Taiwania, **45**(2): 131-146, 2000

Revision of *Mazus* Lour. (Scrophulariaceae) in Taiwan

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(Manuscript received 28 March, 2000; accepted 10 May, 2000)

ABSTRACT: The genus *Mazus* Lour. (Scrophulariaceae) in Taiwan is revised based on comparative morphological, palynological, and cytological studies. Six species, *Mazus alpinus* Masamune, *M. fauriei* Bonati, *M. goodenifolius* (Hornem.) Pennell, *M. miquelii* Makino, *M. pumilus* (Burm. f.) Steenis, and a new species *M. tainanensis* T. H. Hsieh are recognized in this paper. The spotting on the lower lip of the corolla, chromosome number, and pollen grains are all important characters in separating the Taiwanese taxa. The chromosome number of *M. alpinus*, *M. goodenifolius*, and *M. miquelii* is 2n= 20 (diploid); the chromosome number of *M. faurei* and *M. pumilus* is 2n=40 (tetraploid) and *M. tainanensis* is 2n=60 (hexaploid). SEM micrographs of pollen grains and seeds, chromosome counts, a key to species and descriptions, distribution maps, and taxonomic notes are provided.

KEY WORDS: ***Mazus*, Scrophulariaceae, Chromosome number, Revision, Taiwan.**

INTRODUCTION

The genus *Mazus* Lour. (Scrophulariaceae) consists of about 25 species with the center of distribution and differentiation in mainland China (Li, 1978; Yang, 1979; Walker, 1974).

Due to morphological variation, has long been a source of confusion in Taiwan. For example, it is difficult to distinguished between *M. fauriei* Bonati and *M. miquelii* Makino. Yamazaki (1993) and Hsieh and Huang (1999) treated them as conspecific, but Li (1978) and Hong (1996, in sched) treated them as distinct species. *Mazus delavayi* Bonati (1978) and *M. goodenifolius* (Hornem.) Pennell (1993) were treated as two species (Hsieh and Huang, 1999). Plants with few, erect stems and large green leaves and growing in lowland forests were treated as *M. goodenifolius* (Yamazaki, 1969, 1993; Hsieh and Huang, 1999), but individuals with many, flexuous, decumbent stems and usually smaller leaves, with purple on the upper surface, and growing in open grassland from median to high elevation were treated as *Mazus delavayi* (Li, 1978; Hsieh and Huang, 1999). Since these characters vary continuously and delimitation of the two is difficult, these plants may represent the same species. Recently, a new species *Mazus tainanensis* was collected from the campus of National Tainan Teachers College, Tainan, southern Taiwan. This species is very similar to *M. fauriei*. It can be distinguished, however, by its smaller leaves, B type spotting, 3- or 4-colpate pollen grains and hexaploid karyotype. Although Yang (1978) described around 22 species, the morphological characters such as number and form of radical and cauline leaves, and the presence or absence of stolons can not be used to separate taxa in this genus.

MATERIALS AND METHODS

Specimens of *Mazus* used in this study were collected from the field throughout Taiwan. Most materials was pressed and dried for voucher specimens deposited in the Herbarium, Department of Science Education, National Tainan Teachers College (NTNTC).

1. Department of Science Education, National Tainan Teachers College, Tainan 700, Taiwan, Republic of China.

Pollen grains were acetolyzed according to the procedures outlined by Erdtman (1952). The acetolyzed grains were dehydrated in an ethanol series and dried using critical point drying. Dried grains were coated with gold and examined using SEM.

Root tips for chromosome counts were cut from living plants. After being pretreated with of 0.002 M 8-hydroxyquinoline for 3-4 hours at a temperature of 18- 20℃, the root tips were fixed in a mixture of absolute alcohol and glacial acetic acid (3:1/v:v), then macerated with 1% pectinase, stained with acetic orcein, squashed, and observed using a Nikon microscope.

RESULTS

External morphology

The leaves of *Mazus* are rosulately arranged, opposite and membranaceous. The radical leaves are obscurely petiolate, obovate-spatulate, with a rounded or obtuse apex, and the base gradually narrowed to attenuate into the petiole. The leaves are pinnatifid to dentate-serrate and hirsute. The leaves on the stolons are subsessile, opposite or sometimes alternate with an acute apex and acute-serrate margins.

It is difficult to distinguish the taxa by their leaves except *M. pumilus* has obovate to spatulate, subentire to coarsely few-toothed leaves.

In plants with type A spotting on the lower lip of the corolla has many small yellow spots (Fig 8.8). In plants with type B spotting, the lower lip of the corolla has two or four larger spots apically and basally and a few smaller spots in the middle (Fig 10.8). *Mazus alpinus*, *M. goodenifolius*, *M. miquelii* have type A spotting; the others species have type B spotting.

Although *Mazus fauriei* and *M. miquelii* are very similar in external morphology and are usually misidentified in herbaria, the former has type B spotting and the latter has type A. Since the spots gradually disappear or are unclear, this character is difficult to assess in specimens dried.

Pollen grains

Pollen grains 3- or 4-colpate, isopolar, prolate-spheroidal to subprolate in equtorial view, 18-25 x 15-19 μm, circular in polar view; sexine reticulate; lumina irregular, circular or polygonal. Description based on samples from six species in Taiwan (Fig 3).

Although the ornamentation and size are similar, *M. pumilus* and *M. tainanensis* with 3- or 4-colpate pollen grains can be distinguished from other species(Fig 3F-I).

Huang reported that the pollen grains of *Mazus miquelii* to be 2-colpate; *M. fauriei* and *M. japonicus* (=*M. pumilus*) are 3-colporate; *M. alpinus* is 3-colp(or)ate (Huang, 1972). This study showed the pollen grains of the above species to be 3-colpate, except *M. pumilus* also has 3- and 4-colpate pollen.

Seeds

The seeds of *Mazus* are ellipsoid with reticulate surface cells; the cells are in elongate columns elongate. In *Mazus pumilus*, the cells are convex, but in other species they are concave (Fig 4).

Chromosome number

The chromosome number of *M. alpinus* (Fig 4A), *M. goodenifolius* (Fig 4C), and *M. miquelii* (Fig 4D) is 2n= 20 (diploid); the chromosome number of *M. fauriei*(Fig 4B) and *M. pumilus* (Fig 4E) is 2n=40 (tetraploid) and *M. tainanensis* (Fig 4F) is 2n=60 (hexaploid).

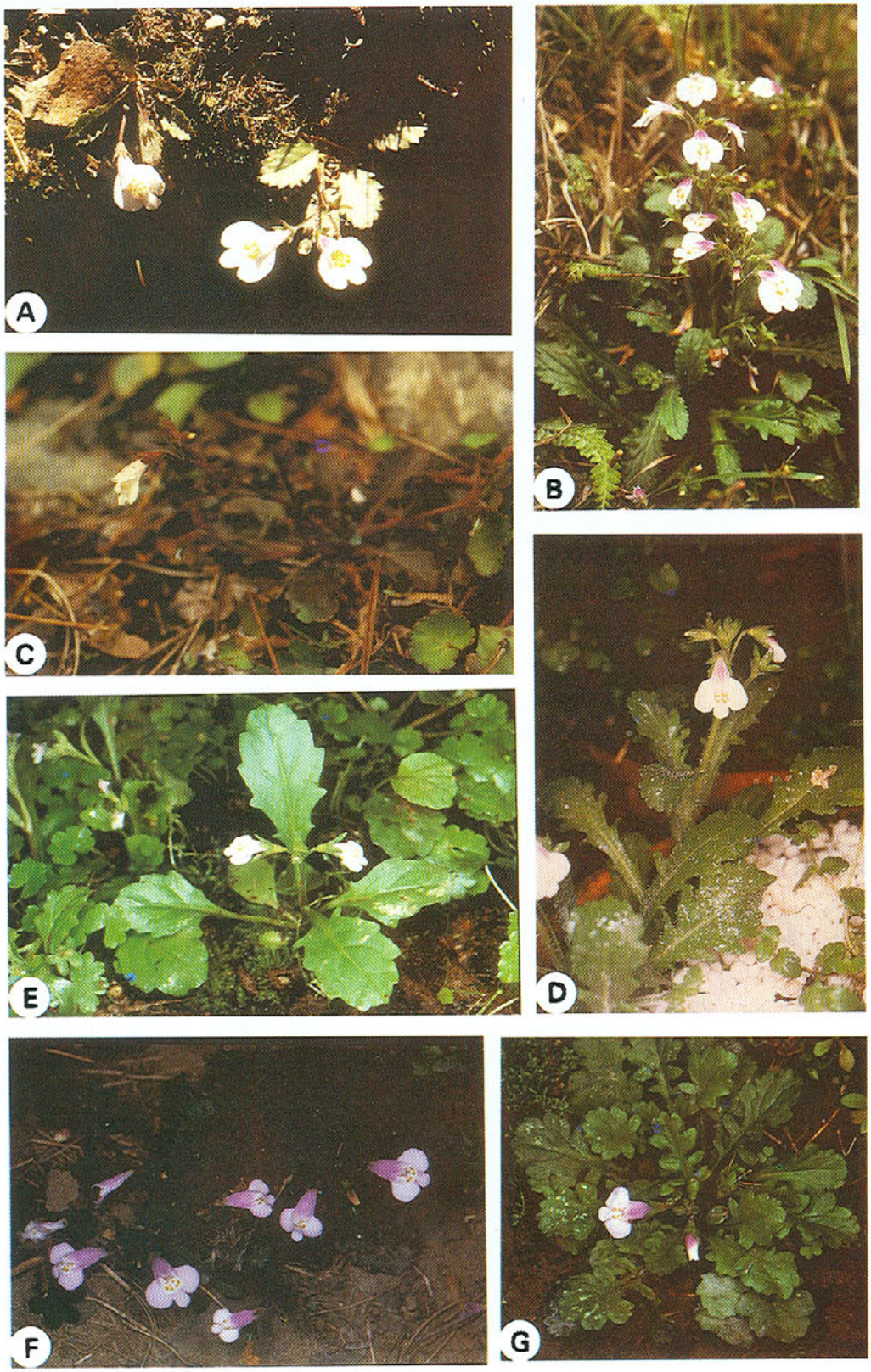
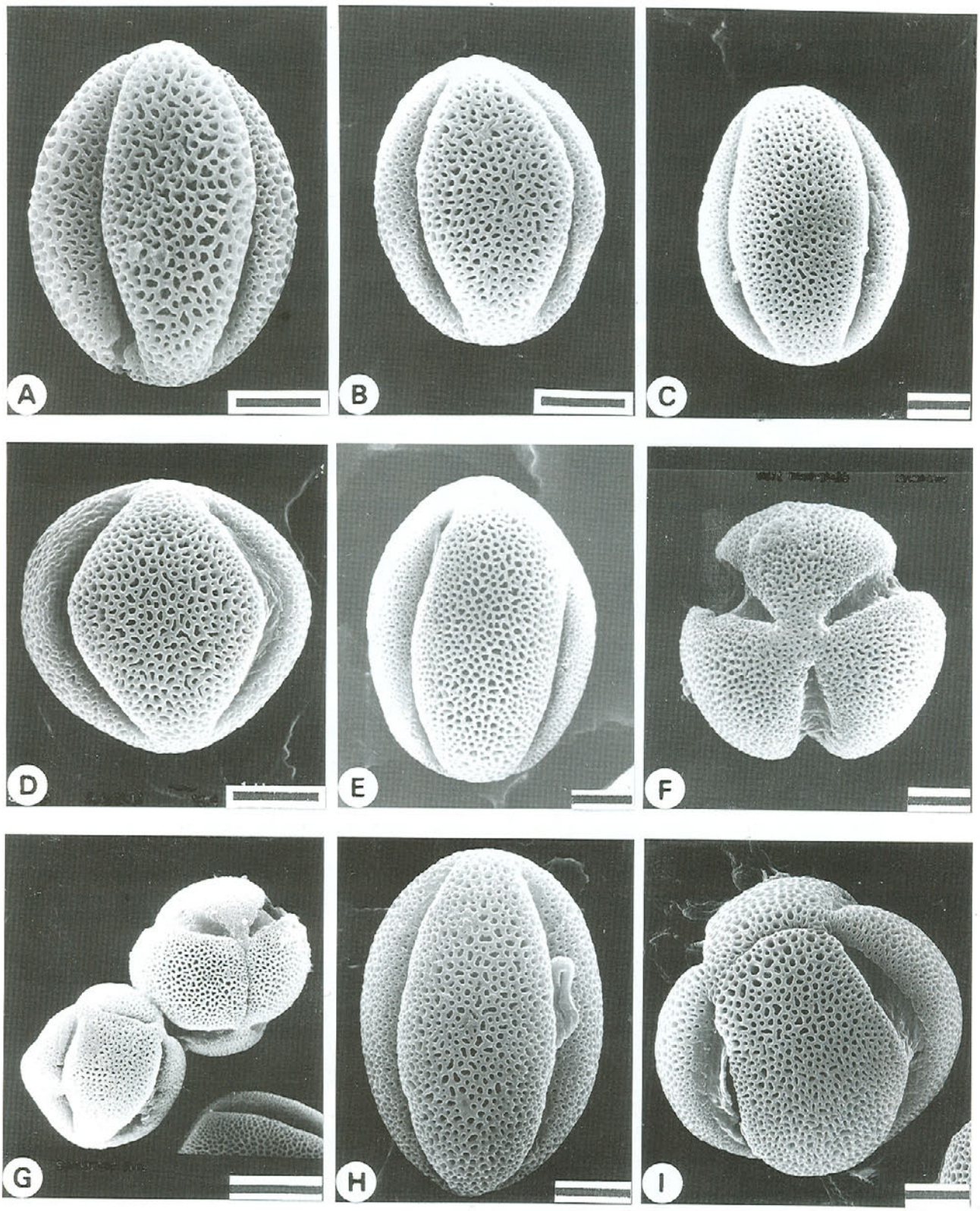
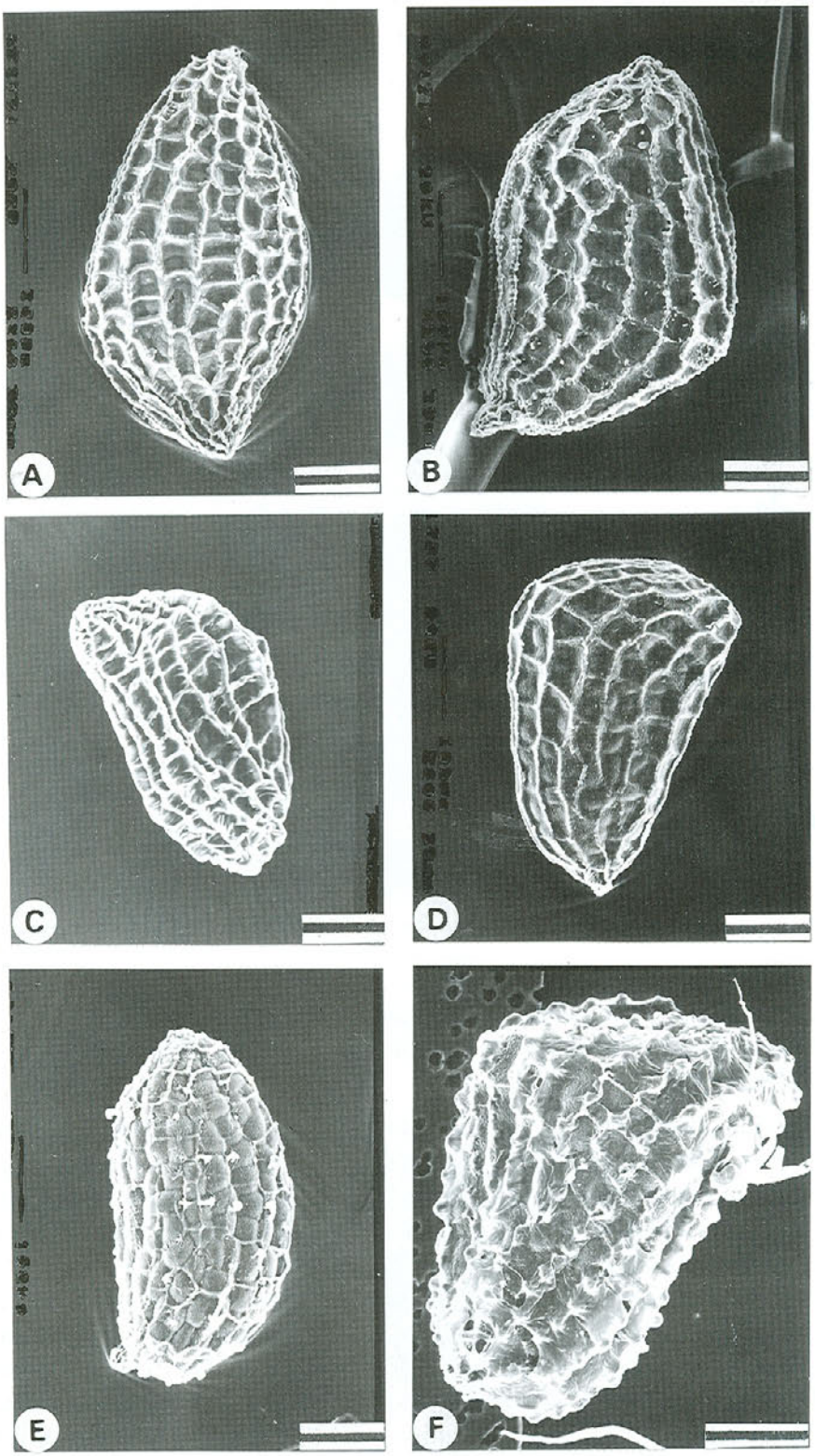


Fig 1. Habit of the species of *Mazus* in Taiwan. A: *M. alpinus* Masam.; B: *M. fauriei* Bonati; C: *M. goodenifolius* (Hornem.) Pennell; D: *M. miquelii* Makino; E: *M. pumilus* (Burm. f.) Steenis; F and G: *M. tainanensis*.



Figs 2. SEM micrographs of pollen grains of *Mazus* in Taiwan. A: *M. alpinus* Masam.; B: *M. miquelii* Makino; C: *M. fauriei* Bonati, D: *M. goodenifolius* (Hornem.) Pennell; E-G: *M. pumilus* (Burm. f.) Steenis; H and I: *M. tainanensis*. Scale bar = 5 μm.



Figs 3. SEM micrographs of seeds of *Mazus* in Taiwan. A: *M. alpinus* Masam.; B: *M. miquelii* Makino; C: *M. fauriei* Bonati, D: *M. goodenifolius* (Hornem.) Pennell; E: *M. pumilus* (Burm. f.) Steenis; F: *M. tainanensis*. Scale bar = 100 μm, except 2 μm in 15.

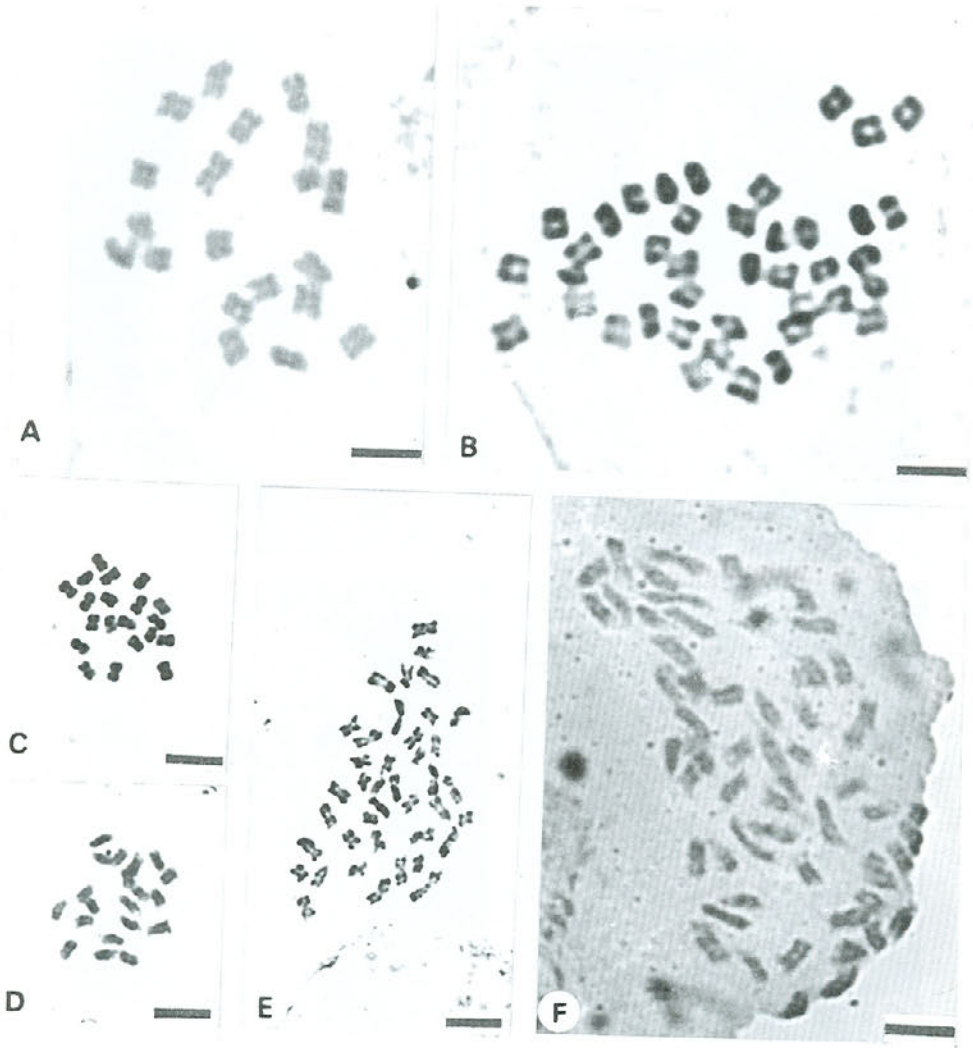


Fig. 4. Chromosome numbers of *Mazus* in Taiwan. A: *M. alpinus* Masam.; B: *M. fauriei* Bonati, C: *M. goodenifolius* (Hornem.) Pennell; D: *M. miquelii* Makino; E: *M. pumilus* (Burm. f.) Steenis; F: *M. tainanensis*. Scale bar = 5 μm.

The chromosome number of *M. miquelii* was reported to be 2n=20 in Japanese plants (Hashimoto, 1986). That observation was confirmed in this study. *Mazus miquelii* is very similar to *M. fauriei*, but the former is diploid, the spotting is type A, and the plants are distributed in medum elevation. *Mazus fauriei* is tetraploid, the spotting is type B, and the plants are occur below 1000 meters in northern Taiwan.

Although the chromosome number of *M. pumilus* was reported to be n=12 and 2n=24 (Hsu, 1967, 1968) in Taiwan, it was reported to 2n=40 in plants from other countries (Bir and Sidhu, 1980; Chandran and Bhavandran, 1981; Sidhu and Bir, 1983; Hashimoto, 1986; Sinha1988). The count of 2n=40 was confirmed in this paper. The chromosome number of *M. fauriei* was also reported to be 2n=24 (Hsu, 1968), but this study did not confirm that report.

The spotting of the lower lip of the corolla and the chromosome number show that diploid species including *M. alpinus*, *M. goodenifolius*, *M. miquelii* are type A; the tetraploid species including *M. fauriei* and *M. pumilus* and the hexaploid species *M. tainanensis* are type B in Taiwan.

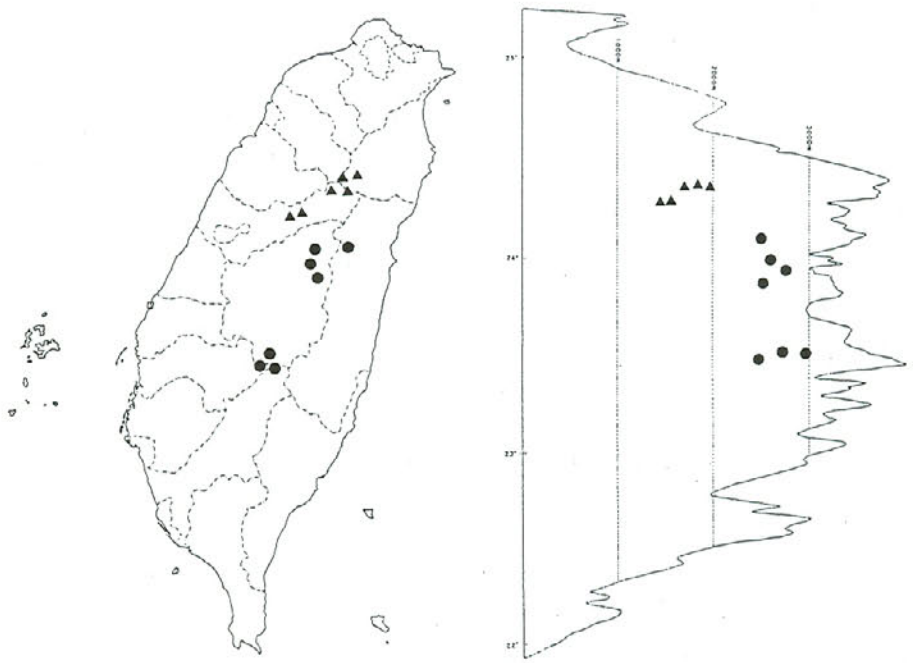


Fig 5. Distribution of *Mazus alpinus* Masam. (●) and *M. miquelii* Makino (▲) in Taiwan.

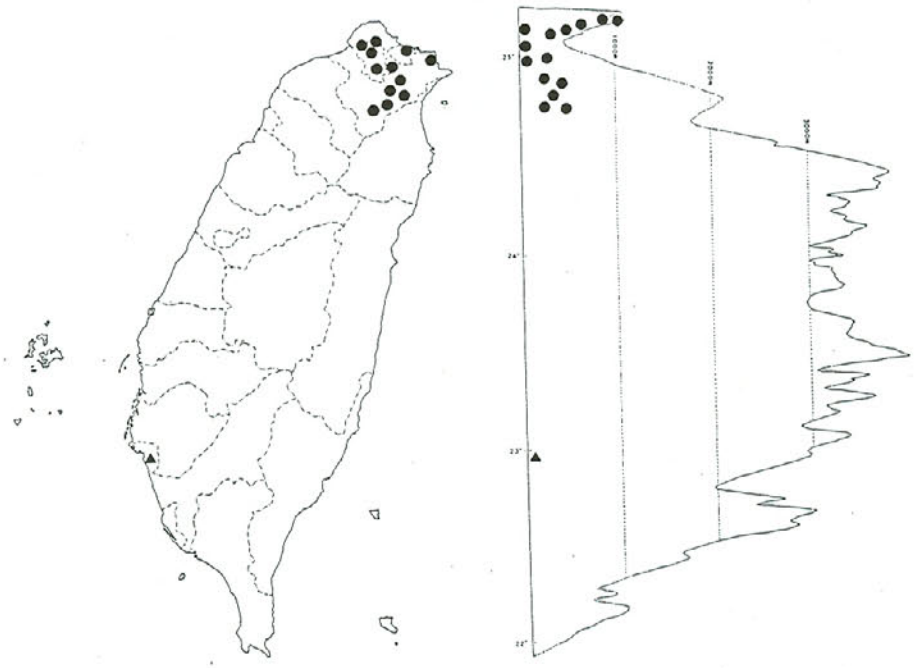


Fig 6. Distribution of *Mazus fauriei* Bonati. (●) and *M. tainanensis* (▲) in Taiwan.

Distribution

Mazus fauriei occurs below 1000 meters in northern Taiwan. *Mazus goodenifolius* is distributed throughout the island from lowland to high elevations. *Mazus pumilus* is distributed throughout the island from lowland to medium elevations. *Mazus miquelii* occurs at medium elevations and *M. alpinus* occurs on high mountains. *Mazus tainanensis* is restricted to Tainan.

The diploid species are distributed from low to high elevations and polyploid species occur from low to medium elevations.

Fig 7. Distribution of *Mazus goodenifolius* (Hornem.) Pennell in Taiwan.

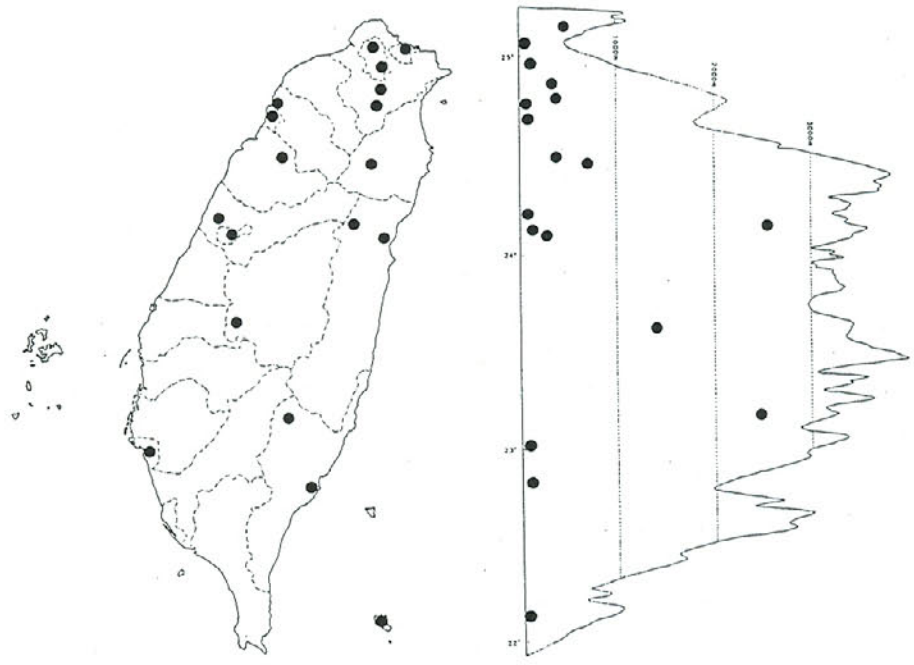


Fig 8. Distribution of *Mazus pumilus* (Burm. f.) Steenis in Taiwan.

TAXONOMICAL TREATMENT

Mazus Lour., Fl. Cochinch. 385. 1790; Bonati, Bull. Herb. Boiss. 2 (8): 525-539. 1908; Li, Brittonia 8 (1): 29-38. 1954; Yang, Fl. Reipubl. Popularis. Sin. 67: 172-196. 1978.

Small annual, biennial or perennial herbs, often stoloniferous. Lower leaves opposite or rosulate, upper leaves opposite or alternate, petiolate; blade simple, toothed or incised. Inflorescence terminal, more or less one-sided racemes, flowers solitary in axils of reduced leaves or bracts, purplish, bluish, or white; calyx campanulate, lobes 5, equal; corolla

exceeding calyx, bilabiate; upper lip outside in bud, erect, 2-lobed; lower lip muchlarger, 3-lobed with 2 prominent ridges in throat; stamens 4, didynamous; filaments long, connivent; ovary 2-loculed, many-ovuled, stigma bilobed, lamellate. Fruit a loculicidal, 2-valved subglobose or compressed capsule, enclosed by persistent calyx. Seeds many, minute.

About 25 species in Asia, Hawaii, New Zealand, Australia and India; six species in Taiwan.

Key to Species

1. Plants stoloniferous, stolons elongated, creeping and rooting; stems flexuous or creeping; flowers 1-2.5 cm long
   2. Plant over 15 cm tall; leaves glabrous or slightly hairy
      3. Spotting type A ..... 4. *M. miquelii*
      3. Spotting type B
         4. Leaves 7-12 cm; pollen grains 3-colpate ..... 2. *M. fauriei*
         4. Leaves 3-5 cm; pollen grains 3- or 4-colpate ..... 6. *M. tainanensis*
   2. Plant 10 cm or less tall; leaves densely hirsute ..... 1. *M. alpinus*
1. Plants without stolons; stems erect or flexuous; flowers 0.7-1 cm long..
   5. Leaves radical and cauline, shallowly crenate-toothed; stems glabrescent sometimes pubescent ..... 5. *M. pumilus*
   5. Leaves radical, incised, coarsely toothed; stems moderately hirsute ..... 3. *M. goodenifolius*

1. **Mazus alpinus** Masam., J. Soc. Trop. Agric. 2: 153. 1930; Mori, Short Fl. Formosa. 191. 1936; Li, Quart. J. Taiwan Mus. 3: 59. 1950; Li, Brittonia 8: 38. 1954; Li, Fl. Taiwan 4: 572. 1978. 高山通泉草 Figs. 1-5

Perennial herbs, caudex with clustered leaves and stolons, stolons slender, hirsute. Leaves rosulate, opposite, membranaceous; leaves obavate-spatulate, 3-6 cm long including petiole, 1-2 cm wide, base gradually narrowed, attenuate into obscure petiole, pinnatifid to dentate-serrate, hirsute, apex rounded or obtuse; leaves on stolons subsessile, opposite, sometimes alternate, 1-2 cm long, 0.5-1 cm wide, margin acute-serrate, apex acute. Inflorescence 1-3-flowered; bracts linear, ca. 2 mm long; pedicel 1.5-2 cm long; calyx campanulate, 5-10 mm long, 5-lobed, lobes lanceolate, acute, ca. 5 mm long; corolla bilabiate, 1.2-2 cm long, white tube tinged pink, with numerous small yellowish spots on lower lip inside; stamens 4, didynamous. Capsule enclosed by persistent calyx, globose. Seeds narrowly ellipsoid, ca. 0.5 mm long, brown.

Chromosome number: 2n= 2x=20.

Endemic. In open grassland and forest edges: 2000-3000 m.

Specimens examined: TAICHUNG: Chika lodge, *C. Hsu 14641* (TAI); *C. I. Peng 7891* (HAST); Wuling lodge to Taoshan, *C. I. Peng 12030* (HAST); Hsuehshan, *J. C. Wang 4375* (TAI). NANTOU: Tienchih, *C. C. Liao 1390* (HAST); *S. T. Chiu et al. 3391* (HAST); Tatachia Saddle to Paiyum Lodge, *C. I. Peng 9534* (HAST). CHIAYI: Yushan, *T. C. Huang 14218* (TAI); Mooroo Cliff, *C. Hsu 5397* (TAI).

This species is close to *M. miquelii*, but differs from it by having more flexuous and decumbent slender stolons, smaller leaves, and 1to3 flowers in the inflorescence.

2. **Mazus fauriei** Bonati, Bull. Herb. Boiss. Ser. 2. 8: 537, *fig. A*.1908; Masam., Trans. Nat. Hist. Soc. Formos. 24: 241. 1934; Yamazaki, J. Jap. Bot. 25: 211. 1950; Li, Quart. J. Taiwan Mus. 3: 59. 1950; Li, Brittonia 8: 38. 1954; Li, Fl. Taiwan 4: 572. 1978.
佛氏通泉草 Figs. 1-4, 6

Mazus taihokuensis Masam, J. Soc. Trop. Agric. 4: 194. 1932.
Mazus stolonifer Makino var. *taihokuensis* Masam,, J. Sco. Trop. Agric. 4:194. 1932.
Mazus miquelii auct. non Makino: Li, Fl. Taiwan 4: 573. *pl. 1110.* 1978. pro. parte.

Perennial herbs. Caudex with clustered leaves and slender stolons; stolons 10-20 cm long, terete, sparsely pubescent. Leaves rosulate, opposite, papyriferous, blade obovate-oblong or spatulate, 7-12 cm long including the petiole, 1.5-3 cm wide, base gradually narrowed, attenuate into obscure petiole, incised or crenate-dentate, apex rounded to obtuse, glabrous or pubescent on both surface; leaves on stolons subsessile, opposite, sometimes alternate, obovate, 1-1.5 cm long, 0.5-1 cm wide, apex acute or obtuse, acute-serrate. Inflorescence racemose, generally terminal on caudex, rarely at apex of stolons, 8-20 cm long, loosely 5-15-flowered; bracts linear-deltoid, ca. 2mm long; pedicels 0.5-2 cm long; calyx campanulate, 5-8 mm long, 5-lobed, lobes deltoid, ca. 3 mm long; corolla bilabiate, light blue, spotting type B, 1.3-2.5 cm long, stamens 4, didynamous. Capsule enclosed by persistent calyx, globose, 3-4 mm across. Seeds narrowly ellipsoid, ca. 0.4 mm long, brown.

Chromosome number 2n =4x=40.

Endemic. Waste ground in lowlands in northern Taiwan.

Specimens examined: TAIPEI: Chihsingshan, *M. T. Kuo 3368* (TAI) ; Tatunshan, *S. Suzuki 10245* (TAI), *C. I. Peng 11334* (HAST); Yangmingshan, *C. Hsu 3155* (TAI), *C. C. Wang 948* (HAST), *T. Y. Liu 219* (HAST), *Panero 6382* (HAST); Chihhsiungshan, *C. M. Kuo 3368* (TAI); Tsaikongkunshan, *S. Sasaki s. n.* 1932 (TAI). Hopingtao, *C. I. Peng 13651* (HAST); Patoutze, *C. I. Peng 7568* (HAST); Lungtong, *K. Y. Wang 829* (HAST); Nankang, *C. I. Peng 10101* (HAST), *C. C. Wang 650* (HAST); Nankangshan, *C. I. Peng 6411* (HAST); Menghu, *Y. R. Lin 256* (HAST); Tunghou, *C. C. Liao 430* (HAST); Shihlioufentzu, *C. I. Peng 7558* (HAST); Hsinshan, *C. C. Liao 1246* (HAST); Pingshi, *H. Y. Shen 543* (HAST); Juifang, *T. I. Chuang 4846* (HAST), *C. M. Kuo and M. T. Kao 4502* (TAI); Yinhongtong, *J. C. Wang 9524* (HAST); Tunghou, *C. C. Liao 430* (HAST); Chutzuhu, *C. I. Peng 12664* (HAST).

3. **Mazus goodenifolius** (Hornem.) Pennell, J. Arnold. Arbor. 24: 245. 1943; Yamazaki, Fl. Japan 3a: 334. 1993. 阿里山通泉草 Figs. 1-4, 7

Gratiola goodenifolia Hornem., Enum. Pl. Hort. Hafn., 19. 1807.
Mazus yakushimensis Sugimoto ex Yamazaki, J. Jap. Bot. 44: 350. 1969.
Mazus delavayi auct. non Bonati: Yamazaki, J. Jap. Bot. 45: 266. 1970.
Li, Fl. Taiwan 4: 572. 1978; Hsieh and Huang in Fl. Taiwan 2nd ed. 4: 609. 1999.

Biennial herbs. Stems simple or few branched, 5-10 cm long, with clustered radical leaves. Leaves opposite, membranaceous, blade spatulate or obovate-oblong, 3-7 cm long including petiole, 1-3 cm wide, apex rounded, base narrowed, attenuate into petiole, incised or coarsely dentate. Inflorescence of several flowers in a terminal raceme, peduncle and pedicels hirsute; pedicel 8-15 mm long; calyx widely campanulate, 6-9 mm long, sparsely hirsute, 5-lobed, lobes triangular-ovate, acute, 2-5 mm long; corolla bilabiate, white with yellow spots on lower inside, 7-10 mm long; stamens 4, didynamous. Capsule enclosed by persistent calyx, globose, ca. 3 mm long. Seeds ellipsoid, ca. 0.4 mm long.
Chromosome number: 2n= 2x=20.

Southern Japan, Taiwan and Papua New Guinea. Taiwan: moist lowlands.

Specimens examined: TAIPEI: Shihlioufentzu, *C. I. Peng 7560* (HAST), *C. I. Peng 10623* (HAST); Nankangshan, *C. I. Peng 6404* (HAST); Pitanshan, *T. Shimizu 2218* (HAST). ILAN: Shenmihu, *C. I. Peng 13785* (HAST). HSINCHU: Kuanwu, *C. I. Peng 8414* (HAST); Chutong, *C. I. Peng 6424* (HAST). TAICHUNG: kukuan, *C. I. Peng 8376* (HAST); Ammashan, *Liu 39* (TAI). NANTOU: Nengkaoshan, *Sasaki s. n.* 1929 (TAI); Chitou, *K. Yamazaki s. n.*1969 (TAI), *K, C. Yang 1633* (TAI); Fenghuangku, *K. Y. Wang 105* (HAST); Tungpu, *C. I. Peng 6536* (HAST), *8114* (HAST). CHIAYI: Alishan, *C. Hsu 6720* (TAI), *H. L. Ho 1176* (HAST), *T. H.*

Hsieh 2350 (NTNTC). TAINAN: Hsienkungmiao, *C. I. Peng 7095* (HAST), *T. H. Hsieh 2382* (NTNTC). PINGTUNG: Shungliu, *S. C. Hsiao 1113* (HAST); Tawushan, *C. H. Chen 507* (HAST). TAITUNG: Lanyu, *T. H. Hsieh 2522* (NTNTC). HUALIEN: Tienhsiang to Jinnherng Bridge, *C. I. Peng 9290* (HAST); Kuailin to Wuchiapengshan, *C. C. Liao 1418* (HAST); Yuehwangting, *C. I. Peng15454* (HAST); Suilien, *T. C. Huang 9145* (TAI).

This species is similar to *M. delavayi*, but differs from it by having long peduncle. The former is distributed in the Liukyus and Taiwan, but the latter is distributed in mainland China (Sichuan and Yunnan Province) (Yamazaki, 1969, 1993).

This species is variable in external morphology. Individuals with few erect stems and large green leaves in forest in the lowlands were treated as *M. goodenifolius* (Yamazaki, 1969, 1993; Hsieh and Huang, 1999), but individuals with many flexuous and decumbent stems and usually small leaves colored purple on the upper surface and growing in open grasslands at median to high elevations were treated as *Mazus delavayi* (Li, 1978; Hsieh and Huang, 1999). Since these characters vary continuously and delimitation is difficult, they are treated as being conspecific.

4. **Mazus miquelii** Makino, Bot. Mag. Tokyo 26: 162. 1902; Li, Quart. J. Taiwan Mus. 3: 60, 1950; Li, Brittonia 8(1): 38, 1954; Li, Fl. Taiwan 4:573, 1978. *exclud. pl. 1110.*
葡莖通泉草 Figs, 1-5, 9

Perennial herbs, caudex with clustered leaves and stolons, stolons slender, pubescent. Stems slender, few-leaved at base. Leaves membranaceous; obovate-spatulate, 4-7 cm long including the petiole, 1-2 cm wide, apex rounded or obtuse, base gradually narrowed, attenuate into obscure, pinnatifid to dentate-serrate, hirsute; leaves on stolons subsessile, 1-2.5 cm long, 0.5-1 cm wide, apex acute, margin acute-serrate. Inflorescence racemose, loosely several-flowered; bracts linear; pedicel 1.5-2 cm long; calyx campanulate, 5-10 mm long, 5-lobed, lobes lanceolate, acute, ca. 5 mm long; corolla bilabiate, 1.2-2.5 cm long, white tube tinged pink, spots type A; stamens 4, didynamous. Capsule enclosed by persistent calyx, globose. Seeds narrowly ellipsoid, ca. 0.5 mm long, brown.

Chromosome number: 2n= 2x=20.

China to Japan. Taiwan, in open grassland or forest edge in median altitudes between 1000 and 2000 m.

Specimens examined: ILA: Yuanyanghu, *I. L. Lai s. n.* 1998 (NTNTC); Taipingshan, *C. I. Peng 7844* (HAST), *J. C. Wang 9888* (HAST); Mingchih, *H. Y. Shen 485* (HAST). TAICHUNG: Chingshan to Kukan, *T. C. Huang 9642* (TAI); Chingshan to Malun Bridge, *C. I. Peng 12459* (HAST).

5. **Mazus pumilus** (Burm. f.) Steenis, Nov. Guin., n. ser. 9: 31. 1958; Li, Fl. Taiwan 4: 573. 1978; Hsieh and Huang, Fl. Taiwan 2nd ed. 4: 612. 1999. 通泉草 Figs. 1-4, 8

Lobelia pumila Burm. f., Fl. Indica 186. 1768.
Mazus rugosus Lour., Fl. Cochinch. 385. 1790; Matsum. & Hayata in J. Coll. Sci. Univ. Tokyo 22: 276. 1906; Hayata, J. Coll. Sci. Univ. Tokyo 35: 173. 1908.
Mazus japonicus (Thunb.) Kuntze, Revis. Gen. 462. 1891; Hayata, Gen. Ind. Pl. Formosa 52. 1916; Mori in Masam., Short Fl. Formosa. 192. 1936; Li, Quart. J. Taiwan Mus. 3:58. 1950; Li, Brittonia 8: 31. 1954.

Annual or biennial herbs. Stems erect or ascending, simple or loosely branched, 5-15 cm long. Leaves mostly on lower half of stems, opposite, membranaceous; blade obovate or spatulate, 2-5 cm long including the petiole, 0.8-2 cm wide, base gradually narrowed, attenuate into petiole, subentire to coarsely few-toothed, apex obtuse. Inflorescence a terminal loosely flowered raceme; bracts linear, acute, 1-2 mm long; pedicel 3-13 mm long, short

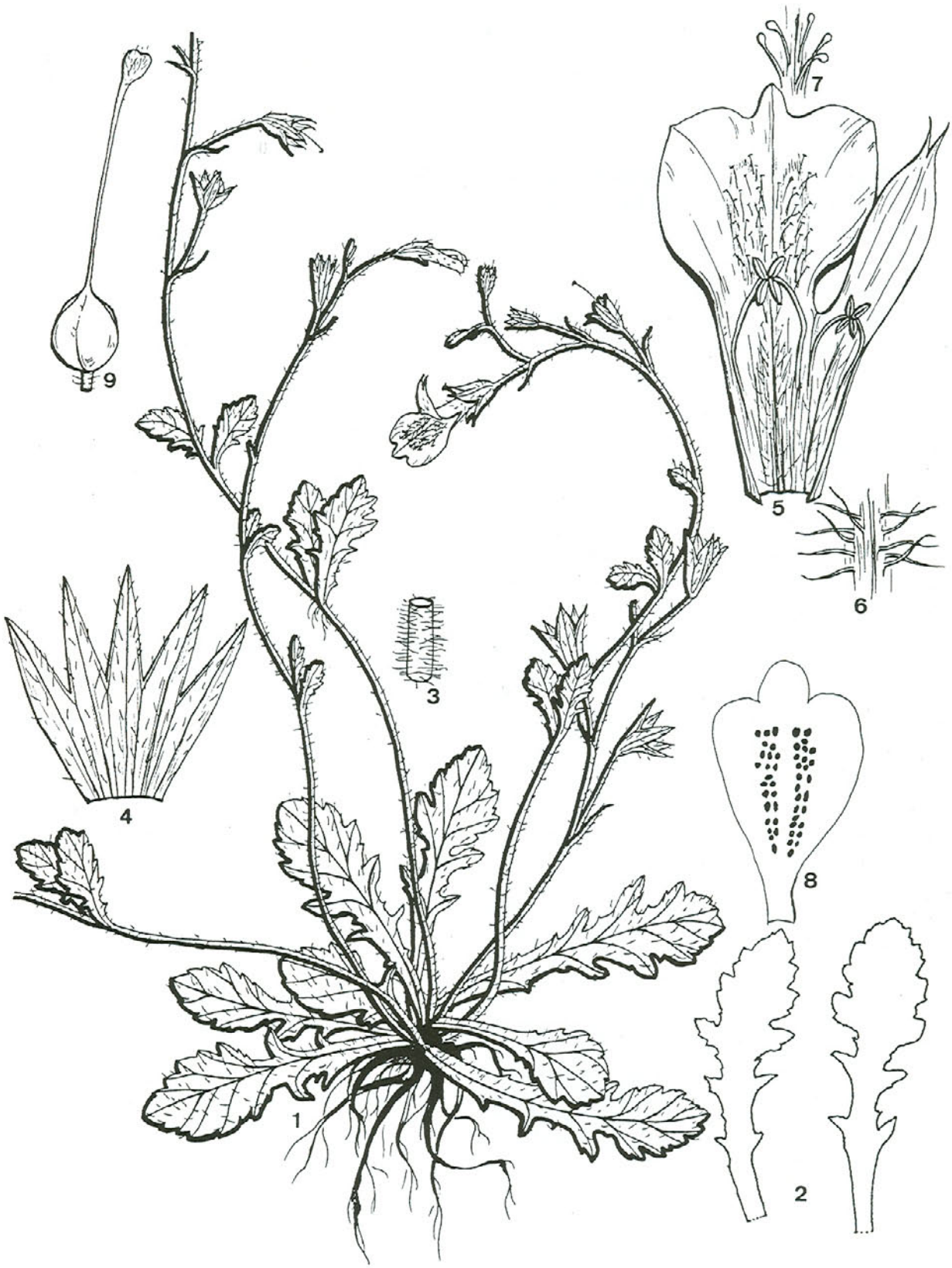


Fig 9. *Mazus miquelii* Makino. 1. Habit; 2. Leaves; 3. Part of stem; 4. Calyx; 5. Corolla and stamens; 6. Hairs in throat; 7. Hairs on lower lip; 8. Spots on lower lip; 9. Pistil.

glandular-pubescent; calyx campanulate, 4-6 mm long, 5-lobed; corolla bilabiate, pale purple, spotting type B, 9-10 mm long; stamens 4, didynamous. Capsule enclosed by persistent calyx, globose, 3-4 mm across. Seeds narrowly ellipsoid, ca. 0.4 mm long, brown.

Chromosome number: 2n = 4x=40.

Widely distributed in India and Asia. Taiwan: a weed of waste ground and cultivated fields in lowlands.

Specimens examined: TAIPEI: Shihting, *K. C. Yang 2336* (TAI); Shihliufengtzu, *C. I. Peng 10604* (HAST); Yangmingshan, *C. I. Peng 12668* (HAST); Patoutzu, *C. I. Peng 7569* (HAST); Nankangshan, *C. I. Peng 10452* (HAST). ILAN: Tuchang, *S. Suzuki 3721*. HSINCHU: Shangkuanli, *C. I. Peng 6426* (HAST); Chunnan Seashore, *S. Z. Yang 20190* (HAST). MIAOLI: Nanchung, *M. T. Kao 7858* (TAI). TAICHUNG: Chingshui, *C. I. Peng 4490* (HAST); Chung Hsing Univ., *C. I. Peng 6442* (HAST). NANTOU: Chitou, *K. C. Yang 1632* (TAI). CHIAYI: Yichu, *T. H. Hiseh 2401* (NTNTC). TAINAN: Tainan, *T. H. Hsieh 2410* (NTNTC); Wusantou, *T. H. Hsieh 1980* (NTNTC). TAITUNG: Hsiangyang, *C. I. Peng 11884*; Lanyu, *T. H. Hsieh 2500* (NTNTC). HUALIEN: Kuanyang, *T.G. Lammers 8473* (HAST); Taroko to Tatung, *W. P. Leu 54* (HAST).

6. **Mazus tainanensis** T. H. Hsieh, *sp. nov.* 台南通泉草 Figs. 1 & 10

Herbae perenes, plus minusve hirsutae, cum. racemis ca. 6-10 cm. altis. Folia rosulata, omnia opposita, obovato-spathulata, 3-5 cm. longa, 1-2 cm lata. Flores racemose, purpurei. Corolla ca. 0.5-1.3 cm. longa, macula typo B. Affinis speciei Mazos fauriei, sed foliis minutis, 3- or 4 colpatis pollenibus et chromosomatibus 2n=60 differt. –TYPE: TAINAN: Campus of National Tainan Teachers College, *Hsieh 2010* (Holotype: TAI; isotype: NTNTC).

Perennial herbs. Caudax with clustered leaves and stolons, stolons 6-10 cm long, terete, pubescent. Leaves rosulate, opposite, papyriferous, radical leaves with obscure petiole, blade obovate-oblong or spatulate, 3-5 cm long including petiole, 1-2 cm wide, base gradually narrowed, attenuate into obscure petiole, incised or crenate-dentate, apex rounded to obtuse, glabrous or pubescent on both surfaces; leaves on stolons subsessile, opposite, sometimes alternate, obovate, 1-1.5 cm long, 0.5-1 cm wide, apex acute or obtuse, acute-serrate. Inflorescence racemose, generally terminal on caudex, rarely at apex of stolons, 5-10 cm long, loosely 5-10-flowered; bracts linear-deltoid, ca. 1.5mm long; pedicels 0.5-1 cm long; calyx campanulate, 5-8 mm long, 5-lobed, lobes deltoid, ca. 3 mm long; corolla purple, bilabiate, spotting type B, 0.5-1.3 cm long, stamens 4, didynamous. Capsule enclosed by persistent calyx, globose, 3-4 mm across. Seeds narrowly ellipsoid, ca. 0.5 mm long, brown.
Chromosome number 2n =6x=60.

Specimens examined: TAINAN: Campus of National Tainan Teachers College, *Hsieh 2010* (NTNTC).

This species (Fig 10) is very similar to *M. fauriei*, but can be distinguished by its smaller leaves, type B spotting on corolla, 3- or 4-colpate pollen grains and hexaploid karyotype. This species grows in grassy places on the campus of National Tainan Teachers College, in southern Taiwan. It might have been introduced during the planting of ornamentals and become naturalized on the campus. Since our present knowledge of this species is insufficient, further study is needed.

UNCERTAIN SPECIES

Mazus stachydifolius (Turcz.) Maxim., Mel. Biol. 9: 404. 1875, Li, Quart. J. Taiwan. Mus. 3: 58. 1950; Brittonia 8: 33. 1954; Fl. Taiwan 4: 575. 1978.

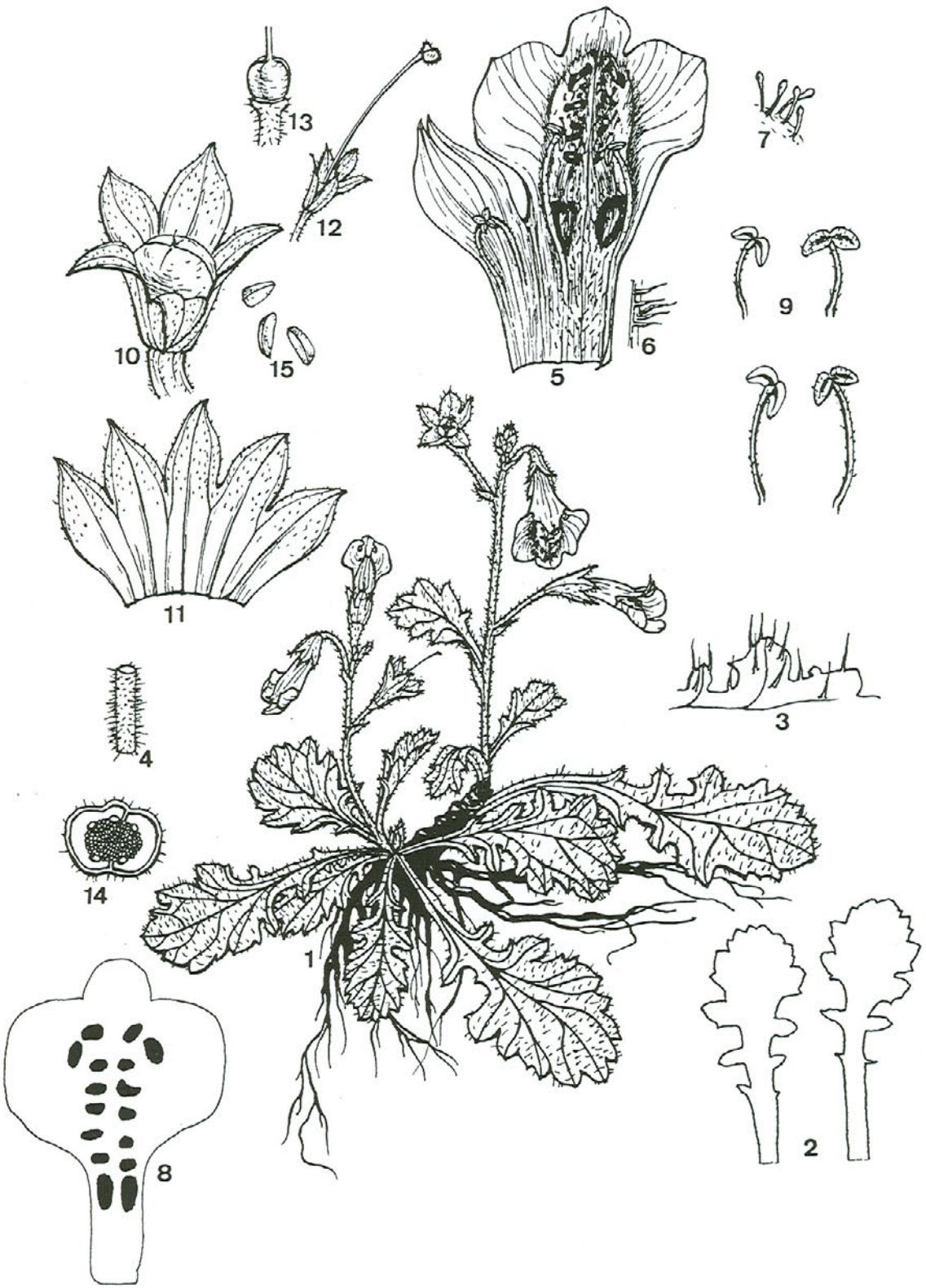


Fig 10. *Mazus tainanensis* T. H. Hsieh. 1. Habit; 2. Leaves; 3. Hairs on leaf; 4. Part of stem; 5. Corolla and stamens; 6. Hairs in throat; 7. Hairs on lower lip; 8. Spots on lower lip; 9. Stamens; 10. Calyx and capsule; 11. Calyx at fruiting stage; 12. Calyx and pistil; 13. Ovary; 14. Cross section of ovary; 15. Seeds

Littmannia stachydifolia Turcz., Bull. Soc. Nat. Hist. Mosc. 7: 156. 1837.
Mazus simadai Masam., Trans. Nat. Hist. Soc. Formosa. 30: 35. 1940.

This species is known only from the type collection (*Simada 3509*, type of *M. simadai*) in Taiwan. Because no specimens of this species are available in Taiwan herbaria, it is treated as an uncertain species.

ACKNOWLEDGEMENTS

I am indebted to Ms. C.-Y. Lin. and Mr. C.-Y. Tang for their assistance in SEM photography. Dr. K.-C. Yang of the Department of Humanities, Providence University, Mr. S.-P. Li of the Longhai Elementary School, Mrs. C.-C. Liao, W.-T. Chao, and S.-C. Wu and Miss I.-L. Lai of the Department of Botany, National Taiwan University, all of whom kindly sent me living material. Thanks are also due to the curators of the herbaria for allowing me to examine the specimens in their care. I am grateful to Drs. T.-C. Huang and C.-F. Hsieh, professors of the Department of Botany, National Taiwan University, for their encouragement. This work was supported by a grant from the National Science Council (NSC87-2312-B-024-001).

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臺灣產通泉草屬之分類研究

謝宗欣[1]

（收稿日期：2000 年 3 月 28 日；接受日期：2000 年 5 月 10 日）

摘　　要

根據外部形態、花粉、種子、細胞學和地理分布來訂正省產通泉草屬植物。本研究指出本省有 6 個分類群，分別為高山通泉草、佛氏通泉草、阿里山通泉草、通泉草、葡萄通泉草、和台南通泉草。在細胞學上，高山通泉草、葡萄通泉草和阿里山通泉草為二倍體 2n=20，佛氏通泉草和通泉草為四倍體 2n=40，台南通泉草為六倍體 2n=60。本文並提供花粉、種子、分布圖、檢索表、分類群描述等資料。

關鍵詞：通泉草屬，玄參科，染色體、分類訂正，台灣。

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