NOTE

Three Newly Naturalized Plants in Taiwan

Ming-Jer Jung[(1)], Ming-Jou Wu[(2)] and Shih-Wen Chung[(3*)]

1. Herbarium of Taiwan Forestry Research Institute, Taiwan Forestry Research Institute, 53, Nanhai Rd, Taipei 100, Taiwan.
2. Graduate Institute of Biological Resources and Technology, National Dong Hwa University, Meilun Campus, No.123, Hua-Hsi Rd., Hualien 970, Taiwan.
3. Division of Forestry Biology, Taiwan Forestry Research Institute, No. 53, Nanhai Rd., Taipei 100, Taiwan.
** Corresponding author. Email: biflora@gmail.com*

(Manuscript received 20 March 2009; accepted 18 June 2009)

ABSTRACT: Three newly naturalized plants are reported in this paper. *Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera (Asteraceae) is naturalized in urban areas of northern Taiwan. *Indigofera pseudo-tinctoria* Matsum. (Leguminosae) is naturalized in low elevations of northern and southern Taiwan and in middle elevations of central Taiwan. *Lamium purpureum* L. (Laminaceae) has become naturalized locally in middle elevations of central Taiwan. Descriptions, illustrations and color photos of these plants are provided.

KEY WORDS: Asteraceae, *Hypochaeris microcephala* var. *albiflora*, *Indigofera pseudo-tinctoria*, Laminaceae, *Lamium purpureum,* Leguminosae, newly naturalized, Taiwan.

INTRODUCTION

Naturalized plants are alien or exotic to a given region, and capable of becoming established in new habitats without human intervention (Chen, 2008). Some of these plants may be invasive because of their strong sexual or asexual fertility and their wide environmental tolerance (Chen, 2008). Naturalized flora could be established and updated according to researchers' field investigations or their examinations of herbarium specimens (Chen, 2008). Since naturalization is considered as the first step of biological invasion (Wu et al., 2004), we report three recently naturalized plants for monitoring their dispersal in Taiwan in the future.

First among them belongs to Asteraceae, which is one of the major contributors to the naturalized flora globally as well as in Taiwan (Wu et al., 2004; Wu and Wang, 2005; Chen, 2008; Jung et al., 2009). Nearly half of naturalized Asteraceae species in Taiwan are considered invasive (Wu and Wang, 2005). Several Asteraceae species, which were reported as locally naturalized during the past decade, have been broadly distributed as pests in Taiwan (Jung et al., 2009). Two *Hypochaeris* species, *H. glabra* L. and *H. radicata* L., have been recorded as naturalized weeds of Taiwan previously (Peng et al., 1998; Jung et al., 2008). We report *H. microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera here as a third naturalized weed for this genus.

The second species belongs to Leguminosae, which is another major contributor to the naturalized flora in Taiwan (Wu et al., 2004; Chen, 2008). Naturalization events of several Leguminosae species, such as *Aeschynomene americana* L. var. *glandulosa* (Pior.) Rudd, *Mimosa pigra* L., and *Trigonella hamosa* Forsk., were reported after the second edition of Flora of Taiwan was published (Wu and Huang, 1999; Yang and Peng, 2001; Chen, 2008). *Mimosa pirga* L. expanded quickly in southern Taiwan, and was evaluated as an invasive plant (Yang and Peng, 2001). We add *Indigofera pseudo-tinctoria* Matsum. here as a newly naturalized legume for the flora of Taiwan.

Several members of Laminaceae species have been recognized as naturalized plants in Taiwan (Wu et al., 2004; Chen and Wu, 2005; Chen, 2008). Recently, Jung et al. (2006) also reported a naturalized Laminaceae species *Lamium hybridum* Vill. In addition, we report another newly naturalized *Lamium* plant *L. purpureum* L. As a result, two naturalized species are included in this genus in Taiwan.

In this paper, we describe these three alien plants, *Hypochaeris microcephala* var. *albiflora* (Asteraceae), *Indigofera pseudo-tinctoria* (Leguminosae), *Lamium purpureum* (Laminaceae), and provide illustrations, color photos and a distribution map of them (Figs. 1-5). Keys to the species of the genera *Hypochaeris* (Asteraceae) and *Lamium* (Laminaceae) in Taiwan are offered, too.

TAXONOMIC TREATMENTS

1. ***Hypochaeris microcephala*** (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera, Notas Mus. La Plata, Bot. 2 (16): 200-201. 1937; Bogler. 2006. Fl. N. Amer. 19: 297-299. — *H. brasiliensis* (Lessing) Grisebach var. *albiflora* Kuntze, Revis. Gen. Pl. 3 (2): 159. 1898.
白花貓耳菊 Figs. 1, 2A-D & 5

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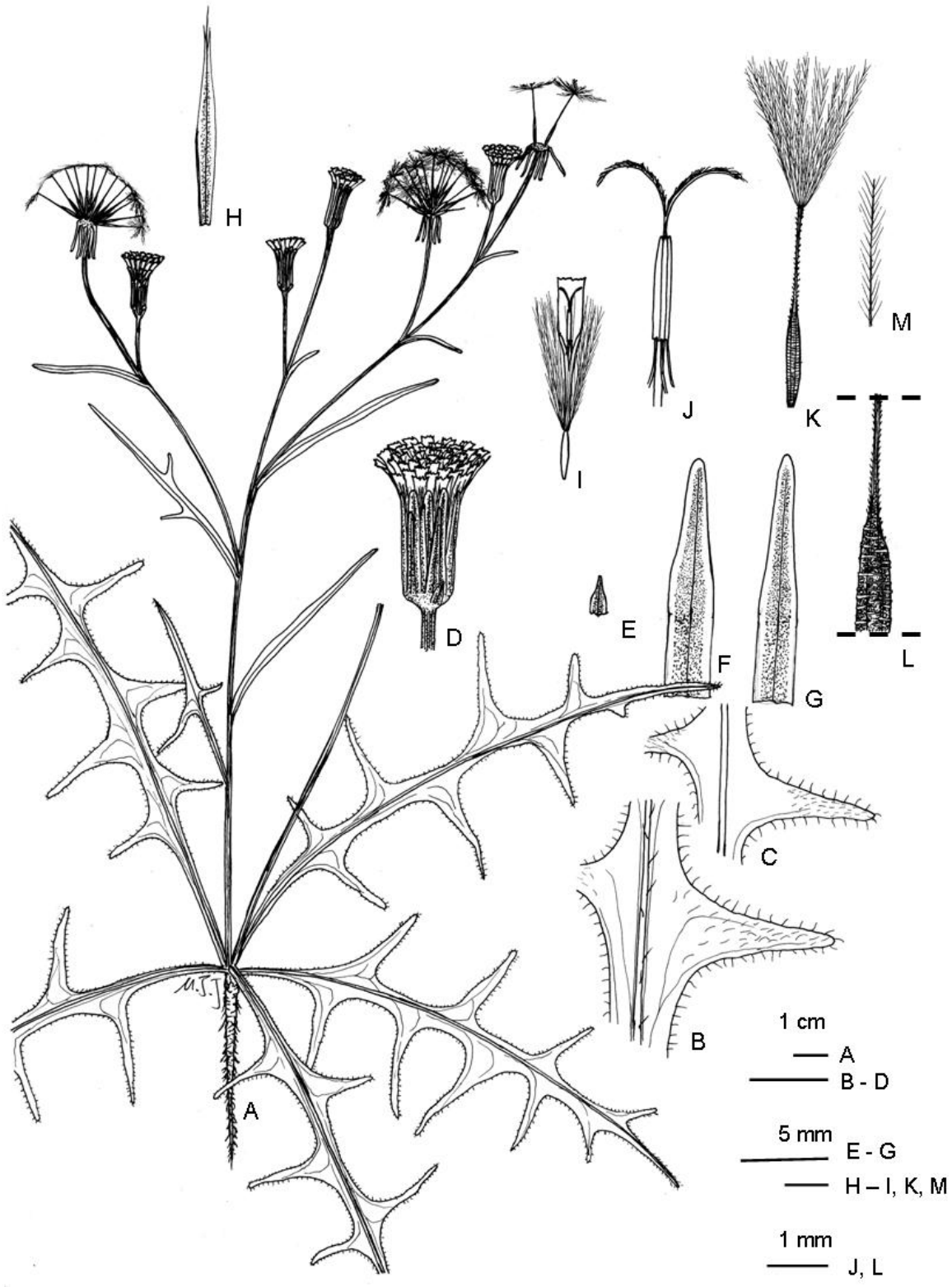


Fig. 1. ***Hypochaeris microcephala*** **(Sch. Bip.) Cabrera var.** ***albiflora*** **(Kuntze) Cabrera. A: Habit. B: Abaxial surface of leaf. C: Adaxial surface of leaf. D: Capitulum. E: Outer involucres. F & G: Inner involucres. H: Chaff. I: Floret. J: Anther and stigma. K: Achene. L: Achene apex, beaked. M: Pappus.**

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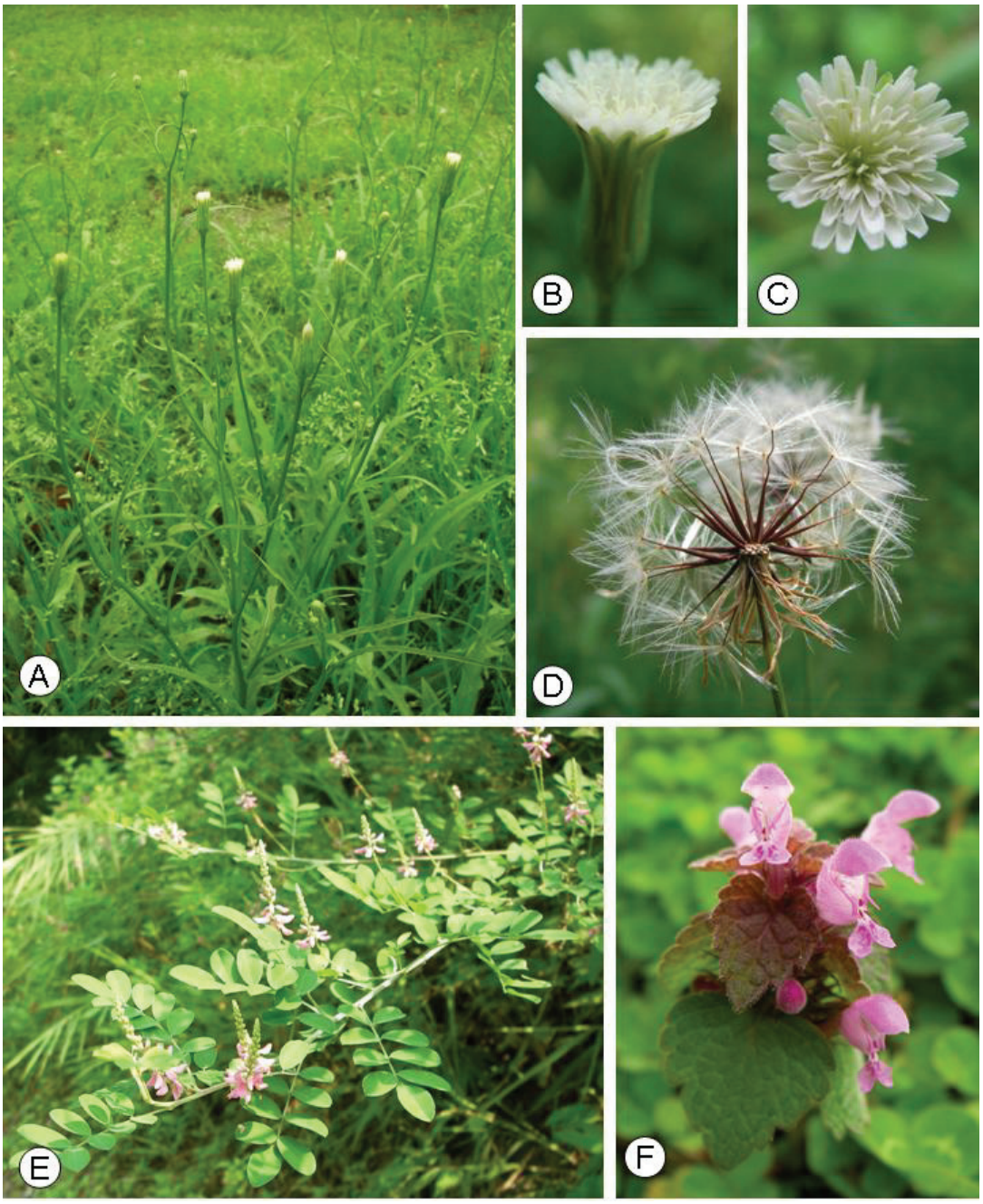


Fig. 2. A-D. *Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera. A: Habit. B & C: Flowering capitulum. D: Capitulum with mature achenes. E. *Indigofera pseudo-tinctoria* Matsum. F: *Lamium purpureum* L.

Hypochaeris albiflora (Kuntze) Azevedo-Gonc. & Matzenb. Comp. Newsl. 42: 3, 2005; Azevêdo-Gonçalves and Matzenbacher. 2005. Hoehnea 32 (3): 361-368, fig. 1; Azevêdo-Gonçalves and Matzenbacher. 2007. Iheringia, Ser. Bot. 62 (1-2): 55-87.

Herbs perennial, rosetted blades oblong, simple to parted, apex obtuse to acute, margin entire, glabrous to sparsely villose, both surfaces glabrous to sparsely villose, blade lobes linear to lanceolate, sparsely villose, hairs on abaxial surface denser than adaxial surface, margin sparsely villose, cauline blades linear, simple to parted; capitulum arranged as a cyme, composed of ray florets, involucral bracts lanceolate, apex obtuse, margin membranous, 2.5 – 15 mm long; chaff lanceolate, apex

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trifid, 1-nerved, membranous, ca. 16 mm long; corolla whitish, ca. 8 mm long, anther syngenesious, base obtuse, apex acute, ca. 1.5 mm long, stigma ca. 1.5 mm long; achene ellipsoid, scabrous, ca. 4 mm long, apex long-beaked, scabrous, ca. 4.5 mm long, pappus plumose sparingly, ca. 7.5 mm long, branch 1 – 2 mm long.

Specimens examined: Taiwan. Taipei City, Kuantu, 25 May 2005, *S.-W. Chung 8155* (TAIF); Taipei Co., Bali Town, Pali, 18 Apr 2009, *S.-W. Chung 9586* (TAIF), Linkou Town, Linkou Interchange, 4 Apr 2009, *C.-M. Wang 12870* (TNM), same loc., 9 Apr 2009, *C.-M. Wang 12899* (TAIF, TNM), Linkou Junior High School's campus, 14 May 2008, *M.-J. Jung 2918* (TAIF); Taoyuan Co., Kueishan Town, Ming Chuan University, Taoyuan campus, 22 Apr 2009, *Y.-C. Lin s. n.* (TAIF), Luchu Town, Guang Ming Junior High School's campus, 14 Apr 2009, *M.-J. Jung 3920* (TAIF), Nankan, 14 Apr 2009, *M.-J. Jung 3928* (TAIF); Hsinchu City, Nanya Park, 11 Apr 2008, *M.-J. Jung 2676* (TAIF), same loc., 9 May 2008, *M.-J. Jung 2883* (TAIF).

Distribution: *Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera is native to South America (Bogler, 2006; Azevêdo-Gonçalves and Matzenbacher, 2005a, 2005b, 2007) and naturalized in Australia (Lazarides et al., 1997) and North America (USDA, NRCS. 2004; Bogler, 2006). Nowadays, this alien plant is naturalized in grasslands of park, roadsides or school campuses in urban areas of northern Taiwan (Fig. 5). *Hypochaeris microcephala* var. *albiflora* was collected by the corresponding author firstly in Taipei City in 2005, and since then have been found steadily in urban areas of northern Taiwan (Fig. 5).

Notes: *Hypochaeris* L. (Asteraceae) contains about 60 species in Australia, Eurasia, North and South America (Lazarides et al., 1997; Peng et al., 1998; Bogler, 2006; Jung et al., 2008). The vernacular names of *Hypochaeris microcephala* var. *albiflora* are "small-headed cat's ear" in America (Bogler, 2006) and "white flatweed" in Australia (Lazarides et al., 1997). This alien plant may be a rampant weed in northern Taiwan in the future, and its population dynamics should be worth noting.

Key to *Hypochaeris* species in Taiwan

1. Leaves rosette and cauline, heads whitish ……..…… ……... *H. microcephala* var. *albiflora*
1. Leaves mainly rosette, heads yellow ……..…. 2
2. Leaves glabrous to sparsely pubescent, achenes dimorphic, marginal achene apexes truncate, central achene apexes beaked ..…. *H. glabra*
2. Leaves densely pubescent, achene monomorphic, achene apexes all beaked …… *H. radicata*

2. ***Indigofera pseudo-tinctoria*** Matsum. Bot. Mag. (Tokyo) 16: 62. 1902. Ohwi. 1965. In: Meyer and Walker. Fl. Japan: 571 – 572. 馬棘 Figs. 2E, 3 & 5

Perennial erect shrubs, to 2 m tall, branches coated with appressed hairs, phyllotaxis alternate, leaf pinnate, ca. 5 cm long, leaflets 7 – 9, opposite, elliptical to obovate, base acute to obtuse, apex round, notched or not, to 25 mm long, covered with appressed hairs on both surfaces, stipules lanceolate, ca. 1.5 mm long, racemes axillary, 5 – 12 cm long, calyx 5-toothed, apex acute, flowers red, petals 3 – 4 mm long, abaxial surface of petals coated with appressed hairs, stamens 10, diadelphous, each anther with a extended peak at apex, pods linear, cylindrical, straight, 2 – 2.5 cm long, apex beaked, 5 – 9 seeded, seed cylindrical, ca. 2 mm long.

Specimens examined: Taiwan. Miaoli Co., Touwu Town, Mingtesan Bridge, 3 Aug 2007, *M.-J. Jung z080302* (HAST, TAIF), same loc., 22 Aug 2007, *M.-J. Jung z082201* (HAST, NHU, TAIF); Nantou Co., Hsinyi Town, Tungpu to Tungpu Tunnel, 3 Jul 2006, *C.-Y. Lin s. n.* (NCKU), same loc., 30 Aug 2008, *P.-F. Lu 16850* (TAIF); Kaohsiung Co., Gangshan Town, Akungtien Reservoir, 14 Apr 2002, *T. Y. A. Yang & T. C. Chou 14765* (HAST).

Distribution: *Indigofera pseudo-tinctoria* Matsum. is native to Japan and central China (Ohwi, 1965). It was found at roadside slopes in low elevations of northern and southern Taiwan and in middle elevations of central Taiwan (Fig. 5).

Notes: *Indigofera* L. has ca. 700 species in the tropics and subtropics (Ohwi, 1965; Huang and Ohashi, 1993). Fifteen species of this genus have been recorded in the flora of Taiwan (Huang and Ohashi, 1993). In Taiwan, we can tell *I. pseudo-tinctoria* and other *Indigofera* species apart according to pinnate leaves, opposite leaflets 7 – 9 per leaf, appressed-hairy branches and blades, and straight pods (Figs. 3 & 4E). *Indigofera pseudo-tinctoria* distributes at roadside slopes in northern and central Taiwan (Fig. 5). It seems that this plant might be introduced as part of the substrate stabilization for slope protection.

3. ***Lamium purpureum*** L. Sp. Pl. 2: 579. 1753. Heywood and Richardson. 1972. In: Tutin et al. 1972. Fl. Europaea, 3: 147-148; Osada. 1972. Illustrated Japanese Alien Plants: 68; Murata and Yamazaki. 1993. In: Iwatsuki et al. Fl. Japan, IIIa: 294-296. 圓齒野芝麻 Figs. 2F, 4 & 5

Herb annual, ascending or erect, to 25 cm tall. Stem square, slender, branched at base; phyllotaxis opposite. Leaves petiolate; petiole ca. 5 cm long; blade ovate, to 2 cm long, both surfaces hairy, base truncate, margin rounded dentate, apex rounded. Inflorescence of dense verticillate cyme; foliaceous bracts opposite, petiolate; petioles 0.5–2 cm long; bract enclosing the cymes, broadly ovate, 2 – 3.5 × 1.5 – 4.5 cm, base cuneate to attenuate, simple, apex acute; lobe 2 – 5 mm long. Flowers sessile. Calyx campanulate, 7 – 9 mm long, puberulent, 5-toothed; teeth narrowly triangular, equal. Corolla reddish purple, tubular, 1.5 – 2 cm long, bilabiate; upper lip galeate; lower lip 3-lobed; lateral lobes triangular, apex acute; central

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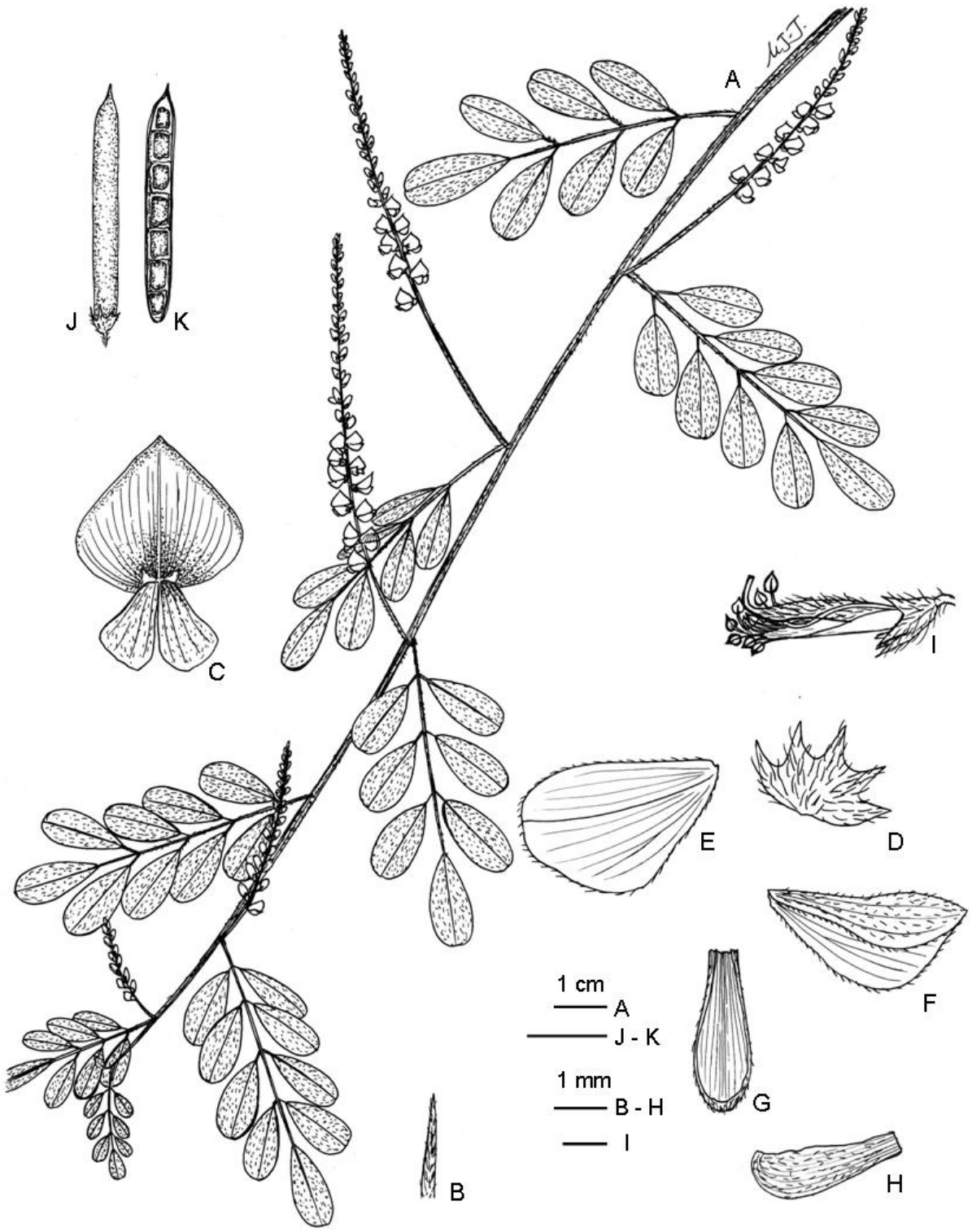


Fig. 3. ***Indigofera pseudo-tinctoria*** **Matsum. A: Branch. B: Stipule. C: Flower. D: Calyx. E & F: Wings, F: folded, showing the appressed hairs. G & H: Keels, H: lateral view. I: Pistil, diadelphous stamens and calyx, lateral view. J & K: Pods, K: showing the seeds and false partitions.**

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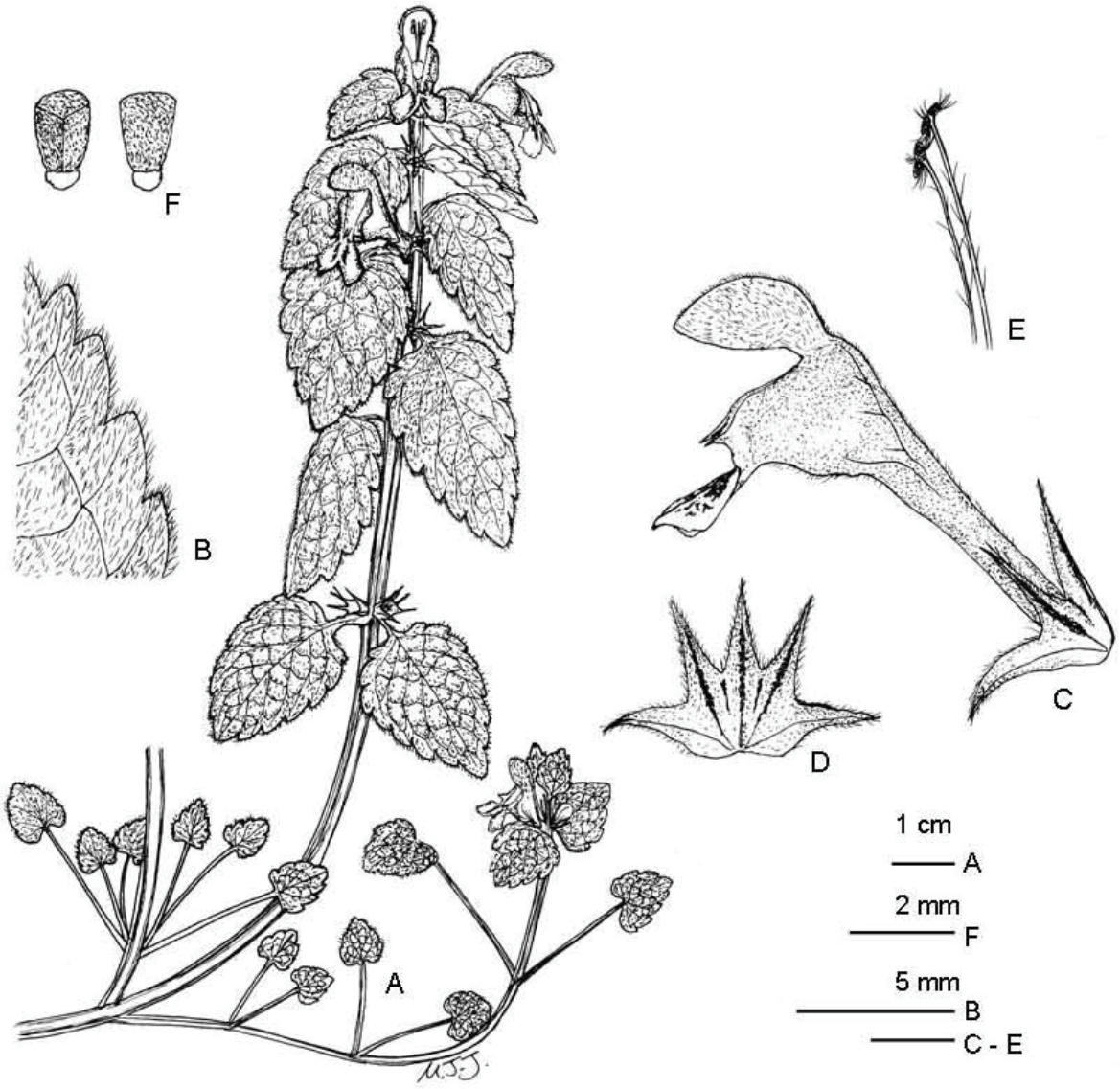


Fig. 4. ***Lamium purpureum*** **L. A. Habit. B. Upper part of foliaceous bract margin. C. Flower, lateral view. D. Calyx, flatten. E. Anther with part of the filament; F. Nuts.**

lobe fan-shaped, deeply divided. Stamens 4, didynamous, lower pair longer; anthers 2-celled, divergent, hairy at ends; stigma bifid. Nuts ca. 2.5 mm long, 3-keeled, scabrous.

Specimens examined: Taiwan. Nantou Co., Jenai Town, Yunhai, 18 Mar 2008, *M.-J. Jung 2482* (TAIF); same loc., 3 Mar 2009, *M.-J. Jung 3747* (TAIF).

Distribution: The genus *Lamium* L. (Laminaceae) contains about 40 species in Africa and Eurasia (Huang et al., 1998; Jung et al., 2006). *Lamium purpureum* L. (purple deadnettle, red deadnettle) is native to Europe (Heywood and Richardson, 1972; Osada, 1972; Murata and Yamazaki, 1993), and naturalized in Australia (Lazarides et al., 1997), Japan (Osada, 1972; Murata and Yamazaki, 1993) and North America (USDA, NRCS. 2004). It was found along the roadsides of a forest trail in middle elevations of central Taiwan (Fig. 5). A key to the species of the genus *Lamium* in Taiwan was provided.

Key to *Lamium* species in Taiwan

1. Corolla whitish ..... *L. tuberifera*
1. Corolla purplish 2
2. Foliaceous bracts sessile ..... *L. amplexicaule*
2. Foliaceous bracts petiolate. 3
3. Foliaceous bracts ovate to slightly tri-lobed, margin crenate ..... *L. hybridum*
3. Foliaceous bracts ovate, margin round dentate ..... *L. purpureum*

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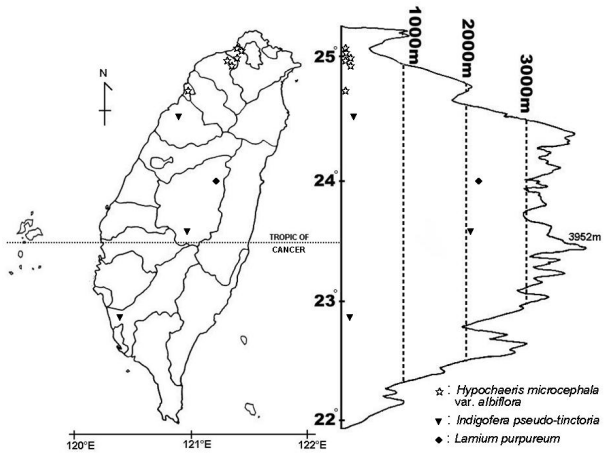


Fig. 5. Distribution map of *Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera (☆), *Indigofera pseudo-tinctoria* Matsum. (▼), and *Lamium purpureum* L. (◆).

ACKNOWLEDGEMENTS

The authors thank Dr. Chiu-Mei Wang of Department of Botany, National Museum of Natural Science for her offering distribution site of *Hypochaeris microcephala* var. *albiflora*. We thank Miss Ting-Yi Tzi for her kindly assistance in field work and offering distribution site of *H. microcephala* var. *albiflora*. Besides, we thank Mr. Yi-Chun Lin for his offering fresh material and distribution site of *H. microcephala* var. *albiflora*.

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三種臺灣新歸化植物

鍾明哲[1]、吳明洲[2]、鐘詩文[3*]

1. 林業試驗所植物標本館，100 台北市南海路 53 號，臺灣。
2. 國立東華大學美崙校區生物資源與科技研究所，970 花蓮市華西路 123 號，臺灣。
3. 行政院農業委員會林業試驗所森林生物組，100 台北市南海路 53 號，臺灣。
* 通信作者。*Email: biflora@gmail.com*

(收稿日期：2009 年 3 月 20 日；接受日期：2009 年 6 月 18 日)

摘要：本文報導三種臺灣新近歸化植物。白花貓耳菊 (*Hypochaeris microcephala* (Sch. Bip.) Cabrera var. *albiflora* (Kuntze) Cabrera) 歸化於北部都會區；馬棘 (*Indigofera pseudo-tinctoria* Matsum.) 歸化於北部與南部低海拔山區，以及中部中海拔山區；圓齒野芝麻 (*Lamium purpureum* L.) 局部歸化於中部中海拔山區；本文提供這些新近歸化植物的描述、線繪圖及彩色照片。

關鍵詞：菊科、白花貓耳菊、豆科、馬棘、唇形科、圓齒野芝麻、新歸化種、臺灣。

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