

Sinosenecio hupingshanensis (Asteraceae), a new species from Hunan and Hubei, China

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ABSTRACT. *Sinosenecio hupingshanensis* Y. Liu & Q. E. Yang, a new species of the Asteraceae from Hunan and Hubei, China, is described and illustrated. Its karyotype is formulated as $2n = 44m + 2sm + 2st$, giving a chromosome number of $2n = 48$. This new species is similar to *S. baojingensis* Y. Liu & Q. E. Yang and *S. denticulatus* J. Q. Liu in its posture, floral morphology and pappose achenes. It differs from *S. baojingensis* in leaf shape and stature. From *S. denticulatus* it differs in the leaf-lamina being very indistinctly repand, pubescent above, the petioles expanded but never auriculate at the base, and in its smaller stature. Line drawings, distribution map, light microscope (LM) microphotographs of floral characters of *S. hupingshanensis*, color photographs of both *S. hupingshanensis* and *S. denticulatus*, and a key to aid in the identification of *S. hupingshanensis* and its possible relatives are provided.

Keywords: Asteraceae; Chromosome number; Karyotype; New species; Senecioneae; *Sinosenecio hupingshanensis*.

INTRODUCTION

For the first author's Ph.D. project on the systematics and evolution of *Sinosenecio* B. Nord. (Senecioneae, Asteraceae), we made a comprehensive survey of the specimens of this genus deposited in Chinese herbaria. One specimen kept in the Herbarium of Jishou University (JIU), *Hupingshan Expedition P-010*, made from the southern slope of the Hupingshan Mountain, Shimen County, Hunan Province, China, caught our attention. This plant had been previously identified as *S. globigerus* (Chang) B. Nord., very likely owing to their similarity in leaf shape and posture. Upon a closer examination, however, we found that the plant in question differs markedly from *S. globigerus* by the 6-7-veined rays and, in particular, the pappose achenes. In *S. globigerus*, the rays are 4-veined, and the achenes are absolutely epappose. We made a botanical expedition in April 2007 to the Hupingshan Mountain and carefully observed the plant in the field, confirming that the plant represents a hitherto undescribed species. Further herbarium and field work resulted in the discovery of more herbarium specimens and of another three populations of this new species, which we name as *S. hupingshanensis* and describe below.

The Hupingshan Natural Reserve lies in Shimen County in northwestern Hunan Province, China. It occupies an area of about 66,568 ha, between 29°50' and 30°09' N and 110°29' and 110°59' E, and ranges from 220 to 2100 m in elevation. It is covered by natural forests and is an important area for biodiversity conservation. In our botanical inventory of this reserve, we found five species of *Sinosenecio*: *S. eriopodus* (Cumm.) C. Jeffrey & Y. L. Chen, *S. globigerus* (Chang) B. Nord., *S. oldhamianus* (Maxim.) B. Nord., the new species (here named *S. hupingshanensis*), and a species that is somewhat similar to *S. palmatisectus* (J. F. Jeffrey) Y. L. Chen in aspect but differs in a series of characters; identification of this last is deferred pending further study.

NEW SPECIES

Sinosenecio hupingshanensis Y. Liu & Q. E. Yang, sp. nov.—TYPE: CHINA. Hunan, Shimen County, southern slope of the Hupingshan Mountain, Yuantouhe River, Shi-gun-tang, alt. ca. 1,300 m, shady places along the margin of mixed evergreen and deciduous broad-leaved forests, 11 Apr 2007, *Qin-er Yang, Qiong Yuan & Ying Liu 613* (holotype: IBSC; isotypes: HAST, PE). 壺瓶山蒲兒根 Figures 1, 2

Haec species similis *Sinosenecioni baojingensi* Y. Liu & Q. E. Yang et *S. denticulato* J. Q. Liu caule foliato,

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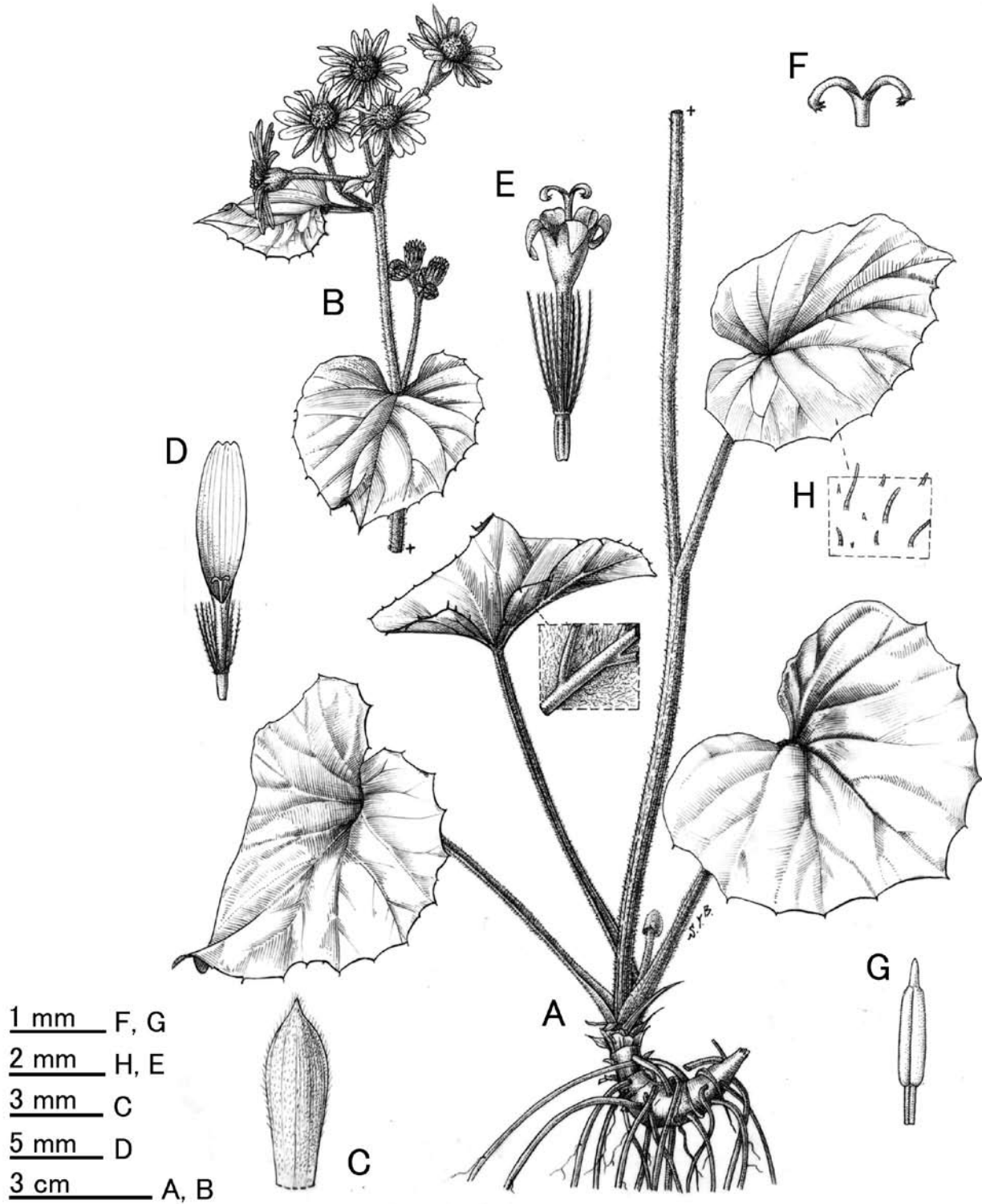


Figure 1. *Sinosenecio hupingshanensis* Y. Liu & Q. E. Yang. A, Habit; B, Inflorescence; C, Phyllary; D, Ray floret; E, Disc floret; F, Style-arms; G, Stamen; H, Magnification of leaf upper surface. (All from *Qin-er Yang, Qiong Yuan & Ying Liu 613*, IBSC).

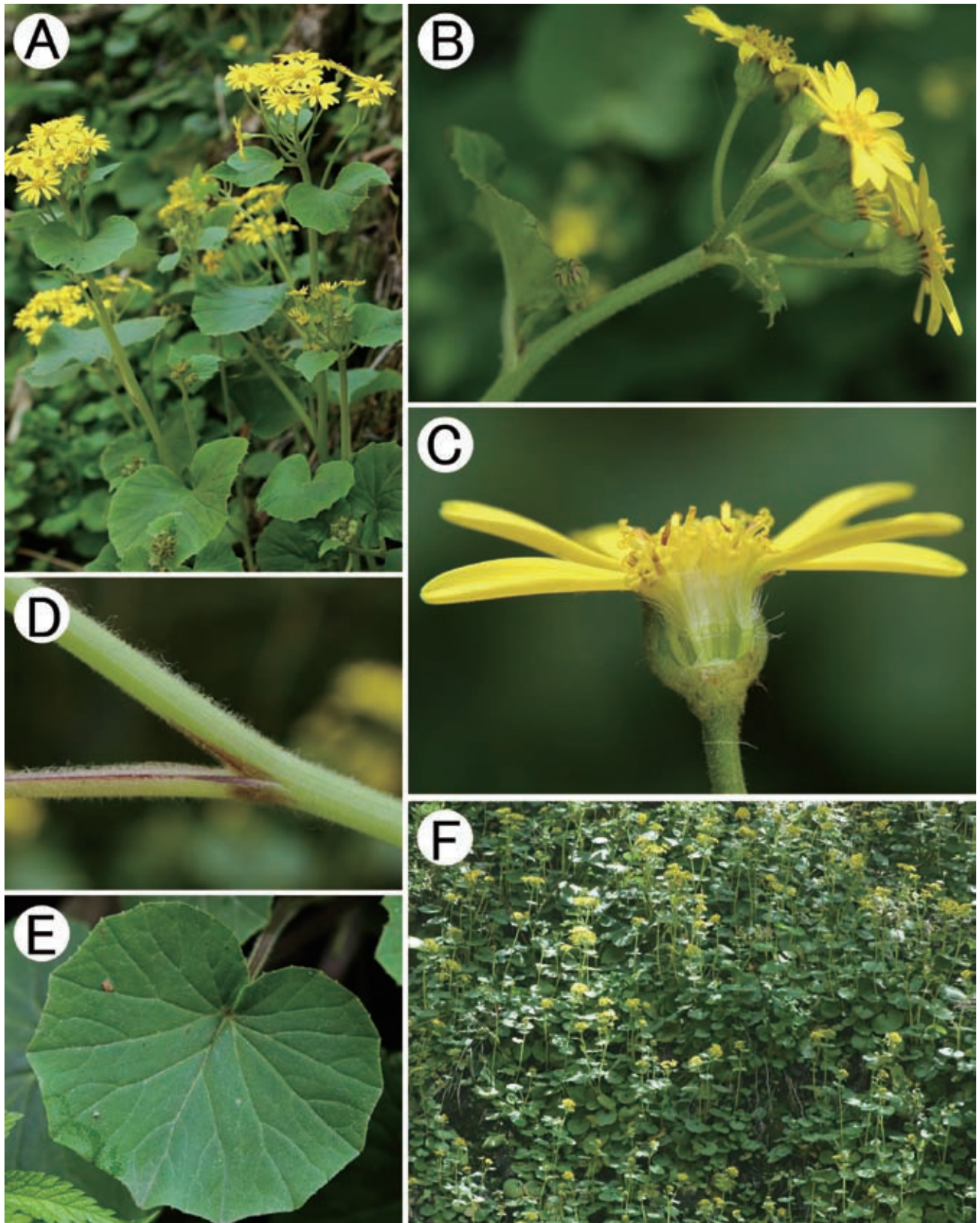


Figure 2. *Sinosenecio hupingshanensis* Y. Liu & Q. E. Yang. A, Posture; B, Inflorescence; C, Capitulum; D, Base of petiole; E, Leaf; F, Habitat. (All from *Qin-er Yang, Qiong Yuan & Ying Liu 613*, IBSC).

ligulis 6-7-nerviis, acheniis laevibus pappis praeditis, ab illo foliorum laminis reniformibus vel orbiculari-reniformibus, margine indistinctissime repandis, ab hoc foliorum laminis margine tantum indistinctissime repandis, supra pubescentibus, petiolis tantum basi dilatatis, haud auriculatis, ab amobus planta brevior, 16-60 cm alta differt.

Description. Rhizomatous herb with leafy stems, stolons absent. Rhizomes ca. 10 mm in diameter. Stems solitary, erect, 16-60 cm tall, simple, pubescent. Radical leaves long-petiolate; lamina undivided, reniform to orbicular-reniform, 4.5-12 × 5-13 cm, palmately veined, apex obtuse to acute, base shallowly to deeply cordate, margin very indistinctly repand and denticulate, green above and pale-green beneath, pubescent above, sparsely villous or sometimes glabrescent beneath; petioles 5-20 cm long, pubescent, base expanded, not auriculate. Upper stem leaves smaller, with shorter petioles. Capitula many in apical compound corymbs; peduncles 1-4 cm long, pubescent or sometimes sparsely to densely villous. Involucres campanulate, ecalyculate, 6-8 × 6-7 mm. Phyllaries 10-14, uniseriate, oblong-lanceolate to oblong-ob lanceolate, 5-7 × 1.5-2 mm, apex acuminate or acute, pubescent, fimbriate-ciliate at the apex, herbaceous, green. Ray florets ca. 13; corolla tube 3 mm long, glabrous; rays yellow, oblong-elliptic, 10-14 × 2.5-4 mm, apically 3-denticulate, 6-7-veined. Disc florets many; corolla 5 mm long, tube 4 mm long, limb campanulate; lobes ovate-lanceolate. Anthers ca. 1.5 mm long, base obtuse, appendages ovate-oblong. Style arms ca. 0.8 mm long, apex truncate. Achenes cylindrical, 1-1.5 mm long, smooth, glabrous. Pappus white, ca. 3 mm long.

Additional specimens examined. CHINA. Hunan, Shimen County, southern slope of the Hupingshan Mountain, Yuantouhe River, Shi-gun-tang, alt. 1,290 m, 3 May 2006, *Hupingshan Exped. P-010* (JIU); Shimen County, southern slope of the Hupingshan Mountain, Da-huang-lian-ping, alt. 1,400 m, 17 May 2000, *L. H. Liu & G. W. Hu 19657* [Herbarium of Hunan Normal University (HNNU)]; Shimen County, southern slope of the Hupingshan Mountain, west of Da-huang-lian-ping, 1,550 m, 21 Apr 1984, *L. H. Liu 18389* (HNNU). Hubei, Wufeng County, northern slope of the Hupingshan Mountain, alt. 1,476 m, 29 Apr 2008, *Hupingshan Exped. 080429030* (JIU).

Etymology. The specific epithet '*hupingshanensis*' is derived from the type locality, the Hupingshan Mountain, Shimen County, Hunan Province, China.

Phenology. Flowering from April to May; fruiting from May to June.

Distribution and habitat. *Sinosenecio hupingshanensis* is currently known from four populations in the Hupingshan Natural Reserve, one on the northern slope within Hubei Province and the other three on the southern slope within Hunan Province, China (Figure 3), growing in shady places along the margin of mixed evergreen and deciduous broad-leaved forests at altitudes between 1,000-

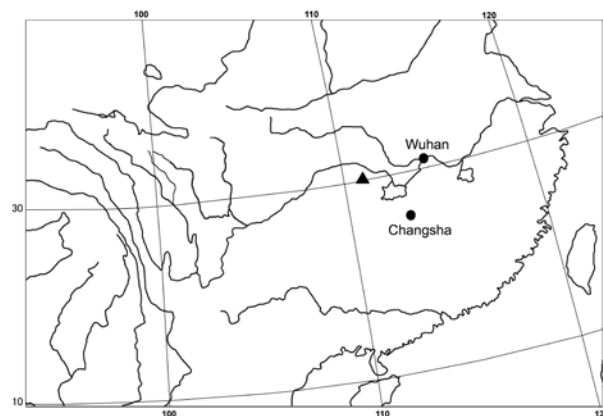


Figure 3. Distribution of *Sinosenecio hupingshanensis* (▲).

1,600 m above the sea level.

Floral micromorphological characters. For observation of the anther endothelial cell wall thickenings and filament collar of *Sinosenecio hupingshanensis*, heads were boiled in distilled water for 3 min, and then fixed with Carnoy I (glacial acetic acid: absolute ethanol = 1:3). Mature disc florets removed from the fixed heads were dehydrated in 70% ethanol for 30 min and then in 99% ethanol for 1 h before they were treated with 5% NaOH overnight. The anther tissue was isolated from the florets on the slide, flooded with 50% glycerol and a cover slip was applied. Samples were then examined at 200× (filament collar) and 400× (endothelial cell wall thickenings) magnification by light microscopy and photographed.

The anther endothelial cell wall thickenings of *Sinosenecio hupingshanensis* were polar and radial (Figure 4A), conforming to the results reported previously that endothelial cell wall thickenings are strictly polar, polar and radial or radial in other species of *Sinosenecio* (Jeffrey and Chen, 1984; Zhang et al., 2008; Liu et al., 2009; Liu and Yang, 2010). As shown in Figure 4B, the filament collar of *S. hupingshanensis* consisted of uniformly sized cells, which is one of the diagnostic features of the genus (Nordenstam, 1978; Jeffrey and Chen, 1984).

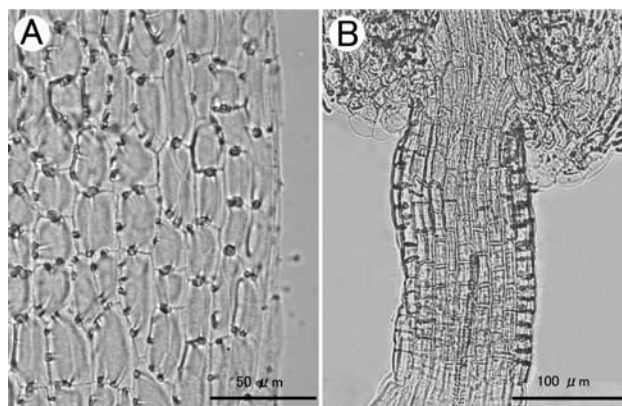


Figure 4. Endothelial cell wall thickenings (A) and filament collar (B) of *Sinosenecio hupingshanensis*. A, Polarized and radial thickenings; B, Uniformly sized cells. (All from *Qin-er Yang, Qiong Yuan & Ying Liu 613*, IBSC).

Chromosome cytology. For chromosome observation, root tips were pretreated with 0.1% colchicine for 3 h before being fixed in Carnoy I (glacial acetic acid: absolute ethanol = 1: 3), then macerated in a 1:1 mixture of 45% acetic acid and 1 M HCl at 60°C for 3 min, stained and squashed in Carbol fuchsin.

One population (*Hupingshan Exped. 080428030*, JIU) of *Sinosenecio hupingshanensis* was cytologically studied. In the interphase nuclei, a few darkly stained condensed bodies were observed, but their boundaries were not clear, because the other part was also stained fairly well but unevenly (Figure 5A). The prophase chromosomes displayed a distinctly continuous condensation pattern (Figure 5B). The metaphase chromosomes were counted to be $2n = 48$ (Figure 5C). The chromosome number of its two possible relatives, *S. baojingensis* Y. Liu & Q. E. Yang and *S. denticulatus* J. Q. Liu, is also $2n = 48$ (Liu et al., 2009; Ying Liu & Qin-er Yang, unpublished data). Based on the nomenclature of chromosomes of Levan et al. (1964), *S. hupingshanensis* had 44 median-centromeric (m), 2 submedian-centromeric (sm) and 2 subterminal-centromeric (st) chromosomes (Figure 5D), i.e. $2n = 48 = 44m + 2sm + 2st$. The chromosomes changed gradually

from the largest to the smallest in size, and the karyotype was highly symmetrical.

Notes. Based on its polar and radial endothelial cell wall thickenings, the presence of cauline leaves, glabrous ovaries and achenes, *S. hupingshanensis* can be referred to subsection *Madarogyne* C. Jeffrey & Y. L. Chen, section *Phyllocaulon* C. Jeffrey & Y. L. Chen. It is similar to *S. baojingensis* (Liu et al., 2009, and Figures 1, 2 therein) and *S. denticulatus* J. Q. Liu (Figure 6) within this section in its posture, 6-7-veined rays and glabrous achenes with a pappus. As shown in Table 1, it differs from *S. baojingensis* in its leaf-lamina reniform or orbicular-reniform (vs. ovate-cordate), margin very indistinctly repand (vs. strictly entire), smaller-sized ($4.5\text{--}12 \times 5\text{--}13$ cm vs. $12\text{--}20 \times 10\text{--}18$ cm), and much smaller stature (16-60 cm vs. 75-150 cm). From *S. denticulatus*, it differs in the leaf-lamina being very indistinctly repand (vs. shallowly 5-7-palmatilobed), pubescent above (vs. subglabrous, sparsely pubescent along the veins), the petioles expanded but never auriculate at the base (vs. auriculate), and the smaller stature (16-60 cm vs. 35-140 cm). The three species mentioned above can be distinguished by features in the following key.

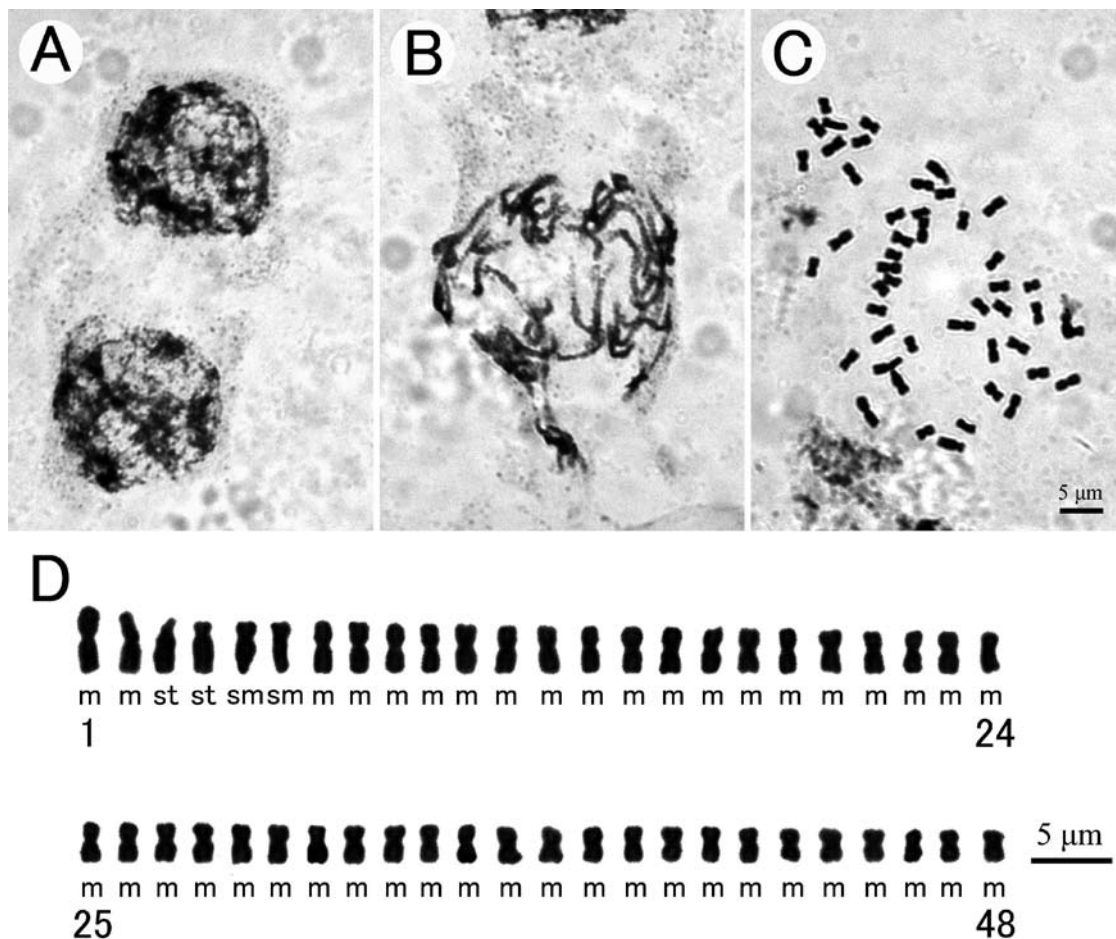


Figure 5. Interphase nuclei (A), mitotic prophase (B), metaphase (C, $2n = 48$) chromosomes and karyotype (D) of *Sinosenecio hupingshanensis*. (All from *Hupingshan Exped. 080428025*, JIU).

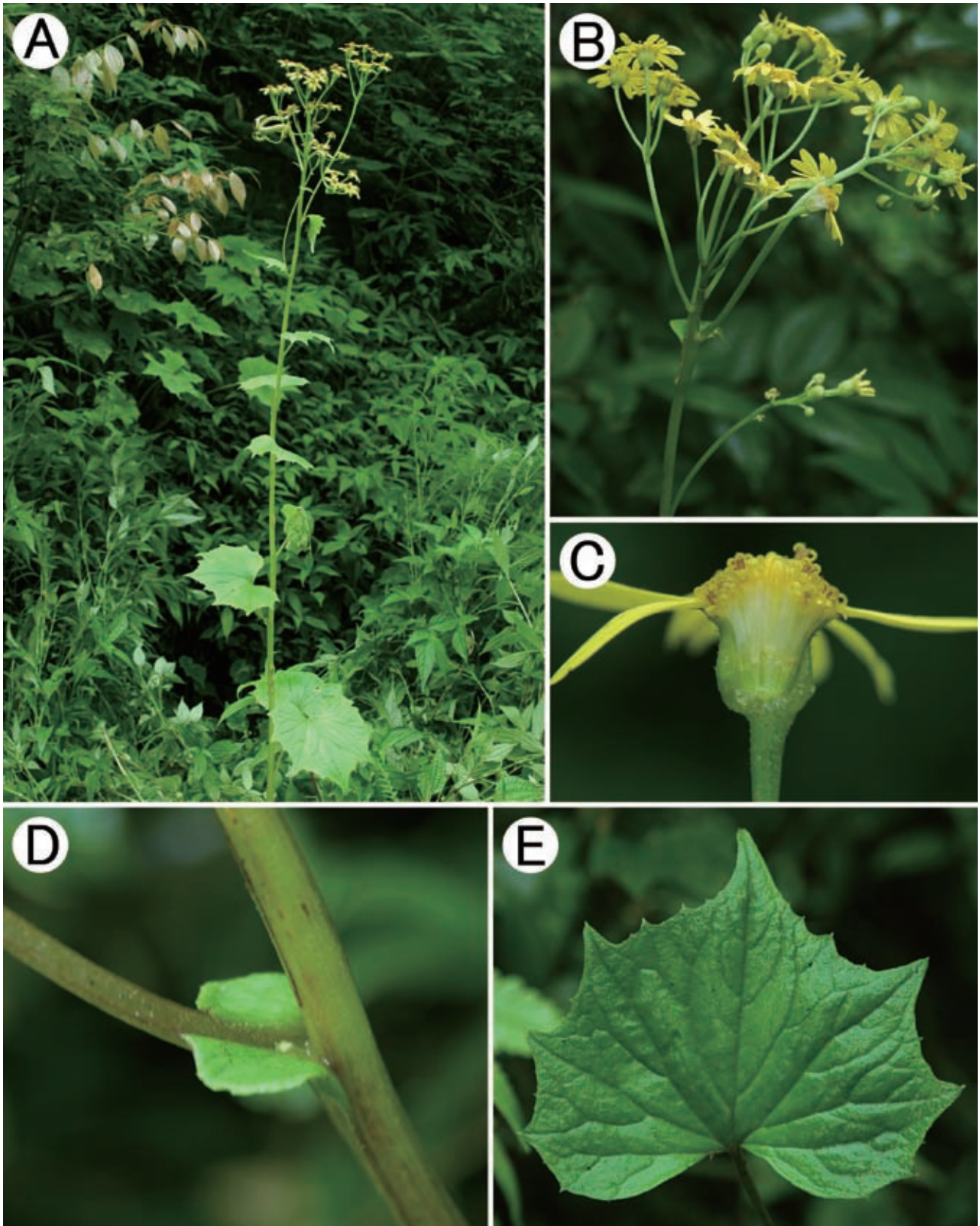


Figure 6. *Sinosenecio denticulatus* J. Q. Liu. A, Posture and habitat; B, Inflorescence; C, Capitulum; D, Base of petiole; E, Leaf. (All from *Qin-er Yang, Qiong Yuan & Ying Liu 854*, IBSC).

Table 1. Comparison of *Sinosenecio hupingshanensis*, *S. denticulatus* and *S. baojingensis*.

	<i>S. hupingshanensis</i>	<i>S. denticulatus</i>	<i>S. baojingensis</i>
Height (cm)	16-60	35-140	75-150
Posture	Herb with leafy stems	Herb with leafy stems	Herb with leafy stems
Leaf shape	Reniform to orbicular-reniform, margin very indistinctly repand and denticulate	Reniform to broadly ovate, shallowly 5-7-palmatilobed, margin denticulate	Ovate-cordate, undivided, margin denticulate
Leaf size (cm)	4.5-12 × 5-13	4-14 × 6-17	12-20 × 10-18
Upper epidermis of lamina	Pubescent	Subglabrous, sparsely pubescent along the veins	Sparsely villous
Base of petiole	Expanded	Auriculate	Expanded
Endothelial cell wall thickenings	Polar and radial	Polar and radial	Polar and radial
Veining of rays	6-7-veined	7-veined	4-7-veined
Epidermis of achene	Smooth, glabrous	Smooth, glabrous	Smooth, glabrous
Pappus	Present	Present	Present
Florescence	April-May	May-June	March-April
Stolon	Absent	Absent	Absent
Chromosome number (2n)	48	48	48
Habitat	Shady places along forest margin, 1,000-1,600 m a.s.l	Moist shady places under trees in ravine, 1,500 m a.s.l	In deep grasses on open hillside, ca. 270 m a.s.l
Geographical distribution	Bordering area between northwestern Hunan and western Hubei	Southeastern Sichuan	Northwestern Hunan

Key to *Sinosenecio hupingshanensis* and its related species

1. Leaf-lamina ovate-cordate, undivided, margin denticulate.....*S. baojingensis*
1. Leaf-lamina reniform to orbicular-reniform, very indistinctly repand or shallowly palmatilobed.
 2. Plant up to 140 cm tall; leaf-lamina shallowly 5-7-palmatilobed, subglabrous, sparsely pubescent along the veins above; petioles auriculate at the base
.....*S. denticulatus*
 2. Plant 16-60 cm tall; leaf-lamina undivided, only very indistinctly repand, pubescent above; petioles expanded but never auriculate at the base.....
..... *S. hupingshanensis*

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中國湖南和湖北產蒲兒根屬一新種：壺瓶山蒲兒根

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本文描述了中國湖南和湖北產蒲兒根屬一新種：壺瓶山蒲兒根 (*Sinosenecio hupingshanensis* Y. Liu & Q. E. Yang)。其體細胞染色體數目為 $2n = 48$ 。核型公式為 $2n = 44m + 2sm + 2st$ 。本新種在體態、花形態和瘦果具有冠毛方面與保靖蒲兒根 (*S. baojingensis* Y. Liu & Q. E. Yang) 和齒裂蒲兒根 (*S. denticulatus* J. Q. Liu) 相似，但以葉形和植株大小與前者明顯有別，又以葉緣僅波狀，葉柄基部只擴大，不成耳狀，植株較小而與後者相區別。本文提供了壺瓶山蒲兒根的彩色圖版、線繪圖、花部微觀性狀的光鏡照片、地理分佈圖以及齒裂蒲兒根的彩色圖版。

關鍵詞：菊科；染色體數目；核型；新種；千里光族；壺瓶山蒲兒根。