

Pouzolzia taiwaniana (Urticaceae), a new species from Taiwan

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ABSTRACT. *Pouzolzia taiwaniana*, a new species from southern Taiwan, is described and illustrated. Somatic chromosome number ($2n = 28$) is here reported. *Pouzolzia taiwaniana* resembles *P. tuberosa* Wight in having tuberous roots, but differing in being a much smaller plant, usually less than 30 cm (vs. 30-180 cm) long, leaves 1-2 cm (vs. 2.5-7.5 cm) long, cordate or broadly ovate (vs. elliptic-lanceolate), basal lateral veins reaching the middle part of leaf margin (vs. reaching leaf apex). *Pouzolzia taiwaniana* was first discovered in a forested watershed area in 1990. It then comprised only a handful of individuals on a moist shady rocky slope. Unfortunately, the habitat was subsequently destroyed by landslides accompanying typhoons that hit Taiwan. In 2011 it was rediscovered in a landscape reserve 30 km south of where it was first collected. *Pouzolzia taiwaniana* is endemic to Taiwan. The only known extant population is on a mudstone slope that is prone to erosion and landslides. The area of distribution is approximately $50 \times 10 \text{ m}^2$ and contains less than 100 plants. According to IUCN Red List criteria, *P. taiwaniana* is considered to be Critically Endangered.

Keywords: Chromosome number; New species; *Pouzolzia taiwaniana*; *Pouzolzia tuberosa*; Rare species; Taiwan; Taxonomy; Urticaceae.

INTRODUCTION

The genus *Pouzolzia* Gaudich. (tribe *Boehmerieae*, Urticaceae) consists of 35 species and 15 infraspecific taxa (Wilmot-Dear and Friis, 1996). Two species, *P. elegans* Wedd. and *P. zeylanica* (L.) Benn., were recorded in Flora of Taiwan, 2nd ed. (Yang et al., 1996). *Pouzolzia elegans* has since been treated at varietal rank under *P. sanguinea* (Blume) Merr. because there are intermediates in leaf shape and leaf margin characters in plants from Taiwan, Yunnan, and Nepal, and there is only partial geographic separation from *P. sanguinea* (Chen et al., 2003). In this paper we report the discovery of a new species of *Pouzolzia* from two localities in southern Taiwan. A careful study of the literature, herbarium specimens and plants grown in the experimental greenhouse supports its recognition as a new species, which we name *Pouzolzia taiwaniana*.

MATERIALS AND METHODS

Living materials of *Pouzolzia taiwaniana* were collected from Taiwan. Type specimens have been preserved in the Herbarium of Academia Sinica, Taipei (HAST) and the Taiwan Forestry Research Institute (TAIF).

Scanning electron microscopy

Fruiting perianth and achenes were mounted on a specimen stub and observed using a scanning electron microscope with an accelerating voltage of 15 KV (Hitachi TM 3000) at the Taiwan Forestry Research Institute. A voucher specimen (Peng et al. 23133) is deposited at HAST.

Chromosome preparation

Somatic chromosomes were examined using root tips from plants of the type collection. Root tips were pretreated in 2 mM 8-hydroxyquinoline solution at 15-18°C for 6-8 h, then fixed overnight in a 3:1 ethanol-acetic acid solution below 4°C. Chromosomes were macerated and stained in 2% acetic orcein with 1N hydrochloric acid (10:1) and observed. Classification of chromosome morphology is based on the position of the centromere following Levan et al. (1964). A voucher specimen (Peng et al. 23133) is deposited at HAST.

NEW SPECIES

Pouzolzia taiwaniana C.-I Peng & S. W. Chung, sp. nov.
— TYPE. TAIWAN. Kaohsiung Hsien, Liukuei District, Shihbaluohanshan (十八羅漢山, literally, 'Eighteen-Buddhist-Disciple Peaks'), scattered on mudstone-rich slope by a stream in a badland region, E120° 38'32", N22° 56'19", ca. 235 m alt., 7 July 2011, Ching-I Peng

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23133, accompanied by Chien-I Huang, Shih-Wen Chung, Tien-Chuan Hsu & Li-Hsien Yang (holotype: HAST; isotypes: PE, TAIF). 台灣霧水葛

Figures 1, 2

Description. Herbs, perennial, matted creeping, laxly branched from tuberous rootstock. Tubers oblong, to ca. 1.6 cm long, 9 mm across. Stems ca. 0.7-1 mm in diameter, densely white tomentose, becoming glabrescent,

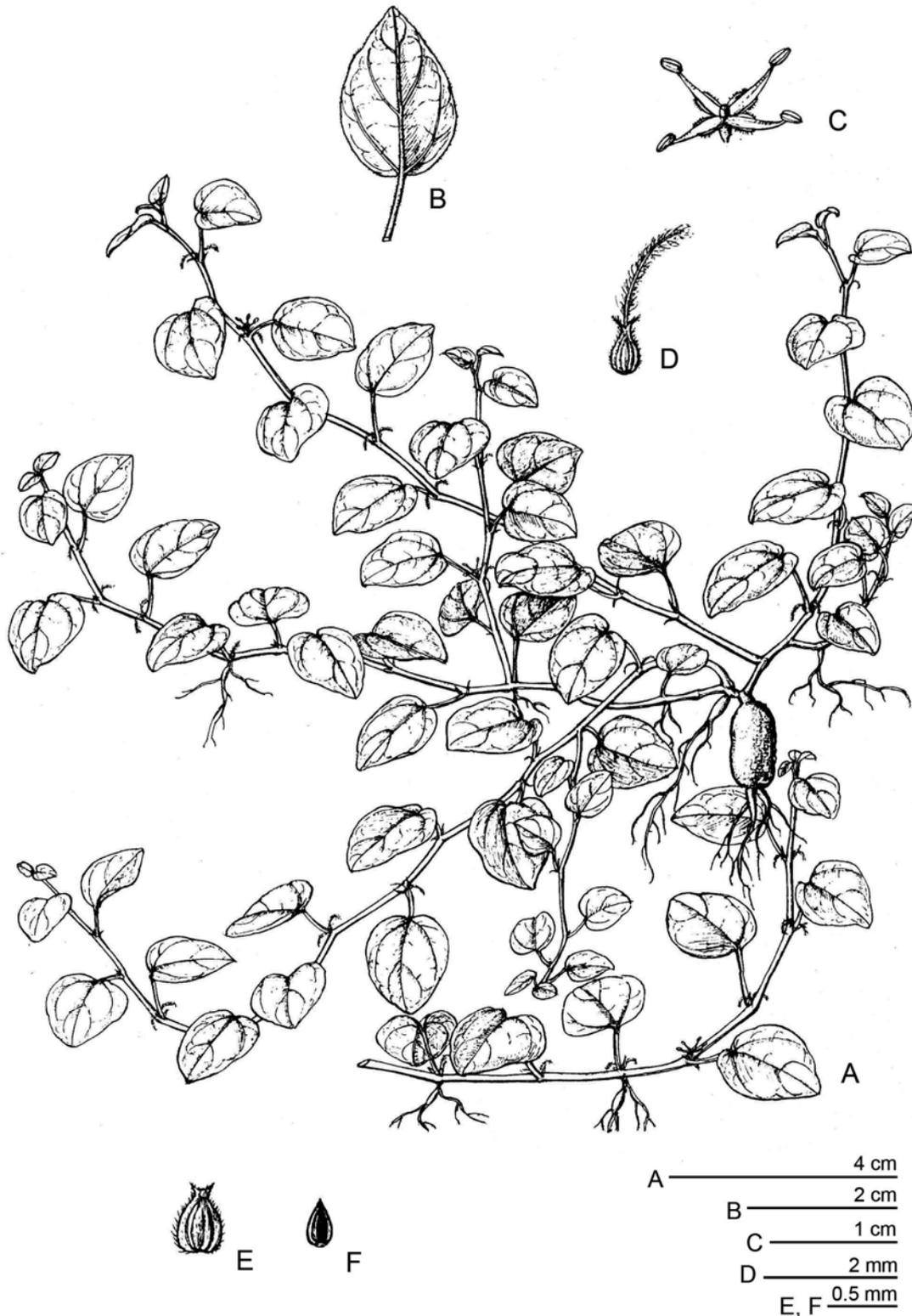


Figure 1. *Pouzolzia taiwaniana* C.-I Peng & S. W. Chung. A, Habit; B, Leaf; C, staminate flower; D, Pistillate flower; E, Fructing perianth; F, Achene.

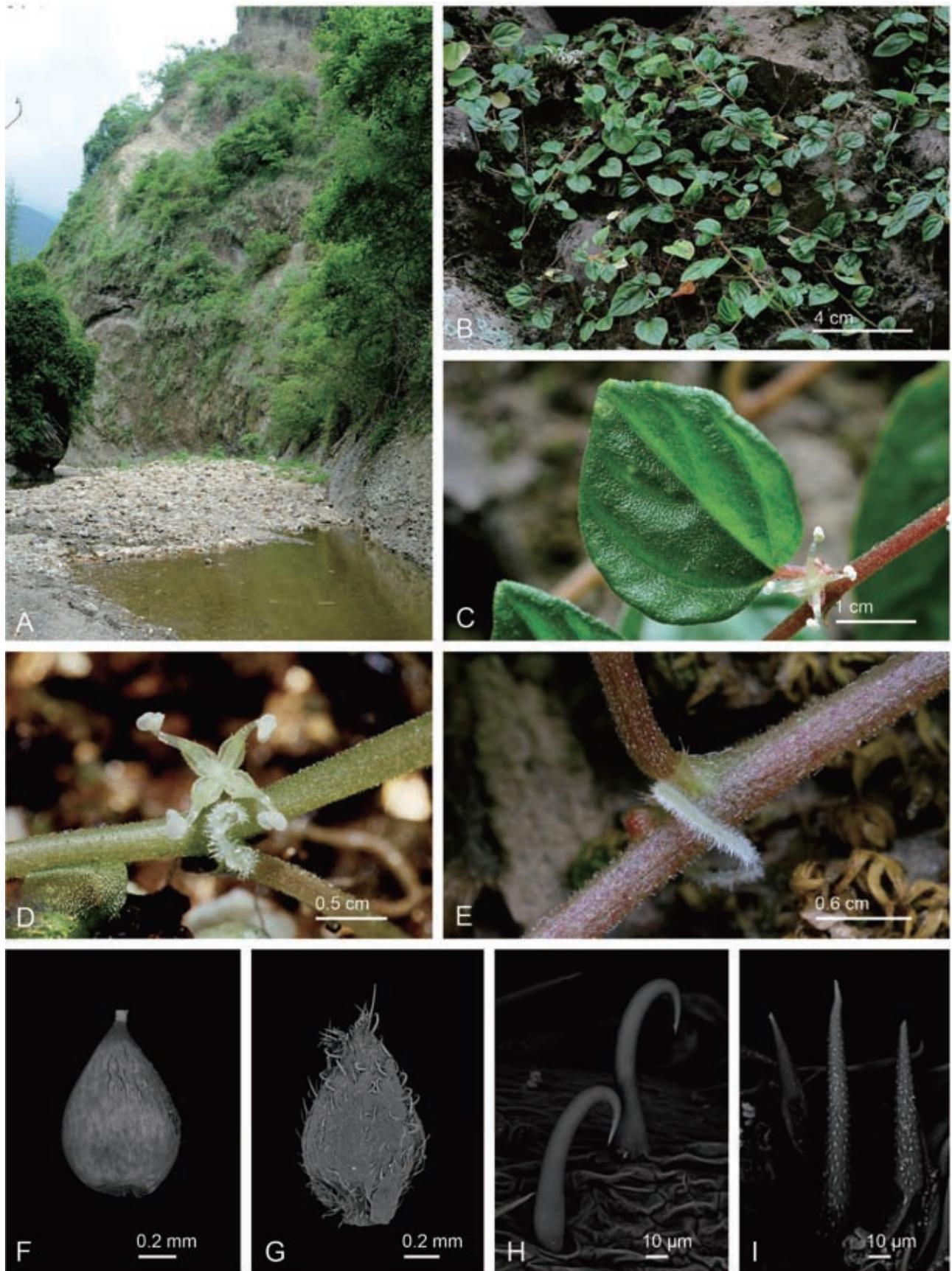


Figure 2. *Pouzolzia taiwaniana* C.-I Peng & S. W. Chung. A, Habitat; B, Habitat and habit; C, Portion of stem showing leaves and a staminate flower; D, Portion of a branch showing staminate and pistillate flowers; E, Portion of a branch showing a flower bud and a filiform stigma; F, achene; G, Fructing perianth; H, Uncinate-tipped hairs on perianth; I, Straight hairs on perianth.

rooting freely at nodes, forming secondary tubers where rooting. Leaves membranaceous, alternate, blade cordate or broadly ovate, 1-2 cm long, 0.9-1.5 cm wide, base rounded to cordate, margin entire, apex subacute, 3-nerved from base; basal pair of lateral veins rising to about half leaf length; upper lateral veins 1 or 2 on each side of midvein, alternate, venation impressed adaxially, elevated abaxially; upper surface puberulous, lower surface glabrous, veins sparsely puberulous; petioles reddish, 3-9 mm long, puberulous; stipules triangular, ca. 2 mm long, 1 mm wide, sparsely brownish puberulous. Inflorescence axillary fascicles of 1-4 flowers, staminate and pistillate flowers in the same cluster; subtending bracteoles triangular, ca. 0.8 mm long. Staminate flowers ca. 8-10 mm across, perianth lobes 4, greenish white, sometimes reddish; mature buds globose, sparsely puberulous. Pistillate flowers: perianth tubular, often ovoid, beaked, apex 2-toothed; stigma filiform, 2.2-2.4 mm long. Fruiting perianth ovoid, ca. 1 mm long, 0.6 mm across, covered with intermixed straight hairs and uncinately-tipped hairs (Figure 2: F-I, SEM images). Fruits ovoid, ca. 1 mm long, 0.6 mm wide, surface glabrous, beaked apically. Somatic chromosome number, $2n = 28$.

Additional specimens examined. TAIWAN. Tainan Hsien, Nanhxi Hsiang, watershed area of Tsengwen Dam, along a trail from bridge #4, moist, shady slope, E120° 30'0", N23° 14'19", elev. 160 m, 10 Aug 1990, *Ching-I Peng 13423* (HAST). Kaohsiung Hsien, Liukuei District, Shihpalohanshan, E120° 38'32", N22° 56'19", ca. 235 m alt., 7 July 2011, *Shih-Wen Chung 10389* (TAIF).

Habitat, distribution and IUCN Red List category. *Pouzolzia taiwaniana* was first discovered by Ching-I Peng in a forested watershed area at a dam in Tainan Hsien during a field survey in 1990. The population consisted of only a handful of individuals on a moist shady rocky slope. Unfortunately, the habitat was subsequently destroyed by landslides accompanying typhoons. Subsequent attempts to relocate *P. taiwaniana* failed, but in 2011, guided by Mr. Li-Hsien Yang, an amateur plant enthusiast, we discovered a population in a landscape reserve in Kaohsiung Hsien ca. 30 km south of where it was first discovered (Figure 3). The plants occurred scatteredly on a semishaded mudstone-rich slope by a stream in a badland region.

Pouzolzia taiwaniana is endemic to Taiwan. Although it is located within a protected area for landscapes, the only extant habitat is a mudstone slope that is prone to erosion and landslides. The area of distribution is approximately $50 \times 10 \text{ m}^2$ and contains fewer than 100 plants. According to IUCN Red List criteria, *P. taiwaniana* is considered to be Critically Endangered (IUCN, 2001).

Morphological comparison. *Pouzolzia taiwaniana* resembles *P. tuberosa* Wight from India in the tuberous roots, but differs in being a much smaller, prostrate plant, usually with stems less than 30 cm (vs. 30-180 cm) long, leaves 1-2 cm (vs. 2.5-7.5 cm) long, base cordate or broadly ovate (vs. elliptic-lanceolate), basal lateral veins reaching the middle of the leaf (vs. reaching leaf apex).

To aid in identification, we provide the following key to distinguish the species of *Pouzolzia* in Taiwan.

1. Shrubs or small trees; leaves serrate1. *P. sanguinea*
1. Herbs or subshrubs; leaves entire.
 2. Herbs, prostrate and rooting on nodes; leaves alternate, cordate or broadly ovate..... 2. *P. taiwaniana*
 2. Herbs, ascending, or subshrubs; leaves opposite and alternate, ovate to lanceolate3. *P. zeylanica*

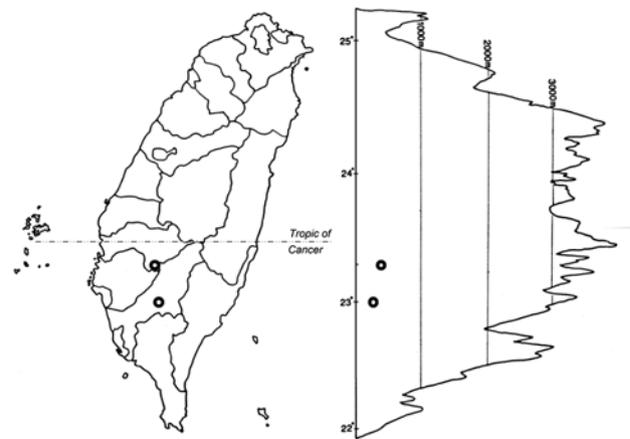


Figure 3. Latitudinal and altitudinal distributions of *Pouzolzia taiwaniana* (circles) in Taiwan.

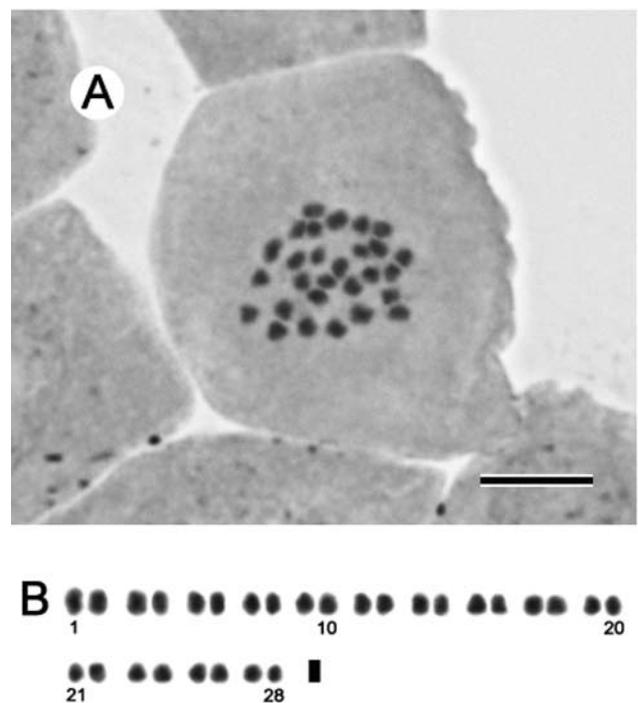


Figure 4. Somatic chromosomes at mitotic metaphase of *Pouzolzia taiwaniana* C.-I Peng & S. W. Chung ($2n = 28$, from Peng et al. 23133, HAST). A, Microphotograph. Scale bar = 5 μm ; B, Somatic chromosomes serially arranged by their chromosome length and the centromeric position. Scale bar = 2 μm .

Chromosome cytology. Our study of somatic chromosomes of *Pouzolzia taiwaniana* revealed $2n = 28$ (Figure 4). The 28 chromosomes at mitotic metaphase gradually varied from ca. 1.6 to 2.2 μm long. Most chromosomes appeared to be metacentric, however, the exact centromere position of several shorter chromosomes could not be determined. Satellites were not observed.

In Taiwan, two species of *Pouzolzia*, *P. elegans* and *P. zeylanica*, were previously recognized (Yang et al., 1996). The chromosome number of *P. zeylanica* from southern India was reported as $n = 12$ and $2n = 24$ (Subramanian and Thilagavathy, 1988). *Pouzolzia taiwaniana* differs not only morphologically, but also in chromosome number from *P. zeylanica*.

Chromosome numbers of $n = 10, 11, 12, 13, 16, 26$ and $2n = 20, 22, 24, 26, 48$ from eight species of *Pouzolzia* have been reported by Sharma (1970), Sharma and Mehra (1977, 1979) and Subramanian and Thilagavathy (1988). Our finding of $2n = 28$ in *P. taiwaniana* is the first report of this number for the genus. In previous reports, the species of *Pouzolzia* showed a serial variation in chromosome number. Therefore, the basic chromosome number (x) of *Pouzolzia* cannot be determined.

Notes. One may be forgiven for thinking that Taiwan's flora is completely described given the currency of the two editions of Flora of Taiwan (1975-1979; 1994-2003) complemented by the Supplement to the Flora of Taiwan, 2nd ed. (Wang and Lu, 2012). The last treats nearly 300 species up to 2009. A cursory search of recent literature, however, indicates that considerable taxonomic diversity is still being discovered and described; e.g., new species in Rosaceae: *Cotoneaster rosiflorus* and *C. chingshuiensis* (Chang et al., 2011a, b); Zingiberaceae: *Alpinia oui* (Tseng and Wang, 2011); Asparagaceae: *Maianthemum harae* (Chao et al., 2012); Gentianaceae: *Tripterospermum hualiense* (Hsu and Chung, 2012); four new species of Orchidaceae (Lin and Lin, 2011); new generic records for Taiwan in Melanthiaceae (*Ypsilandra*: Hsu et al., 2011) and Orobanchaceae (*Phacellanthus*: Chung et al., 2011). As can be seen, these novelties (including *Pouzolzia taiwaniana* reported here) are not restricted taxonomically, nor are they in life form or ecologically, ranging from seaside to alpine locations. While isolated limestone areas are relatively underexplored and understudied and are a priority, much taxonomic work remains even in this well studied flora.

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臺灣蕁麻科新種植物：台灣霧水葛

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本文發表臺灣南部發現的蕁麻科新種植物：台灣霧水葛 (*Pouzolzia taiwaniana*)，並報導其染色體數目 ($2n = 28$)。此新種之形態略似印度產的塊莖霧水葛 (*P. tuberosa*)，二者雖都具塊莖，但新種的植株甚小，匍匐而多分支，莖長可達 30 cm，葉長 1-2 cm，葉基心型或闊卵形，葉基側脈向上及於葉緣中部；塊莖霧水葛植株長可達 30-180 cm，葉長 2.5-7.5 cm，葉橢圓至披針形，葉基側脈向上延伸至葉尖，明顯可以區別。本文除提供台灣霧水葛之線繪圖、彩色圖版以及分布圖檢索表，並製作臺灣產本屬三種植物的檢索表以利辨識。台灣霧水葛族群數量極為稀少，且其生育地為甚不穩定的惡地石礫陡坡，容易受害，根據國際自然保育聯盟 (IUCN) 的評估準則，本種應列為嚴重瀕臨絕滅等級。

關鍵詞：染色體數目；新種；台灣霧水葛；塊莖霧水葛；稀有植物；臺灣；分類學；蕁麻科。