

Sinosenecio yilingii (Asteraceae), a new species from Sichuan, China

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ABSTRACT. *Sinosenecio yilingii* Y. Liu & Q. E. Yang, a new species from Sichuan, China, is described and illustrated. The new species is similar to *S. homogyniphyllus* (Cumm.) B. Nord., but differs in the taller stature, the leaves radical and cauline, often reniform, occasionally broadly ovate, glabrous or very sparsely pubescent above, the petioles proximally and the peduncle distally densely sericeous, the capitula solitary and terminal, and the phyllaries 11-13. Its somatic karyotype is formulated as $2n = 56m + 4sm$, giving a chromosome number of $2n = 60$. Photographs of both *S. yilingii* and *S. homogyniphyllus*, line drawings, distribution map, and light microscope (LM) microphotographs of floral characters of *S. yilingii* are provided.

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

INTRODUCTION

In the course of making a comprehensive survey of the specimens of the genus *Sinosenecio* B. Nord. (Senecioneae-Asteraceae) deposited in Chinese herbaria for the first author's Ph.D. project on the systematics and evolution of this genus, a fruiting collection, *Gui-ling Chu 3052* (IBSC, PE) (Figure 1), made from Meili River, Baoxing County, Sichuan Province, China, caught our attention. This collection had been previously identified as *S. homogyniphyllus* (Cumm.) B. Nord., and cited under this name by Jeffrey and Chen (1984). Upon a closer examination, however, we found that the collection differs markedly from *S. homogyniphyllus* in having leaves radical and cauline (vs. radical), the petioles proximally and the peduncle distally densely sericeous (vs. yellowish-brown villous). In June 2007 and May 2009, we made two botanical expeditions to Baoxing County and collected successfully flowering and fruiting specimens of the plant in question. We found that the plant is similar to *S. homogyniphyllus* in posture and epappose achenes, but differs in the taller stature (10-40 cm vs. 10-25 cm), the leaves radical and cauline (vs. radical), often reniform, occasionally broadly ovate (vs. often broadly ovate-orbicular, occasionally reniform), glabrous or very sparsely pubescent above (vs. sparsely villous), the petioles proximally and the peduncle distally densely

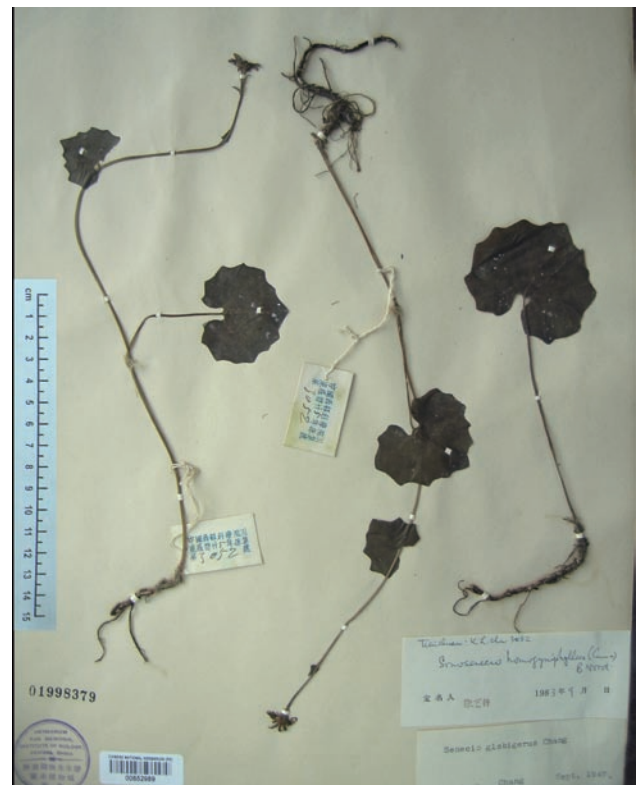


Figure 1. *Gui-ling Chu 3052* (PE), collected from Baoxing County, Sichuan, China. This collection, previously misidentified as *Sinosenecio homogyniphyllus*, represents a new species, *S. yilingii*.

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sericeous (vs. yellowish-brown villous), the capitula always solitary and terminal (vs. solitary or several in terminal subumbelliform corymbs), and the phyllaries 11-13 (vs. 7-10). Therefore, we concluded that the plant represents a hitherto undescribed species.

NEW SPECIES

Sinosenecio yilingii Y. Liu & Q. E. Yang, sp. nov.—
TYPE: CHINA. Sichuan, Baoxing County, Meili River, alt. ca. 2,200 m, stream side along margin of deciduous broad-leaved forests, 17 May 2009, *Ying Liu & Tao Deng 2009069* (holotype: IBSC; isotypes: HAST, PE).

藝林蒲兒根

Figures 2, 3

Habitu et pappo nullo species nova haec similis Sinosenecioni homogyniphylo (Cumm.) B. Nord., sed planta altiore, 10-40 cm alta, caule foliato, foliorum laminis reniformibus vel interdum late ovatis, supra glabris vel interdum sparsissime pubescentibus, petiolis basi et pedunculo in superiore parte dense sericeo, capitulis singularibus, involucri phyllariis 11-13 differt.

Subscapigerous herb, stolons absent. Rhizomes 2-3 mm in diameter. Stems solitary or sometimes several, erect, 10-40 cm tall, simple, sparsely sericeous or later glabrescent in the upper part, densely sericeous at the base. Leaves 3-6, radical and cauline, long-petiolate; lamina reniform or sometimes broadly ovate, 1.7-5.5 × 2-6.5 cm, palmately veined, margin repand or dentate with mucro-

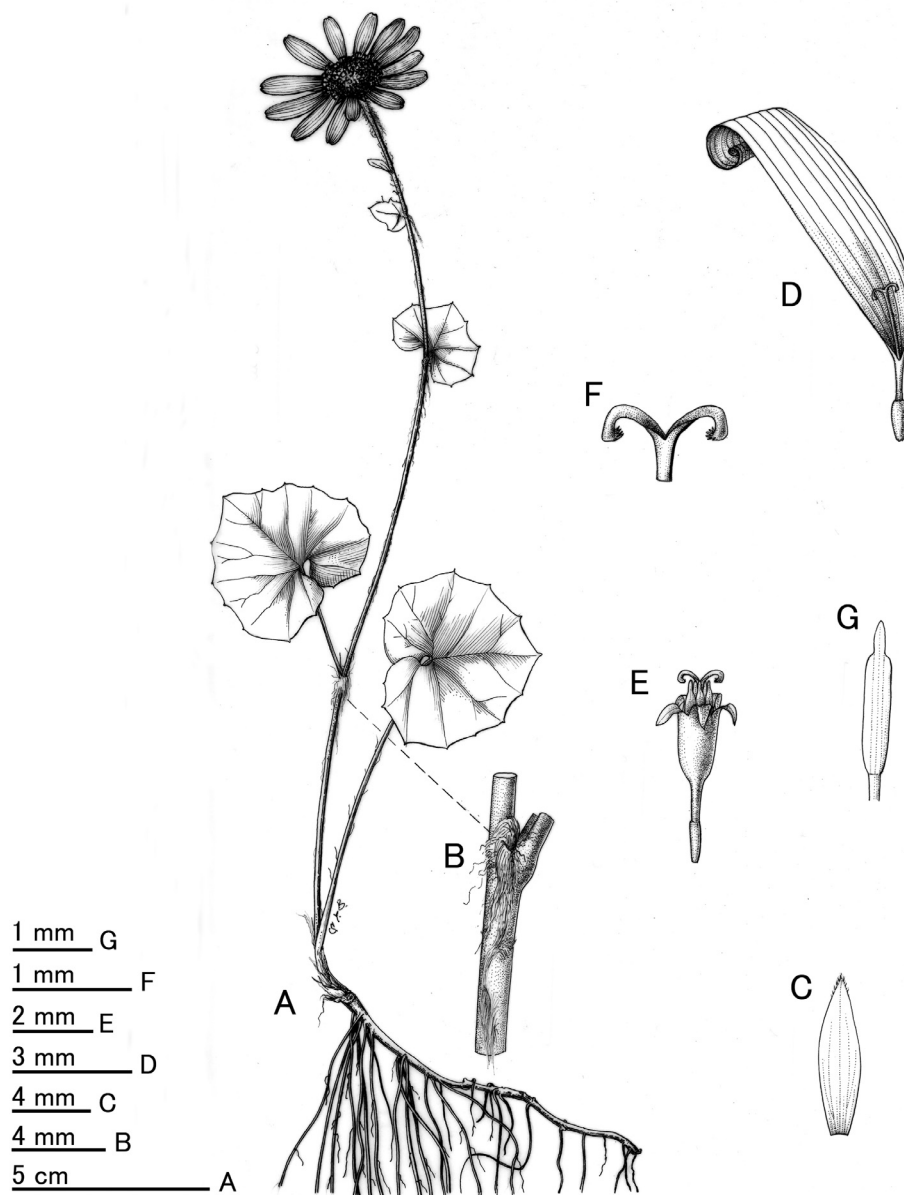


Figure 2. *Sinosenecio yilingii* Y. Liu & Q. E. Yang. A, Habit; B, Base of petiole; C, Phyllary; D, Ray floret; E, Disc floret; F, Style-arms; G, Anther (From *Ying Liu & Tao Deng 2009069* and *Qin-er Yang, Qiong Yuan & Ying Liu 947*, both at IBSC and PE).

nulate teeth, apex obtuse or sometimes acute, base deeply cordate to cordate, subcoriaceous to membranous, green to dark green, nitid above, pale-green beneath, glabrous or sometimes very sparsely pubescent on both surfaces; petioles 4-9 cm long, sparsely sericeous or later glabrescent in the upper part, densely sericeous at the base. Upper cauline leaves smaller, with shorter petioles. Capitula solitary, terminal; peduncle sparsely sericeous or later glabrescent in the lower part, densely sericeous in the upper part. Involucre obconic, ecalyculate, 7-10 × 5-7 mm. Phyllaries 11-13, uniseriate, oblong or oblong-lanceolate, 7-10 × 1.5-2.5 mm, apex acuminate or acute, subglabrous, apex fimbriate-ciliate, herbaceous, green. Ray florets ca. 13; corolla tube ca. 2.5 mm long, glabrous; rays yellow, oblong-elliptic, ca. 10 × 3 mm, apically 3-denticulate,

6-7-veined. Disc florets many; corolla ca. 4 mm long, tube ca. 3 mm long, limb campanulate; lobes ovate-lanceolate. Anthers ca. 2 mm long, base obtuse, appendages ovate-oblong. Style arms ca. 1 mm long, apex truncate. Achenes obovoid-cylindrical, 1.5 mm long, smooth, glabrous. Pappus absent.

Additional specimens examined. **CHINA:** Sichuan, Baoxing County, Meili River, in woods, 30 Jun 1936, *Guiling Chu 3052* (BM, IBSC, PE); the same locality, alt. ca. 2100 m, stream side along margin of deciduous broad-leaved forests, 26 June 2007, *Qin-er Yang, Qiong Yuan & Ying Liu 947* (IBSC, PE).

Etymology. This species is named in honor of Professor Yi-Ling Chen, Institute of Botany, Chinese Academy of

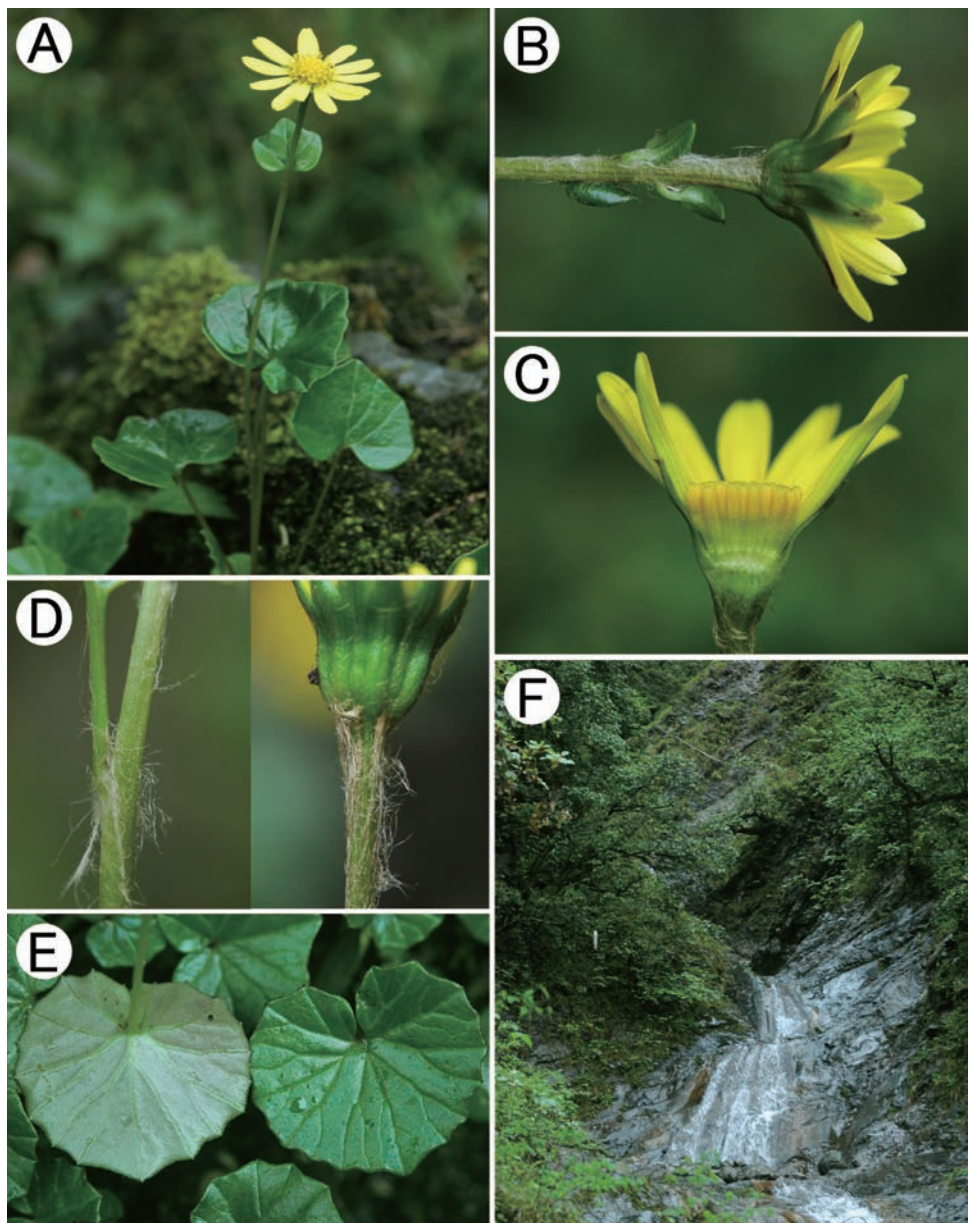


Figure 3. *Sinosenecio yilingii* Y. Liu & Q. E. Yang. A, Posture; B, Capitulum; C, Florets; D, Trichomes of petiole (left) and peduncle (right); E, Leaves, abaxial side (left) and adaxial side (right); F, Habitat (All from *Ying Liu & Tao Deng 2009069*, HAST, IBSC, PE).

Sciences, who has made outstanding contributions to the taxonomy of the Chinese Asteraceae.

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

Distribution, habitat and status. *Sinosenecio yilingii* is currently known only from one population found in a ravine in Baoxing County, Sichuan Province, China (Figure 4), growing in grasses or on rocks of streamside along margin of deciduous broad-leaved forests at an altitude of ca. 2,200 m above the sea level. If this is truly the only population, then according to the IUCN red list categories and criteria, version 3.1 (IUCN, 2001), *S. yilingii* should be categorized as a critically endangered species (CR). Perhaps the most serious threat to the species' survival lies in the ongoing habitat destruction through mining.

Floral micromorphological characters. For observation of the anther endothelial cell wall thickenings and filament collar of *Sinosenecio yilingii*, 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 \times (filament collar) and 400 \times (endothelial cell wall thickenings) magnification by light microscopy and photographed.

The endothelial cell wall thickenings in *Sinosenecio yilingii* were strictly polar (Figure 5A), a character found to occur in some members of *Sinosenecio* sect. *Sinosenecio* (Jeffrey and Chen, 1984). In the members of *Sinosenecio* sect. *Phyllocaulon* C. Jeffrey & Y. L. Chen, the endothelial cell wall thickenings are radial or radial and polar (Jeffrey and Chen, 1984; Zhang et al., 2008; Liu et al., 2009). As indicated in Figure 5B, its filament collar consisted of uniformly sized cells, conforming to one of the diagnostic characters of this genus (Nordenstam, 1978; Jeffrey and Chen, 1984).

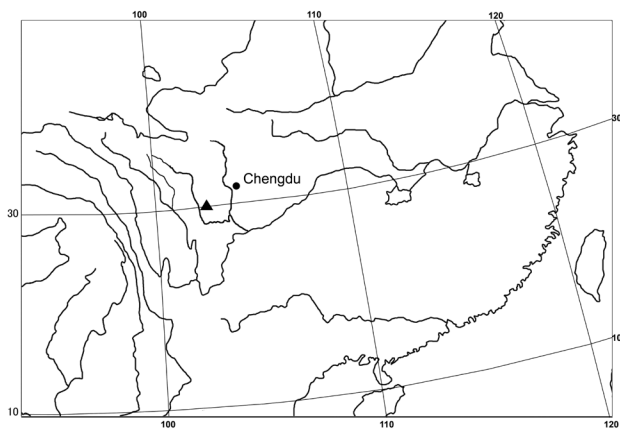


Figure 4. Distribution of *Sinosenecio yilingii* (▲).

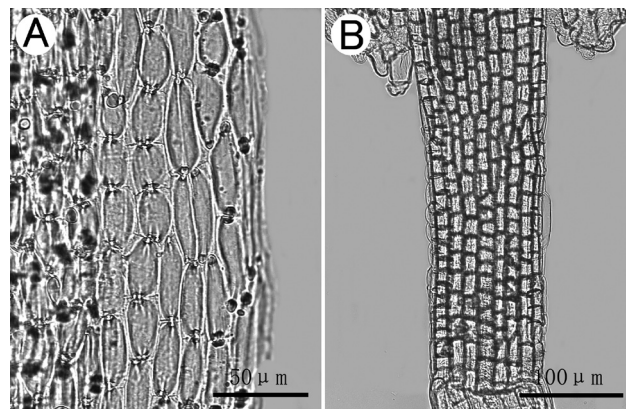


Figure 5. Anther endothelial cell wall thickenings (A) and filament collar (B) of *Sinosenecio yilingii*. A, Polar and radial thickenings; B, Uniformly sized cells (All from *Qin-er Yang, Qiong Yuan & Ying Liu 947*, IBSC, PE).

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.

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 6A). The prophase chromosomes displayed a distinctly continuous condensation pattern (Figure 6B). The metaphase chromosomes were counted to be $2n = 60$ (Figure 6C). Based on the nomenclature of chromosomes of Levan et al. (1964), *Sinosenecio yilingii* had 56 median-centromeric (m) and 4 submedian-centromeric (sm) chromosomes (Figure 6D), i.e. $2n = 60 = 56m + 4sm$. The chromosomes changed gradually from the largest to the smallest in size, and the karyotype was highly symmetrical. The chromosome number $2n = 24$ reported by Liu (1999) for *S. homogyniphyllus*, the close relative of *S. yilingii*, may represent a wrong count, most likely owing to misidentification of material, as the material examined by him was obtained as a gift from an anonymous person. We have re-examined the chromosomes of *S. homogyniphyllus* and revealed the number as $2n = 60$. The results of a comprehensive survey of the chromosome numbers in the genus *Sinosenecio* will be reported in a separate paper (Ying Liu & Qin-er Yang, in prep.).

Notes. *Sinosenecio yilingii* can be readily referred to subsect. *Phalacrocarpa* C. Jeffrey & Y. L. Chen, sect. *Sinosenecio*, based on its strictly polar anther endothelial cell wall thickenings and epappose achenes. Its subscapigerous posture and epappose achenes, at first glance, are strongly reminiscent of *S. homogyniphyllus* (Figure 7), but upon a closer examination they are readily distinguishable from each other by a series of significant characters as aforementioned (also see Table 1). In the same ravine where *S. yilingii* was collected, we also found

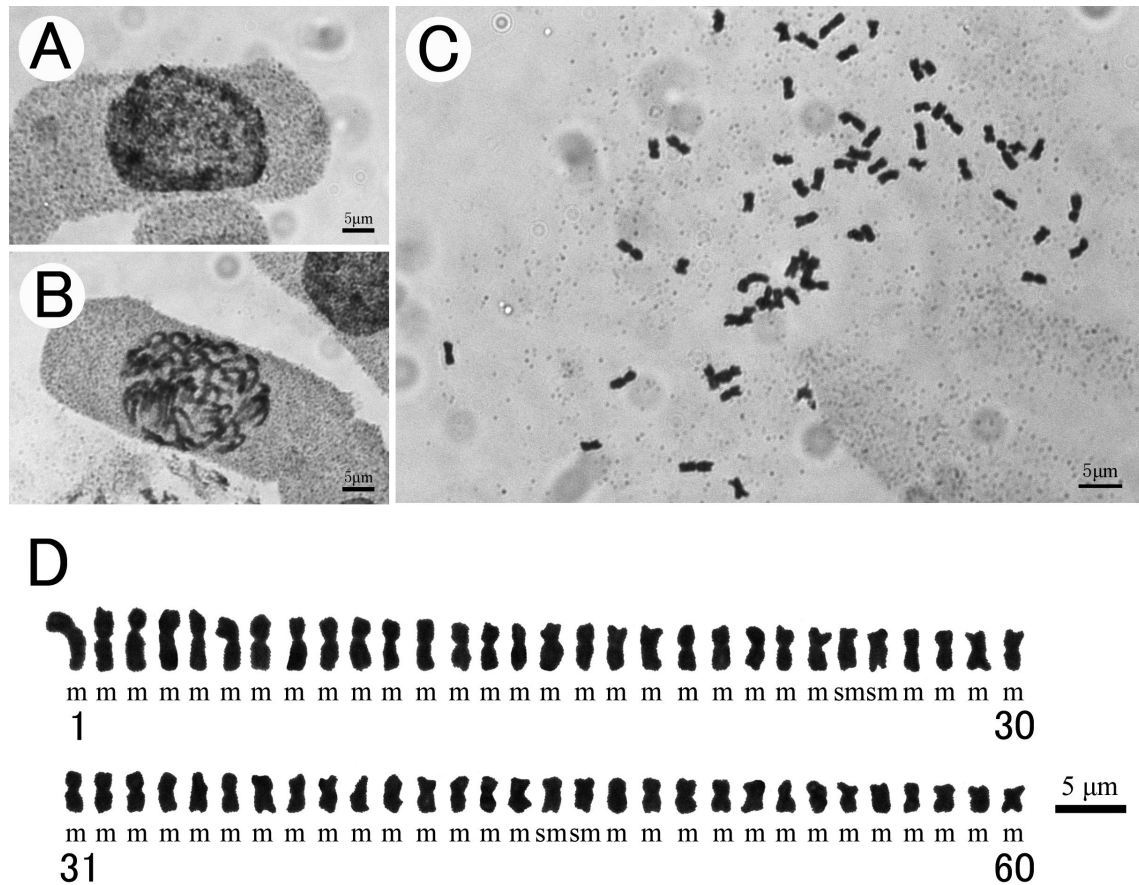


Figure 6. Interphase nucleus (A), mitotic prophase (B), metaphase (C, $2n = 60$) chromosomes and karyotype (D) of *Sinosenecio yilingii* (All from Qin-er Yang, Qiong Yuan & Ying Liu 947, IBSC, PE).

Table 1. Comparison of *Sinosenecio yilingii* and *S. homogyniphyllus*.

	<i>S. yilingii</i>	<i>S. homogyniphyllus</i>
Height (cm)	10-40	10-25
Posture	Herb with radical and cauline leaves	Herb with radical leaves
Leaf-lamina shape	Often reniform, occasionally broadly ovate, margin repand or dentate with mucronulate teeth	Often broadly ovate-orbicular, occasionally reniform, margin repand-dentate or subentire with mucronulate teeth
Leaf-lamina surface	Glabrous or very sparsely pubescent above	Sparsely villous above
Pubescence of petiole and peduncle	Petiole proximally and peduncle distally densely sericeous	Petiole and peduncle more or less yellowish-brown villous
Capitulum	Solitary	Solitary or several
Phyllary number	11-13	7-10
Pappus	Absent	Absent, rarely pappus-hairs several
Florescence	May-June	June-July
Chromosome number ($2n$)	60	60
Habitat	Shady places along forest margin or on streamside rocks, 2,100-2,200 m a.s.l	On rocks, in shady places and in forests, 1,300-2,900 m a.s.l
Geographical distribution	Restricted to Baoxing County, W Sichuan	Widely distributed in W Sichuan

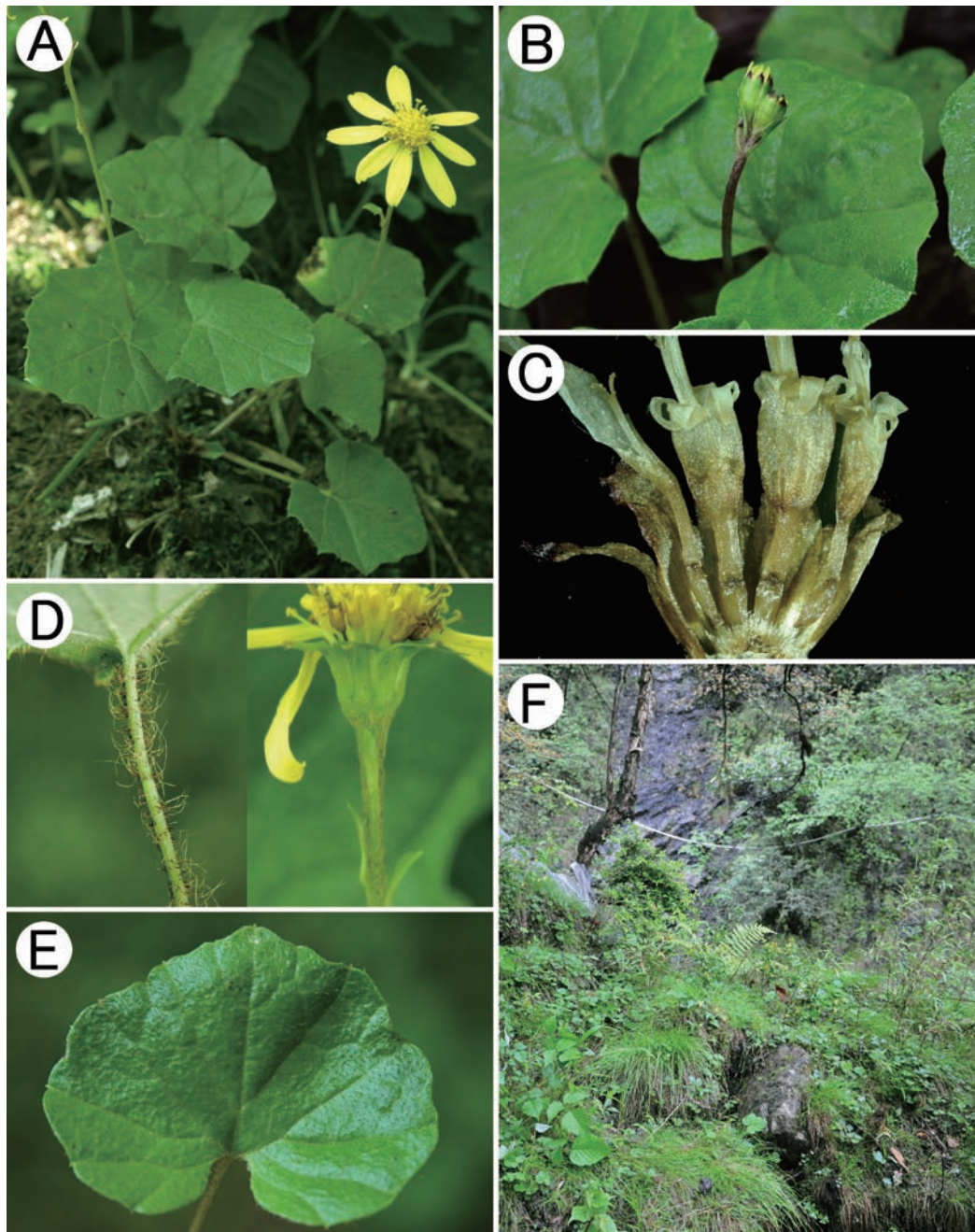


Figure 7. *Sinosenecio homogyniphyllus* (Cumm.) B. Nord. A, Posture; B, Capitula; C, Florets; D, Trichomes of petiole (left) and peduncle (right); E, Leaf; F, Habitat (All from Qin-er Yang, Qiong Yuan & Ying Liu 946, PE).

a population of *S. homogyniphyllus*. Interestingly, the plant individuals of *S. yilingii* usually grew in shady places along forest margin or on streamside rocks, flowering from May to June, while those of *S. homogyniphyllus* preferred more open sunny places, flowering from June to July. It seems that at least in this ravine these two species have achieved their reproductive isolation through the differences in their flowering time and habitat preference. As such, it is not surprising that we did not observe any possible hybrids between *S. yilingii* and *S. homogyniphyllus* in the ravine.

In their infrageneric division of the genus *Sinosenecio*,

Jeffrey and Chen (1984) used the presence or absence of cauline leaves as the only character to distinguish ser. *Elati* C. Jeffrey & Y. L. Chen from ser. *Scaposi* C. Jeffrey & Y. L. Chen under subsect. *Phalacrocarpa*, with the former series characterized by the presence of cauline leaves, and the latter by the absence of cauline leaves. The discovery of *S. yilingii* has resulted in the collapse of this distinguishing character at series level. This species, although having cauline leaves, seems to be much more closely related to *S. homogyniphyllus* within ser. *Scaposi* than to the members within ser. *Elati*. The strictly polar

anther endothelial cell wall thickenings and chromosome number $2n = 60$ of *S. yilingii* also lend strong support to its placement together with *S. homogyniphyllus* in the same series. All the species thus far examined in ser. *Elati* were found to have polar and radial anther endothelial cell wall thickenings and the chromosome number $2n = 48$ (Zhang et al., 2008; Liu et al., 2009; Ying Liu & Qin-er Yang, unpublished data).

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中國四川產蒲兒根屬一新種：藝林蒲兒根

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本文描述了中國四川產蒲兒根屬一新種：藝林蒲兒根（*Sinosenecio yilingii* Y. Liu & Q. E. Yang）。本新種與腎葉蒲兒根 [*Sinosenecio homogyniphyllus* (Cumm.) B. Nord.] 相似，但以植株較高，葉基生以及莖生，通常腎形，偶爾闊卵形，葉片上表面無毛或稀被柔毛，葉柄基部與花序梗上部密被絲狀毛，頭狀花序單生，總苞片 11–13 而與後者相區別。其體細胞染色體數目為 $2n = 60$ 。核型公式為 $2n = 56 m + 4 sm$ 。本文提供了藝林蒲兒根以及腎葉蒲兒根的彩色圖版、藝林蒲兒根的線繪圖、花部微觀性狀的光鏡照片以及地理分佈圖。

關鍵詞：菊科；染色體數目；核型；新種；千里光族；藝林蒲兒根。