

Notes on the Flora of Taiwan (23) — The Genus *Teucrium* L. (Lamiaceae)⁽¹⁾

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ABSTRACT : Three species of *Teucrium* L. (Lamiaceae), i. e., *T. bidentatum* Hemsl., *T. taiwanianum* T. H. Hsieh et T. C. Huang, sp. nov., and *T. viscidum* Bl. are described in this paper. SEM micrographs of pollen grains, chromosome counts, a key to species, species descriptions, and a distribution map are provided. The chromosome number of *T. taiwanianum* is $2n=64$, and of the others $2n=32$.

KEY WORDS : *Teucrium*, *Teucrium taiwanianum*, Taxonomy, Pollen morphology, Polyploid.

INTRODUCTION

The genus *Teucrium* L. comprises about 200 species with a cosmopolitan distribution (Abu-Asab and Cantino 1993; Kastner 1989). In Taiwan, Hemsley (1890) reported the first species (*Oldham 360*) from Formosa as *Teucrium stoloniferum* Roxb. which was a *nomen nudum*. Later, Kudo (1929) reidentified this plant as *T. viscidum* Bl. Because of the filaments of this species are twice as long as the corolla tube, Kudo (1929) segregated it from *Teucrium* and established a new genus, *Kinostemon*. Wu and Li (1977) followed this treatment with some modification. Recently, Kastner's broader concept of *Teucrium* (1989) is supported by Abu-Asab and Cantino (1993) from a palynological study. Kudo (1930) proposed a new combination *Kinostemon ningpoense* (Hemsl.) Kudo from *T. ningpoense* Hemsl., and reported the distribution of this species as from mainland China proper to Taiwan. Mori (1936) and Huang and Cheng (1978) followed this opinion. But, Wu and Li (1977) reported the presence of *Teucrium bidentatum* Hemsl. in Taiwan. According to Hemsley (1890), *T. ningpoense* differs conspicuously from *T. bidentatum* in having a large bract and in the anterior lip of the calyx being much more deeply bifid. The Taiwan plant is closer to *T. bidentatum* than to *T. ningpoensis*.

In addition, we found a new species belonging to Sect. *Isotriodon* Boiss. subsect. *Pycnobotrys* (Benth) Kastner (Kastner 1989), which occurs in Asia especially in mainland China. We propose a new name *T. taiwanianum* for this species, which is characterized by

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its long pedicel (4-5 mm), long calyx (8mm), large nutlets (1.5-1.6 mm long) and a chromosome number of $2n = 64$. From the above characters, it is different from the other species in this subsection in Taiwan and in mainland China. A revision of this genus in Taiwan is presented as follows.

MATERIALS AND METHODS

Both fresh materials collected in the field and herbarium specimens were examined and vouchers are deposited in the Herbarium of the Department of Botany, National Taiwan University (TAI), except for a few specimens indicated by the herbarium acronyms of their places of deposition.

Pollen grains were acetolysed according to the procedures outlined by Erdtman (1966). The acetolyzed grains were dehydrated in an ethanol series and dried using critical point drying. Dried grains were coated with gold and examined with SEM. The root tips were held in a solution of 0.002M 8-hydroxyquinoline for 3-4 hours at a temperature of 18-20°C, then fixed in 1:3 acetic ethanol overnight, then hydrolysed in pectinase and squashed in acetic orcein.

RESULTS

External morphology

The leaves of *T. taiwanianum* are usually purple on the lower surface, but the leaves of the other two are always green. The leaf apex of *T. bidentatum* is acuminate, but the other two are acute to obtuse.

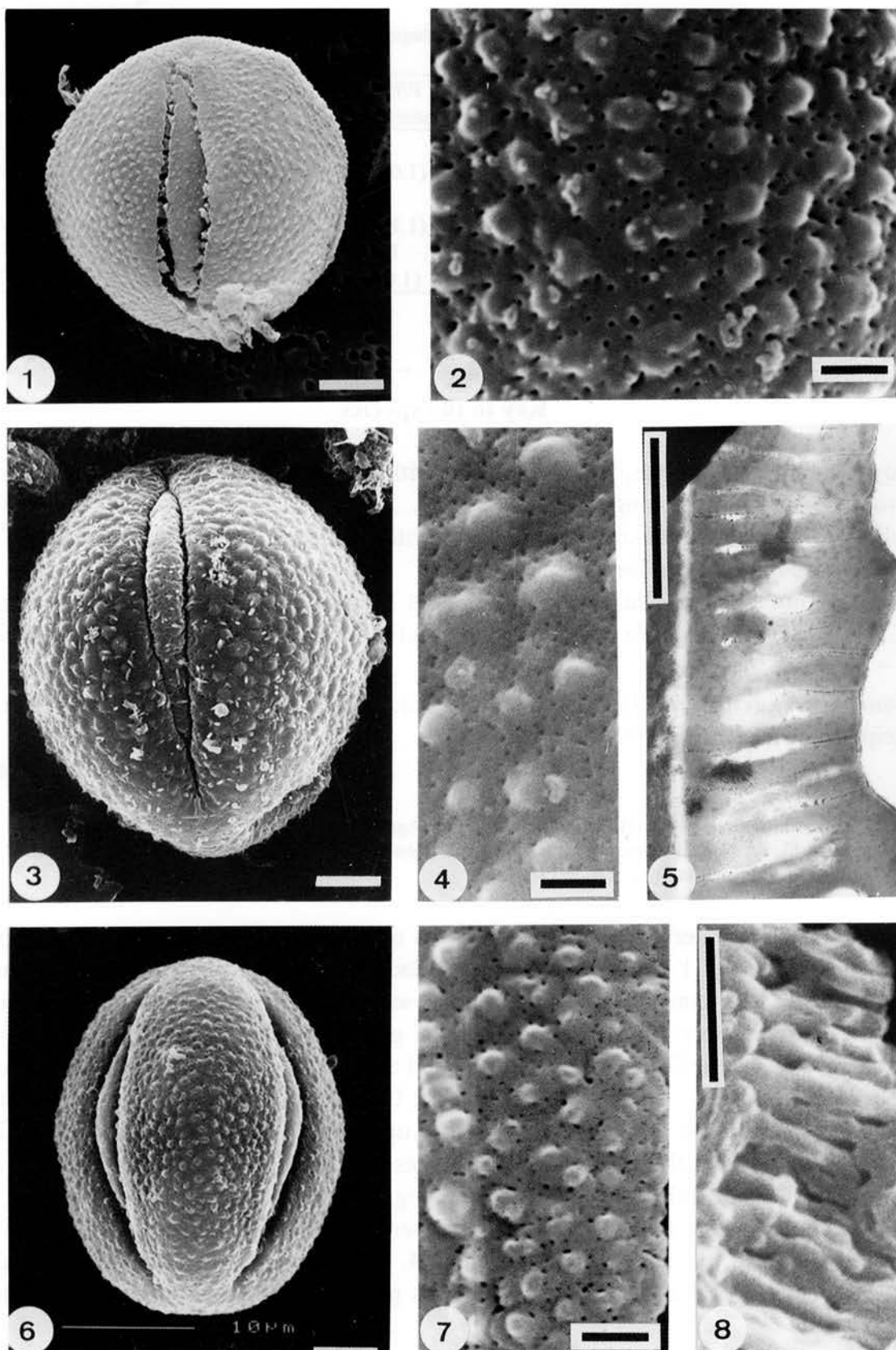
The three species also differ conspicuously in flower morphology. The corolla of *T. viscidum* is purple, but that of the other two are white. The calyx of *T. viscidum* is obscurely bilabiate, 3-4 mm long, densely glandular puberulent outside and glabrous inside; the calyx of the other two is distinctly bilabiate, over 5 mm long, scattered puberulent outside, with septate hairs on the throat forming a ring inside. It is easy to distinguish *T. bidentatum* and *T. taiwanianum*: the former with a calyx 5 mm long, the corolla 10 mm long, nutlets 1.2 mm long, and the latter with a calyx 8 mm long, the corolla 16-18 mm long, and nutlets 1.5-1.6 mm long.

Pollen morphology (Figs. 1-8, table 1)

Pollen grains of all three species are isopolar, tricolpate. The equatorial shapes of *T. bidentatum* and *T. viscidum* are spheroidal to prolate-spheroidal, but *T. taiwanianum* is subprolate. The operculum is present, the exine is tectate-perforate, with suprategal verrucae in all species. The columella is simple in *T. taiwanianum* (Fig. 5), but the columella is profusely branched in the other two species (Fig. 8).

Chromosome number

The chromosome number of *T. taiwanianum* is polyploid with $2n=64$ (Fig. 11). The other two species, *i. e.*, *T. bidentatum* (Fig. 9) and *T. viscidum* (Fig. 10), have a chromosome count of $2n=32$.



Figs. 1-4 and 7-8. SEM- micrographs and Fig. 5. TEM- micrographs of pollen grains of *Teucrium* from Taiwan (White scale bar = 5 μ m, black scale bar = 1 μ m). Figs. 1-2. *T. bidentatum* Hemsl. (K. C. Yang 2048); Figs. 3-5. *T. taiwanianum* T. H. Hsieh & T. C. Huang (*T. H. Hsieh* 1518) and Figs. 6-8. *T. viscidum* Bl. (*T. H. Hsieh* 1524). Figs. 1, 3 and 6. equatorial views. Figs. 2, 4 and 7. ornamentations of mesocolpia. Fig. 5. a portion of interstitium with the simple baculae. Fig. 8. a portion of interstitium with the branched baculae.

Table 1. Pollen size (μm) and shape of *Teucrium* in Taiwan

Characters Taxa	Polar axis mean (range)	Equatorial axis mean (range)	P/E ratio mean (range)	Shape	Voucher specimens
<i>T. bidentatum</i>	36.8 (35-40)	36.5 (35-37.5)	1.0 (1.0-1.07)	Spheroidal- prolate spheroidal	K. C. Yang 2048
<i>T. taiwanianum</i>	37 (32.5-42.5)	30.7 (27.5-35)	1.2 (1.16-1.3)	Subprolate	T. H. Hsieh 1518
<i>T. viscidum</i>	33.8 (30-37.5)	31.3 (27.5-35)	1.08 (1.0-1.1)	Spheroidal- prolate spheroidal	T. H. Hsieh 1524

Taxonomic treatment

Key to the species

1. Calyx distinctly bilabiate, 3-4 mm long, with dense glandular puberulence outside; corolla purple, 7-9 mm long 3. *T. viscidum*
1. Calyx obscurely bilabiate, over 5mm long, with scattered puberulence outside; corolla white, more than 10 mm long
 2. Calyx 5 mm long; corolla 10 mm long; nutlet 1.2 mm long 1. *T. bidentatum*
 2. Calyx 8 mm long; corolla 16-18 mm long; nutlet 1.5-1.6 mm long 2. *T. taiwanianum*

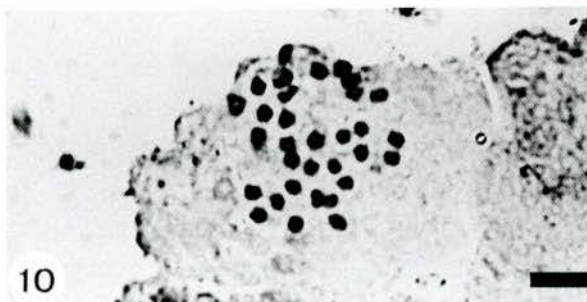
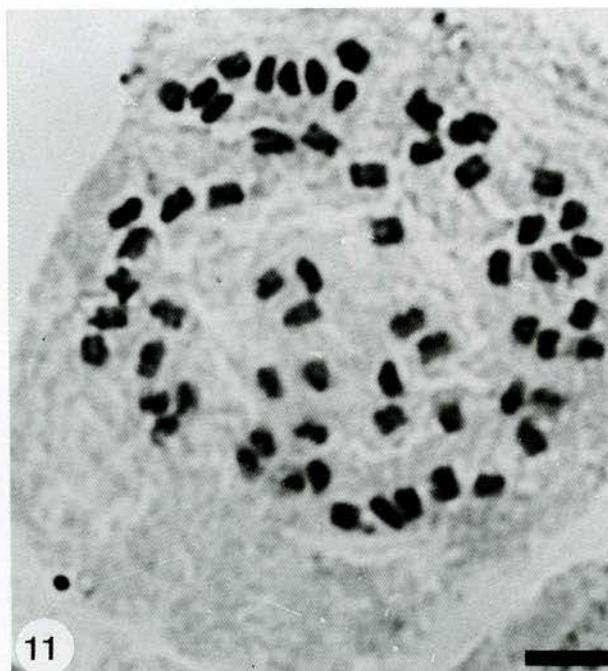
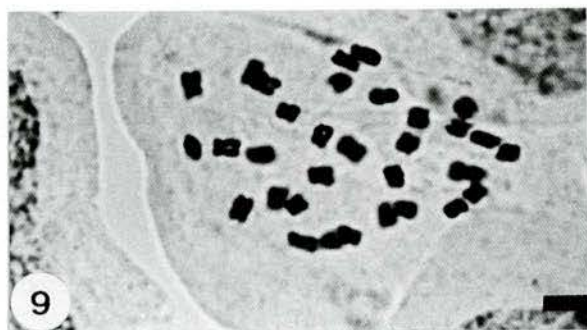
1. ***Teucrium bidentatum*** Hemsl. in Journ. Linn. Soc. Bot. 26: 312. 1890; Wu & Li, Fl. Reip. Sinic. 65 (2): 52. 1977.

Figs. 1, 2, 9, 14. 二齒香科科

Kinostemon ningpoense (Hemsl.) Kudo, in Trop. Agr. 2:146 1930. p. p. q. v. Pl. Taiwan; Mori, Short Fl. Form. 182. 1936; Huang et Cheng, Fl. Taiwan 4: 472. 1978. *Teucrium ningpoense* auct. non Hemsl.: Kudo in Trop. Agr. 2: 146. 1930.

A perennial erect herb, 40-60 cm tall. Stem quadrangular, pubescent. Leaves opposite, chartaceous; petiole to 1 cm long, pubescent; blade elliptic, 2.5-9 cm long, 1-2.5 cm wide, apex acuminate, base cuneate to obtuse, margin serrate, upper surface glabrous or minutely pubescent, lower surface pubescent on veinlets, gland-dotted. Flowers 2, in a false whorl, opposite; raceme-like inflorescences terminal and axillary, to 3 cm long; leafy bracts elliptic, both surfaces pubescent. Pedicels 3-4 mm long. Calyx campanulate, bilabiate, 5 mm long, with septate hairs in the throat forming a ring; upper lip 3-lobed, middle lobe the largest, broadly ovate, concave; the two lateral lobes transversely oblong; lower lip 2-lobed, adnate to 2/3 of lip. Corolla bilabiate, ca. 10 mm long, white; upper lip deeply bilobed, lobes oblique triangular, apex obtuse, connate to lower lip; lower lip 3-lobed, middle lobe the largest, boat shaped, ca. 3 mm long. Stamens 4, didynamous, exserted. Nutlets shallowly ridged, globose, ca. 1.2 mm long, covered with glandular granules. Chromosome number $2n=32$.

Hsinchu: Kwanwu, T. C. Huang 4100, K. C. Wang s. n. May 6. 1992. **Taichung:** Lishan, K. C. Yang 2048; Hsuehshan, Shimada 2495A. **Nantou:** Between Kwankao and Tungpu, T. C. Huang 8596; between Loloku and Kwankao, S. F. Huang et al. 5261. **Hualien:** Sakahen, S. Sasaki s. n. Aug 21. 1929; Tienchang, Suzuki 1786. **Kaohsiung:** Neiyingshan, T. Suzuki 20936. **Taitung:** Tienlong Bridge, Huang 3 (TNU).



Figs. 9-13. Somatic chromosomes: Fig. 9. *Teucrium bidentatum* Hemsl., Fig. 10. *T. viscidum* Bl. and Fig. 11. *T. taiwanianum* T. H. Hsieh & T. C. Huang. Scale bar = 5 μ m; Figs. 12-13. Habit of *T. taiwanianum* T. H. Hsieh & T. C. Huang.

2. **Teucrium taiwanianum** T. H Hsieh et T. C. Huang, *sp. nov.*

Figs. 3-5, 11-15. 臺灣香科科

Haec species Teucrio omeiensi Sun ex Chow similis est, sed ab ea characteribus sequentibus differt: pedicellis longioribus (4-5 neque 2 mm), calyce longiore (8 neque 6 mm), nucula longiore (1.5-1.6 neque 1.3 mm) atque ratione dimidio neque duabus tertiis partibus inter cicatricem nuculamque.

Herba perennis, stolonifera, obscure puberula, pedicellis gracilibus puberulibus, 4-5 mm longis. Calyx bilabiatus, ca. 8 mm longus, labio superiore tridentato, dente medio cordati-acuto, inferiore bilobato, triangulare. Corolla alba, 16-18 mm longa; nuculae globosae, 1.5-1.6 mm longae. Chromosomatum numerus $2n=64$.

This species is similar to *Teucrium omeiense* Sun ex S. Chow, but differs as follows (*T. omeiense* measurements in parentheses): pedicel length 4-5 mm (2 mm), calyx length 8 mm (6 mm), nutlet size, 1.5-1.6 mm (1.3 mm) and the size ratio between the scar and nutlet 1/2 (2/3).

A perennial erect herb, 20-60 cm tall. Rhizomes creeping, stoloniferous. Stems quadrangular, purple, pubescent, with recurved purple hairs. Leaves opposite, chartaceous; petioles 0.5-1.3 cm long, with pubescent recurved hairs; blade elliptic, 2.5-4 cm long, 1.2-2.0 cm wide, apex acute or broadly acute, base acute or cuneate, decurrent into petiole, margin simple or double serrate, both surfaces scattered recurved hairs; lower surface gland-dotted, usually purple. Flowers 2, in a false whorl, opposite; raceme-like inflorescences terminal, 3-7 cm long. Bracts elliptic 4-10 mm long, puberulent. Pedicels 4-5 mm long, recurved pubescent. Calyx campanulate, bilabiate, 8 mm long, with puberulent sparsely recurved hairs along veins outside, with septate hairs in the throat forming a ring inside; upper lip 3-lobed, middle lobe largest, broadly cordate-deltoid, concave, acuminate at apex, *ca.* 3 mm long, *ca.* 4 mm wide, lateral lobes triangular, acute, 1.5 mm long; lower lip 2-lobed, triangular, acute, *ca.* 3 mm long. Corolla bilabiate, 16-18 mm long, white; upper lip deeply bilobed, lobes narrowly triangular, apex acuminate, puberulent, *ca.* 3 mm long, connate to lower lip; lower lip 3-lobed, middle lobe largest, boat-shaped, *ca.* 5 mm long. Stamens 4, didynamous, exserted. Nutlets shallowly ridged, globose, 1.5-1.6 mm long, covered with glandular granules. Chromosome number $2n=64$.

Endemic, Meyfong, Nantou Hsien, growing along forest edge at altitudes of 2100-2200 m; flowering time from August to September.

Nantou: Meyfong, T. H. Hsieh 1518 (Holotype, isotypes, TAI), C. I. Peng 15146 (HAST), T. G. Lammers 8461 (HAST).

3. **Teucrium viscidum** Bl., Bijdr. Fl. Ned. Ind. 827. 1825; Kudo, in Mem. Fac. Sci. Agr. Taihoku Imp. Univ. 2: 295. 1929; Wu & Li, Fl. Reip. Sinic. 65 (2): 31. 1977

Figs. 6-8, 10, 14. 血見愁

Teucrium stoloniferum Roxb. [Hort. Beng. 44. 1814. *nom. nud.*] ex Hemsl. in Journ. Linn. Soc. Bot. 26: 314. 1890; Henry, List Pl. Form. n. 813. 1896; Matsum. et Hayata in Journ. Coll. Sci. Univ. Tokyo 22: 318. 1906.

Teucrium miquelianum auct. non (Maxim) Kudo: Mori in Masamune, Short Fl. Form. 182. 1936.

A perennial erect herb, 20-60 cm tall. Rhizomes creeping, stoloniferous. Stems quadrangular, with puberulent recurved hairs. Leaves opposite, chartaceous; petioles 1-3 cm

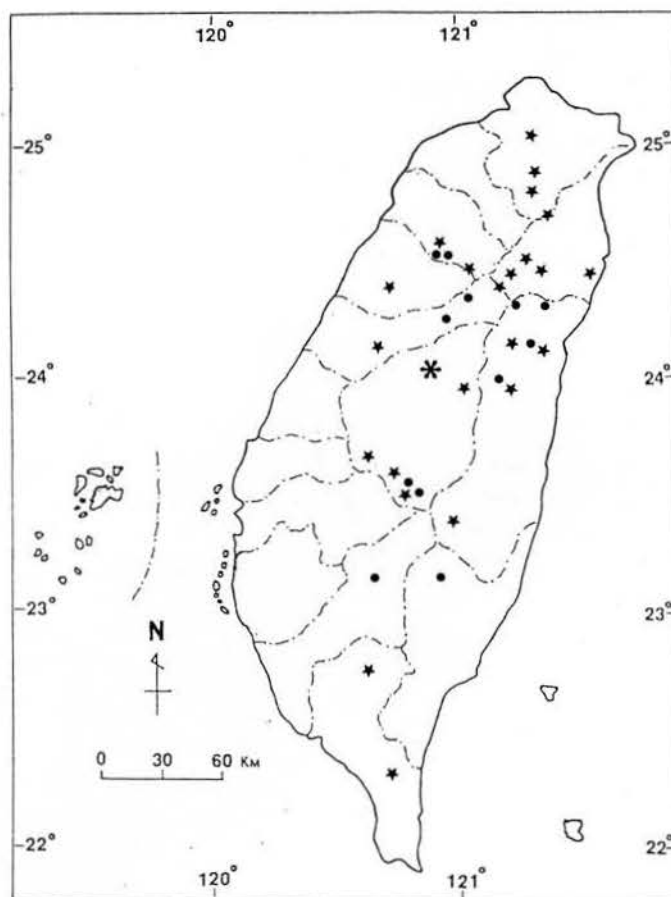


Fig. 14. Distribution of *Teucrium* in Taiwan. ● : *T. bidentatum* Hemsl. * : *T. taiwanianum* T. H. Hsieh & T. C. Huang. ★ : *T. viscidum* Bl.

long, with pubescent recurved hairs; blade ovate, 4-7 cm long, 2-4 cm wide, apex acute or broadly acute, base cuneate to rounded, margin simply or doubly crenate-serrate, both surfaces with pubescent scattered hairs. Flowers 2, in a false whorl, opposite; raceme-like inflorescences terminal or axillary, 3-10 cm long; rachis densely short pubescent. Bracts linear-lanceolate, acuminate, 3-5 mm long, puberulent. Pedicels *ca.* 1 mm long, puberulent. Calyx campanulate, slightly bilabiate, 3-4 mm long, densely glandular puberulent outside, 5-lobed; upper 3 lobes deltoid-ovate to triangular, *ca.* 1 mm long, lower 2 narrowly ovate, *ca.* 1.5 mm long. Corolla bilabiate, 7 - 9 mm long, purple; upper lip deeply bilobed, lobes narrowly ovate, obtuse, connate to lower lip; lower lip *ca.* 4 mm long, 3-lobed, middle lobe largest, boat-shaped. Stamens 4, didynamous, exserted. Nutlets shallowly ridged, globose, 1.2-1.4 mm long. Chromosome number $2n = 32$.

Japan, Korea, C. to S. China, Taiwan, Indochina, the Philippines, Malaysia and India.

Taipei: Wenshan, *T. Suzuki* 15455; Wulai, *T. H Hsieh* 1524. **Ilan:** Wutatsun to Riyohen, *T. Suzuki* 7568; Tuchang, *Chang s. n.* Aug 4. 1944. **Hsinchu:** Kwanwu, *T. C. Huang* 4108; Tapachienshan, *C. S. Kuoh* 3249. **Miaoli:** Tahu, *Hayata et Mori s. n.* Aug 1. 1908 (TAIF). **Taichung:** Syasi, *Sasaki s. n.* Dec 13. 1923 (TAIF). **Nantou:** Tungpu to Tentzu, *Huang* 5700; Kuantaochi, *C. S. Kuoh* 4281; Tailukotashan, *T. Suzuki* 10938; Wallami, *Chiang* 15. **Pingtung:** Santimen, *Hosokawa* 5455; Shouka, *Chen* 840 (HAST).



Fig. 15. Illustration of *Teucrium taiwanianum* T. H. Hsieh & T. C. Huang. 1. Habit; 2. Leaf; 3. Calyx; 4. Flower; 5. Portion of anther; 6. carpel; 7. Nutlets.

DISCUSSION

According to Abu-Asab and Cantino (1993), the columellae found in interstitium of the pollen wall of *Teucrium* (including *T. bidentatum*) are profusely branched (Fig. 8), which is the condition found in a number of genera traditionally indicated the Verbenaceae. The

columella of *T. taiwanianum* is simple unbranched (Fig 5), which is the common condition in Lamiaceae. We can use this character to distinguish *T. taiwanianum* and *T. bidentatum*. The discovery of unbranched columella in *T. taiwanianum* casts some doubt on the value of this character as one of the generic criteria of the genus *Teucrium*.

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臺灣植物誌之觀察(23) — 香科科屬(唇形科)⁽¹⁾

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摘 要

本文訂正臺灣產香科科屬植物為3種，分別為二齒香科科 (*Teucrium bidentatum* Hemsl.)，臺灣香科科 (*T. taiwanianum* T. H. Hsieh & Huang, *sp. nov.*) 和血見愁 (*T. viscidum* Bl.)。臺灣香科科的花梗長度 5 mm，花萼大小 8 mm，小堅果大小 1.5~1.6 mm 明顯大於東亞的本屬其它種類，並報導其為多倍體，染色體 $2n=64$ 。文中比較3種的外部形態、花粉特徵、染色體數目和地理分佈等特徵，並提供檢索表做為鑑定之用。

關鍵字：香科科屬、唇形科、分類訂正、臺灣香科科、花粉形態、多倍體。

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