazzetti and *V. formosana* Hayata var. *kawakamii* (Hayata) Chen & Yang, as well as *V. adenothrix* Hayata var. *adenothrix* and *V. nagasawae* Makino & Hayata var. *pricei* (W. Becker) Wang & Huang. Detailed differences in diagnostic morphological features of these species are discussed in this paper.

Key words: new record species, Taiwan, Violaceae, *Viola kwangtungensis*.

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¹⁾Department of Biological Resources, National Chiayi University, 300 Syuefu Rd., Chiayi 60004, Taiwan. 國立嘉義大學生物資源學系，60004嘉義市鹿寮里學府路300號。

²⁾Amateur nature observer, 188 Jincheng Street, Jindun Village, Huatan Township, Changhua 50343, Taiwan. 生態攝影家，50343彰化縣花壇鎮金墩村金城街188號。

³⁾Department of Biology, National Museum of Natural Science, 1 Guancian Rd., Taichung 40453, Taiwan. 國立自然科學博物館生物學組，40453台中市館前路1號。

⁴⁾Corresponding author, e-mail:alanchen@mail.nmns.edu.tw 通訊作者。

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研究簡報

台灣堇菜科的新紀錄種—廣東堇菜

呂長澤¹⁾ 洪裕榮²⁾ 陳志雄^{3,4)}

摘 要

為本文報導了台灣一新紀錄種的堇菜—廣東堇菜 (*Viola kwangtungensis* Melch.)。這種新的記錄物種分布於台灣海拔1300~1600 m山區，生長在竹林下的斜坡上。它近似於小尖堇菜 (*V. mucronulifera* Handel-Mazzetti) 和川上氏堇菜 (*V. formosana* Hayata var. *kawakamii* (Hayata) Chen & Yang)，以及喜岩堇菜 (*V. adenothrix* Hayata var. *adenothrix*) 與普萊氏堇菜 (*V. nagasawae* Makino & Hayata var. *pricei* (W. Becker) Wang & Huang)。在本文中，我們對這些物種在形態特徵上的詳細差異進行討論。

關鍵詞：新紀錄種、台灣、堇菜科、廣東堇菜。

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Viola Linnaeus (1753: 933) comprises approximately 600 species worldwide (Marcussen et al. 2015) and is the largest genus of the Violaceae (Wahlert et al. 2014). It is monophyletic and is thought to have diversified ca. 30 Mya in South America (Ballard et al. 1999). *Viola* consists of at least 17 monophyletic lineages and putative sections (Fan et al. 2015) and is currently undergoing revision (Marcussen et al. 2015). In East Asia, the genus is mostly distributed in temperate regions, and numerous new species have been described in recent years [such as *V. austrosinensis* (Chen and Yang 2008), *V. maershanensis*, *V. nitida* (Chen and Yang 2009), *V. changii* (Zhou and Xing 2007), *V. nanlingensis* (Zou et al. 2008), *V. guangzhouensis* (Dong et al. 2009), and *V. jinggangshanensis* (Ning et al. 2012)]. In total, 16~18 *Viola* species have been reported to occur in Taiwan (Wang and Huang 1990, 1993, Wang 1991, Yang et al. 2000, Chen et al. 2007).

Recently, according to our botanical fieldwork in central Taiwan, an unfamiliar

species of *Viola* was found by the second and third authors. This species was always found growing in shady soil on slopes under a bamboo plantation. Taking into consideration the characteristics of the slender, elongated stolons with scattered leaves, rootlets emitting from nodes and internodes of stolons, and the acute apex of the lower petal, this unfamiliar species should belong to the *Viola* series Australasiatica Okamoto (Okamoto et al. 1993).

Subsequent observations and a literature survey were carried out. Eventually we confirmed this species to be *V. kwangtungensis* Melch., a species endemic to China (Chen et al. 2007). And now we report it as a newly recorded species in Taiwan. Diagnostic morphological characteristics of this new record species were compared to those of congeners found in Taiwan and neighboring areas, and are summarized in a table. Additionally, distribution maps, and a discussion of this new record species and similar taxa in Taiwan and neighboring areas are provided.

Taxonomic description

Viola kwangtungensis Melch. Sunyatsenia
1:124. 1933..... 廣東堇菜 (Figs. 1, 2)

Type: CHINA. Prov. Kwangtung: Lung
Tou Shan, Kook Kiang, on slope, fl. 7 Apr.
1930, *S.P. Ko 50326* (isotype A, photo!).

Perennial herb. Rhizome long, slender, 2~7
cm long; internodes remote. Stolon up to 15 cm,
slender, glabrous, rootlets emitting from nodes

and internodes of stolons, top developing into a
new plant. Leaves nearly basal or clustered on
shortened stem; stipules adnate to petioles only
at base, brown or greenish with dark striations,
free part lanceolate, ca. 10×1.5 mm, margin
short-fimbriate, apex acuminate; petioles sub-
equal blades, 3.5~7.5 cm, glabrous; leaf blade
ovate to ovate-triangular, 2~4.5 \times 1.5~3 cm,
adaxially deep-green, midvein conspicuously

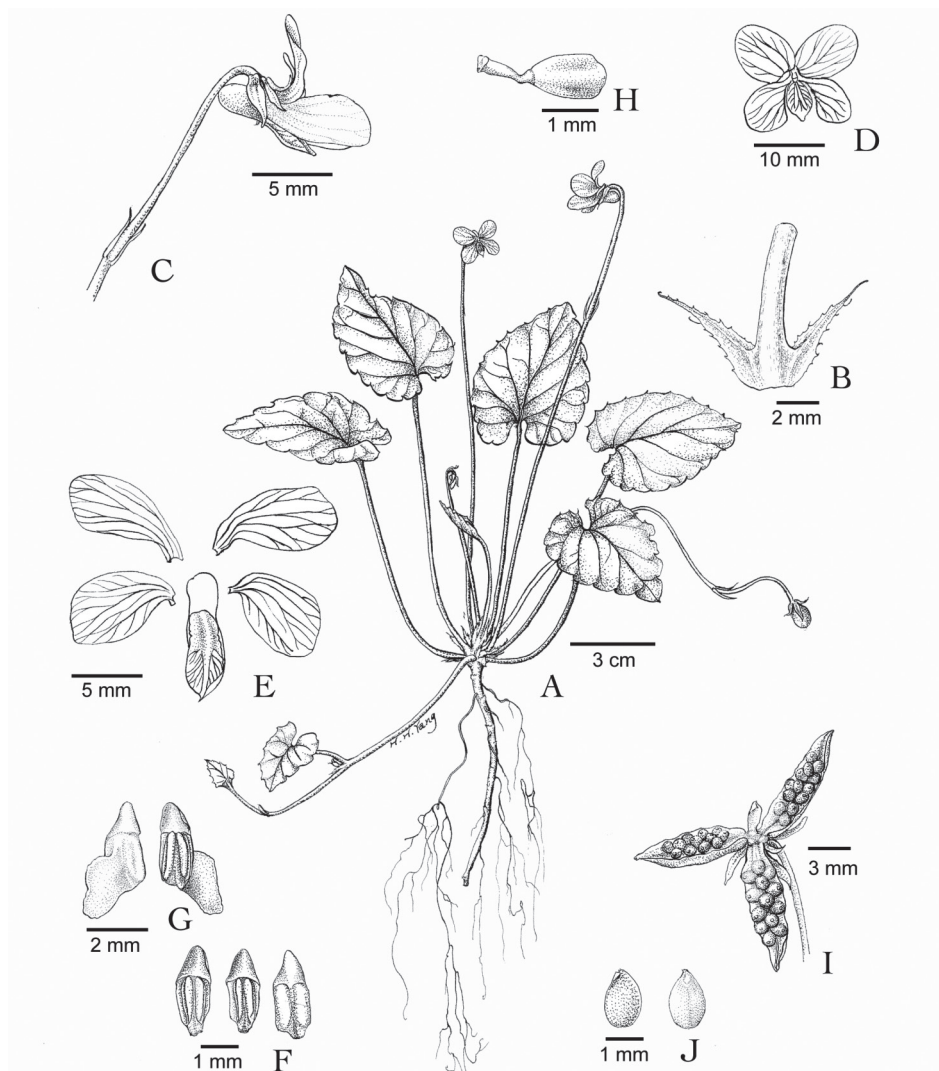


Fig. 1. *Viola kwangtungensis*. A, Habit; B, stipules; C, inflorescence; D, flower (front view); E, petals; F, stamens; G, stamen with nectariferous appendage; H, pistil; I, dehiscent capsule; J, seeds. Drawing based on *C.-H. Chen 10831* (TNM!).

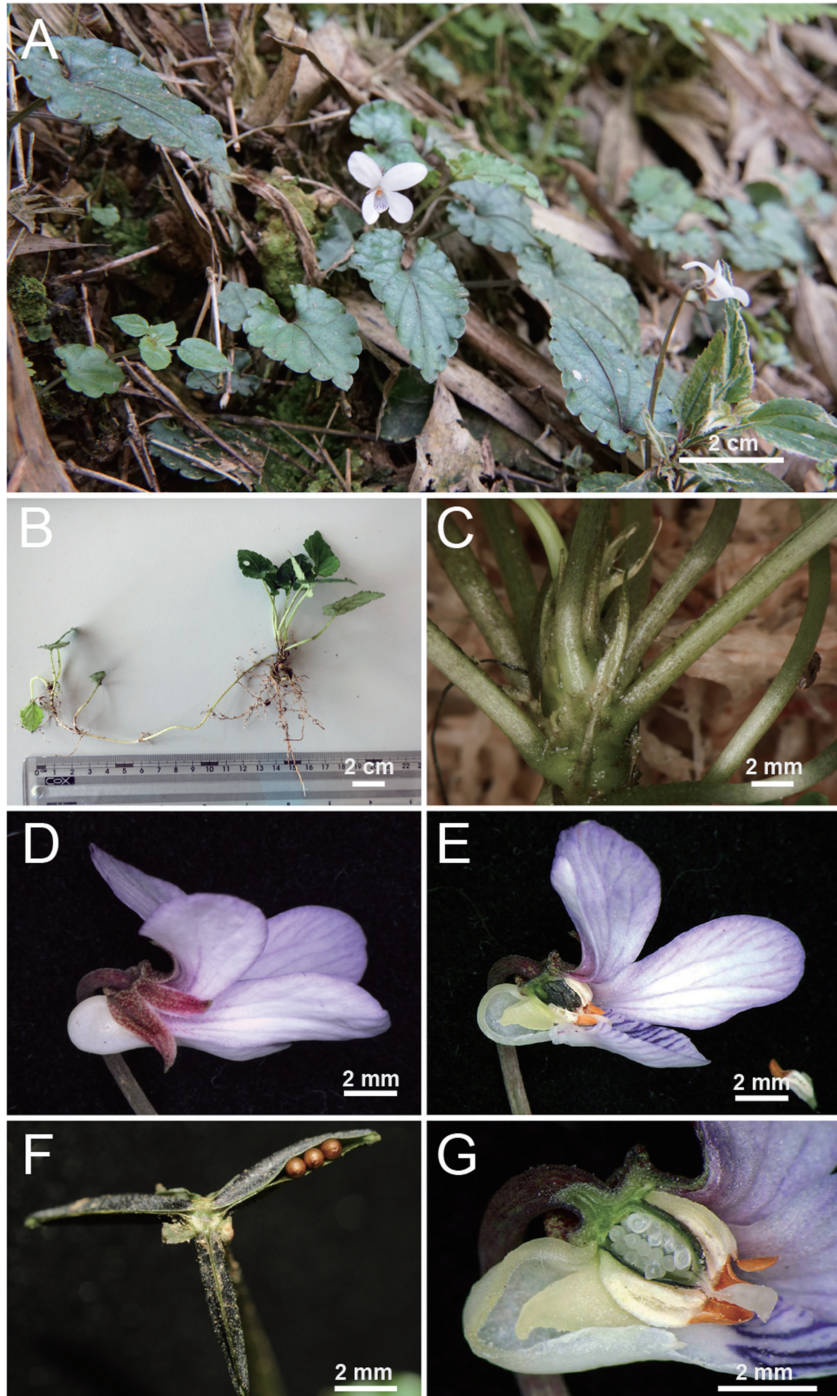


Fig. 2. *Viola kwangtungensis*. A, Habit; B, live plants with a long stolon; C, stipules; D, flower (lateral view), showing saccate spur; E, bisection of flower, showing stamens and nectariferous appendage; F, dehiscent capsule; G, bisection of flower, showing pistil and ovules.

raised, glabrous, abaxially grayish-green, usually purplish-red along veins, base cordate, margin crenate, 7~12-toothed on each side, teeth sub-orbicular, not spinose at apices. Flowers white or light-purplish; pedicels usually exceeding leaves, glabrous, 2-bracteolate above middle; bracteoles linear-triangular, ca. 6 mm. Sepals purplish-red, lanceolate, $3\sim 5 \times 1\sim 1.2$ mm, sparsely pubescent, basal auricles short, < 1 mm, apex truncate, sparsely shallowly dentate. Petals oblong-obovate, upper ones subequal to lateral ones, $9\sim 10 \times 4\sim 5$ mm, lateral ones glabrous, $8\sim 9 \times 4\sim 4.5$ mm, anterior one shorter, $7\sim 8 \times 3$ mm (spur included), distinctly violet striped, apex acute; spur saccate, short, 3~4 mm, stout, ca. 2 mm in diameter; nectariferous appendages of 2 anterior stamens, acutangular, ca. 2 mm, subequal to anthers. Ovary oblong-globose, glabrous; styles clavate, base slightly geniculate, gradually thickened upward; stigmas slightly raised at apex, thickened and narrowly margined on lateral sides, inconspicuously beaked at apex, with a small stigma hole open upward at tip of beak. Capsule ellipsoid, 6~9.5 mm long, glabrous. Seeds ca. 0.9 mm long.

Specimens examined: TAIWAN. Nantou County: Luku Township, elev. 1600 m, 31 May 2011, *Chen C.-H.*, *C.-M. Wang*, & *Y.-J. Hung 10556* (TNM); Chushan Town, Shanlinhsi, elev. 1350~1450 m, 29 May 2013, *Chen C.-H. 11099* (TNM). Chiayi County: Arisan [Alishan], inter Funkiko et Toroyen, 20 Jan. 1912, *Hayata & Sasaki s.n.* (TAIF, identified as *V. kawakamii* Hayata); Chuchi Township, Chuchi, elev. 1400~1500 m, 4 May 2011, *Chen C.-H.*, *C.-M. Wang*, & *Y.-J. Hung 10544* (TNM).

Distribution and habitat: *Viola kwangtungensis* is distributed in China and Taiwan. In China, its distribution is restricted to Fujian, N. Guangdong, Hunan, Jiangxi, and Sichuan Provinces (Chen et al. 2007, Chen and Yang 2008). So far, it is only known from 2 small

areas, Shanlinhsi, Nantou County and Funchihu, Chiayi County, in Taiwan (Fig. 3). It was found there along a trail, growing in shady soil on a slope under bamboo plantations, at elevations of 1300~1600 m. This area is situated in the montane zone with a humid microclimate due to being located in a cloud forest area. Its flowering period is from March to early May and fruiting period is from late March.

Discussion: Compared to other species in the *Viola* series Australasiaticae, *V. kwangtungensis* is closely related to *V. mucronulifera* Handel-Mazzetti. *Viola kwangtungensis* resembles *V. mucronulifera*, which both share the characteristic of a leaf margin that is spinose at the apices of teeth. However, in *V. kwangtungensis* the apices of the teeth are spinose, but in *V. mucronulifera* in between teeth is spinose (Fig. 4).

In Taiwan, *V. kwangtungensis* occurs sympatrically with *V. formosana* Hayata var. *kawakamii* (Hayata) Chen & Yang. These 2 species share glabrous leaves and similar vegetative bodies. If they are not flowering, it is difficult to distinguish them. Because of their similar habitats and vegetative bodies, *V. kwangtungensis* has been misidentified as *V. formosana* var. *kawakamii*; e.g., a specimen of *V. kwangtungensis* (e.g., *Hayata & Sasaki s.n.* collected from Alishan) was previously misidentified as *V. kawakamii* (= *V. formosana* var. *kawakamii*). However, *V. kwangtungensis* can be easily distinguished from *V. formosana* var. *kawakamii* by the following characteristics: leaf apex (obtuse vs. acute), the anterior petal (shortest, acute at the apex vs. longest, deeply emarginate or shallowly 2-lobed), spur (short, saccate, 3~4 mm vs. longer, cylindrical, 5~7 mm, slightly curved), and leaf margin (shortly spinose at apices of teeth vs. absent). Additionally, *V. kwangtungensis* also resembles *V. adenothrix* Hayata var. *adenothrix* and *V. nagasawae* Makino & Hayata var.

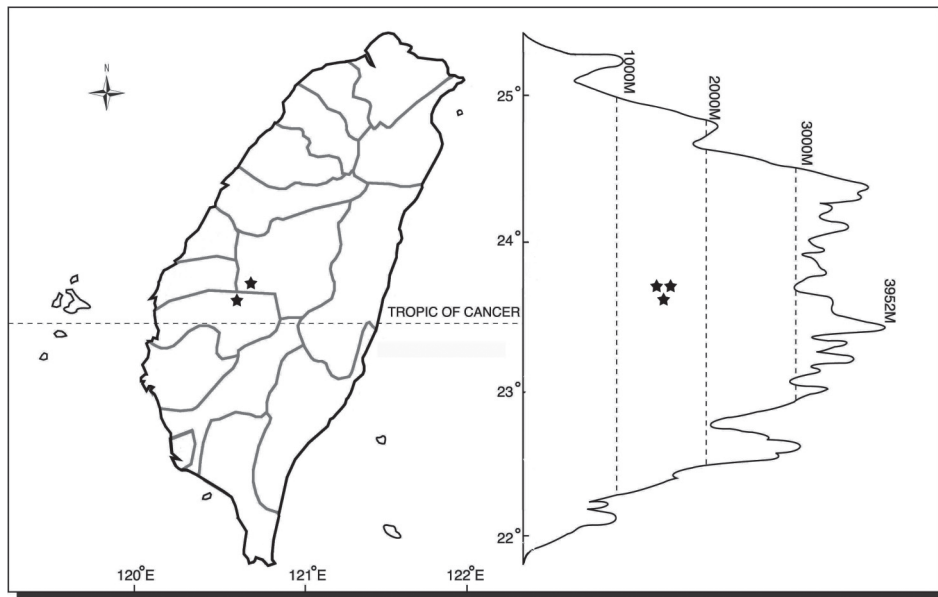


Fig. 3. Distribution map of *Viola kwangtungensis* in Taiwan. Each star represents a distribution location.

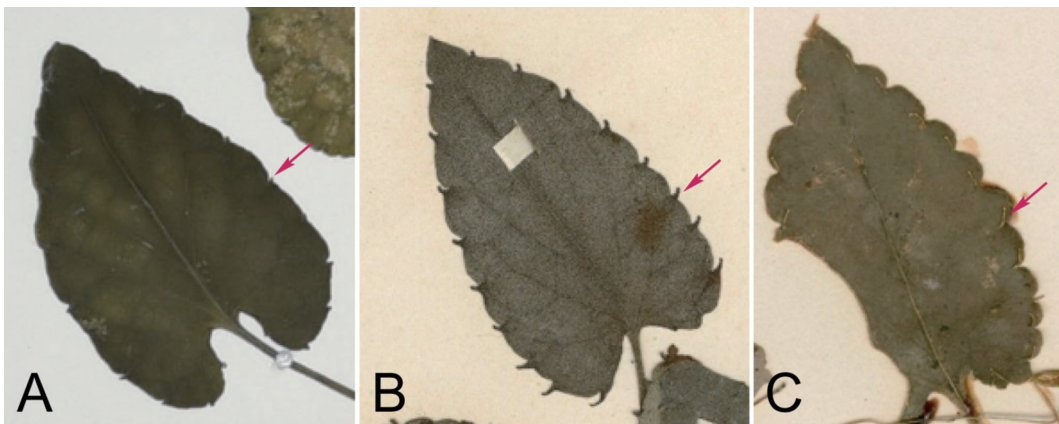


Fig. 4. Leaf margin comparison of *Viola kwangtungensis* and *V. mucronulifera*. A, *Viola kwangtungensis* (Taiwan) from C.-H. Chen 10831; B, *V. kwangtungensis* (China) from isotype S.P. Ko 50326; C, *V. mucronulifera* from isotype R.C. Ching 7016. Arrows indicate the spinose feature at the leaf margin.

pricei (W. Becker) Wang & Huang, because they grow in similar habitats. However, the former can be distinguished from the latter two by leaf texture (glabrous vs. hirsute) and leaf shapes (ovate to ovate-triangular vs. elliptical to elliptical-ovate or ovate-cordate,

and triangular-ovate to lanceolate). A detailed comparison of *V. kwangtungensis* with *V. adenothrix* var. *adenothrix*, *V. formosana* var. *kawakamii*, *V. nagasawae* var. *pricei* and *V. mucronulifera* is provided in Table 1.

Although we regarded this taxa as *V.*

Table 1. Morphological comparison of *Viola kwangtungensis* with *V. adenothrix* var. *adenothrix*, *V. formosana* var. *kawakamii*, *V. nagasawai* var. *pricei*, and *V. mucronulifera*

	<i>V. kwangtungensis</i> (population in Taiwan)	<i>V. kwangtungensis</i> ¹⁾ (China)	<i>V. adenothrix</i> var. <i>adenothrix</i> ³⁾	<i>V. formosana</i> var. <i>kawakamii</i>	<i>V. nagasawai</i> var. <i>pricei</i>	<i>V. mucronulifera</i> ²⁾
Stipules	margin sparsely short-fimbriate	margin long-fimbriate	margin fimbriate or laciniate	margin fimbriate or erose	margin sparsely fimbriate-laciniate	margin long fimbriate-dentate
Leaf blade	ovate to ovate-triangular, 2~4.5 × 1.5~3 cm	orbicular or sometimes reniform, 1~3 × 1~3 cm	elliptical to elliptical-ovate or ovate-cordate, 1~5 × 1~4 cm	broadly triangular-cordate, 1.5~4 × 1~4 cm	triangular-ovate to lanceolate, 1~3 × 1~2.5 cm	ovate-cordate, or elliptic-cordate, 2~5 × 1.5~3 cm
Leaf margin	crenate, inconspicuously shortly spinose in teeth	deeply mucronate-crenate, shortly spinose in teeth	shallowly crenate on margin, subdentate on lobes, teeth not spinose	crenate, teeth not spinose	crenate on margin, teeth not spinose	crenate, teeth suborbicular, conspicuously spinose at apices, spines spreading or bending forward
Leaf base	cordate	plane cordate	cordate with rounded basal lobes	cordate	broadly cordate	narrowly cordate
Sepal	sparsely pubescent, 3~5 × 1~1.2 mm; basal auricles short, < 1 mm	usually pubescent, 3~5 × 1.5~2 mm; basal auricles absent	sparsely pubescent, 3~7 × 1~1.5 mm; basal auricles ca. 0.5 mm	narrowly lanceolate, 3~5 × 0.5~1.5 mm	sparsely ciliate to almost entire on margin, 5~8 × 1~1.5 mm; basal auricles up to 0.5 mm	glabrous, ca. 5 × 1~1.2 mm; basal auricles short
Anterior petal (spur included)	7~8 × 3 mm, apex acute	ca. 9 mm, apex acute	apex emarginate; spurs 0.8~2 mm long	ca. 15 mm, apex deeply emarginate or shallowly 2-lobed	apex acute; spurs 1~1.5 mm long	ca. 11 × ca. 3 mm, apex acute

¹⁾ Description based on Melchior (1933) and Chen et al. (2007); ²⁾ Description based on Chen et al. (2007); ³⁾ Description based on Wang and Huang (1993).

kwangtungensis, individuals in Taiwan also slightly differ from individuals in China. For example, the leaf shape is ovate to ovate-triangular, base cordate, and leaf margin inconspicuously shortly spinose in teeth in the former, while the leaf shape is orbicular or sometimes reniform, base plane is cordate, and the leaf margin is obviously shortly spinose in teeth in the latter (Fig. 4). We consider that further study is required to elucidate their relationship.

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