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SYSTEMATICS

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

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ABSTRACT. *Sinosenecio albonervius* Y. Liu & Q. E. Yang, a new species from Hunan and Hubei, China, is described and illustrated. Its chromosome number ($2n = 48$) is reported here. Its karyotype is formulated as $2n = 42m + 2sm + 4st$. This new species is similar to *S. palmatisectus* C. Jeffrey & Y. L. Chen in the posture, the palmately-divided leaves and the epappose achenes, but differs in its leaves shallowly 7-9-palmatilobed to 1/4-1/3, matte-green adaxial surface, pubescence and white veins, deltoid lobes with remotely denticulate margins; and 9-13 ray florets. Line drawings, distribution map, light microscope (LM) microphotographs of floral characters of *S. albonervius*, and color photographs of both *S. albonervius* and *S. palmatisectus* are provided.

Keywords: Asteraceae; Chromosome number; Karyotype; Senecioneae; *Sinosenecio albonervius*.

INTRODUCTION

In the course of making a comprehensive survey of *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, one collection kept in the Herbarium of Jishou University (JIU), *Hupingshan Expedition 060422008*, from the southern slope of the Hupingshan Mountain, Shimen County, Hunan Province, China, caught our attention. At first glance, the plant appeared to be *S. palmatisectus* C. Jeffrey & Y. L. Chen, a species currently known only from Hefeng County, Hubei Province, due to similarities in their leaf shape, posture, and epappose achenes. A more careful examination however, revealed that the plant in question differed from *S. palmatisectus* in several characters, such as its upper leaf-lamina pubescence and the remotely denticulate margins of its deltoid lobes. Field studies carried out in Shimen County, Hunan and Hefeng County, Hubei (the type locality of *S. palmatisectus*) confirmed and increased the list of differences between the population from Shimen and *S. palmatisectus*, leading us to recognize the population from Shimen as an undescribed species. Further field work resulted in the discovery of another population of this new species from the northern slope of the Hupingshan Mountain in Wufeng County, Hubei Province.

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NEW SPECIES

Sinosenecio albonervius Y. Liu & Q. E. Yang, sp. nov.—TYPE: CHINA. Hunan, Shimen County, southern slope of the Hupingshan Mountain, Hou-shan-ping, alt. ca. 800 m, shady places along margin of mixed evergreen and deciduous broad-leaved forests along streamside in ravine, 12 Apr 2007, *Qin-er Yang, Qiong Yuan & Ying Liu 632* (holotype, IBSC; isotypes, HAST, PE).

白脉蒲儿根 Figures 1, 2

Haec species similis Sinosenecioni palmatisecto C. Jeffrey & Y. L. Chen habitu, foliorum laminis palmatim divisis et acheniis laevibus glabris pappo destitutis, sed foliorum laminis supra hebetato-viridibus, pubescentibus, non profunde palmatim 7-9-lobatis, lobis ambitu deltatis margine remote denticulatis, nervis albis, ligulis 9-13 differt.

Description: Rhizomatous herb with leafy stems, stolons absent. Rhizomes ca. 6 mm in diameter. Stems solitary or several, erect, 24-45 cm tall, simple, pubescent or glabrous. Radical leaves long-petiolate; lamina reniform to orbicular-reniform in outline, 3-13×4-13 cm, shallowly palmately 7-9-lobed to 1/4-1/3, palmately white veined, apex acute to obtuse, base shallowly to deeply cordate, submembranous, matte-green above and pale-green beneath, pubescent above, pubescent or sometimes glabrescent beneath; lobes deltoid, margin remotely denticulate; petioles 8-26 cm long, pubescent or sometimes glabrescent, base expanded, not auriculate. Upper stem leaves

smaller, with shorter petioles. Capitula many in apical compound corymbs; peduncles 1-3 cm long, distally expanded, sparsely fulvous-villous. Involucres campanulate, ecalyculate, 7-8 × 8-9 mm. Phyllaries 12-13, uniseriate, oblong-lanceolate, ca. 7×2 mm, apex acuminate or acute, sparsely fulvous-villous or sometimes glabrescent, fimbriate-ciliate at the apex, herbaceous, green. Ray florets 9-13; corolla tube 2-3 mm long, glabrous; rays yellow, oblong-elliptic, ca. 10 × 3 mm, apically 3-denticulate, 4-veined. Disc florets many; corolla 4 mm long, tube 2 mm long,

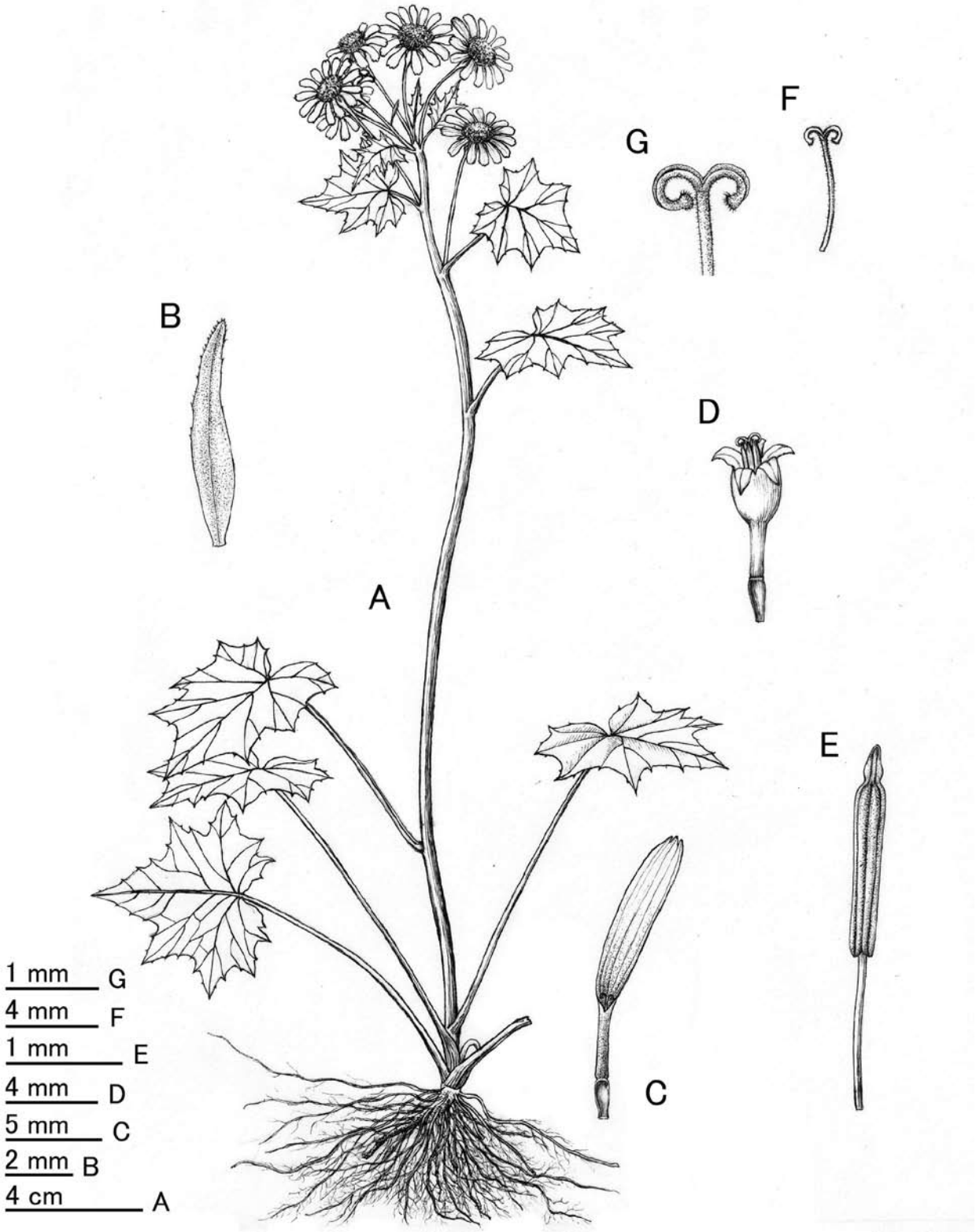

Figure 1. *Sinosenecio albonervius* Y. Liu & Q. E. Yang. A, Habit; B, Phyllary; C, Ray floret; D, Disc floret; E, Stamen; F, Style; G, Style-arms (All from *Qin-er Yang, Qiong Yuan & Ying Liu 632*, HAST, IBSC, PE).

limb campanulate; lobes ovate-lanceolate. Anthers ca. 1.7 mm long, base obtuse, appendages ovate-oblong. Style arms ca. 0.6 mm long, apex truncate. Achenes cylindrical, ca. 2 mm long, smooth, glabrous. Pappus absent.

Additional specimens examined. **CHINA.** HUNAN: Shimen County, southern slope of the Hupingshan Mountain, Hou-shan-ping, alt. 800 m, along streamside in ravine, 22 Apr 2006, *Hupingshan Exped. 060422008* (JIU).

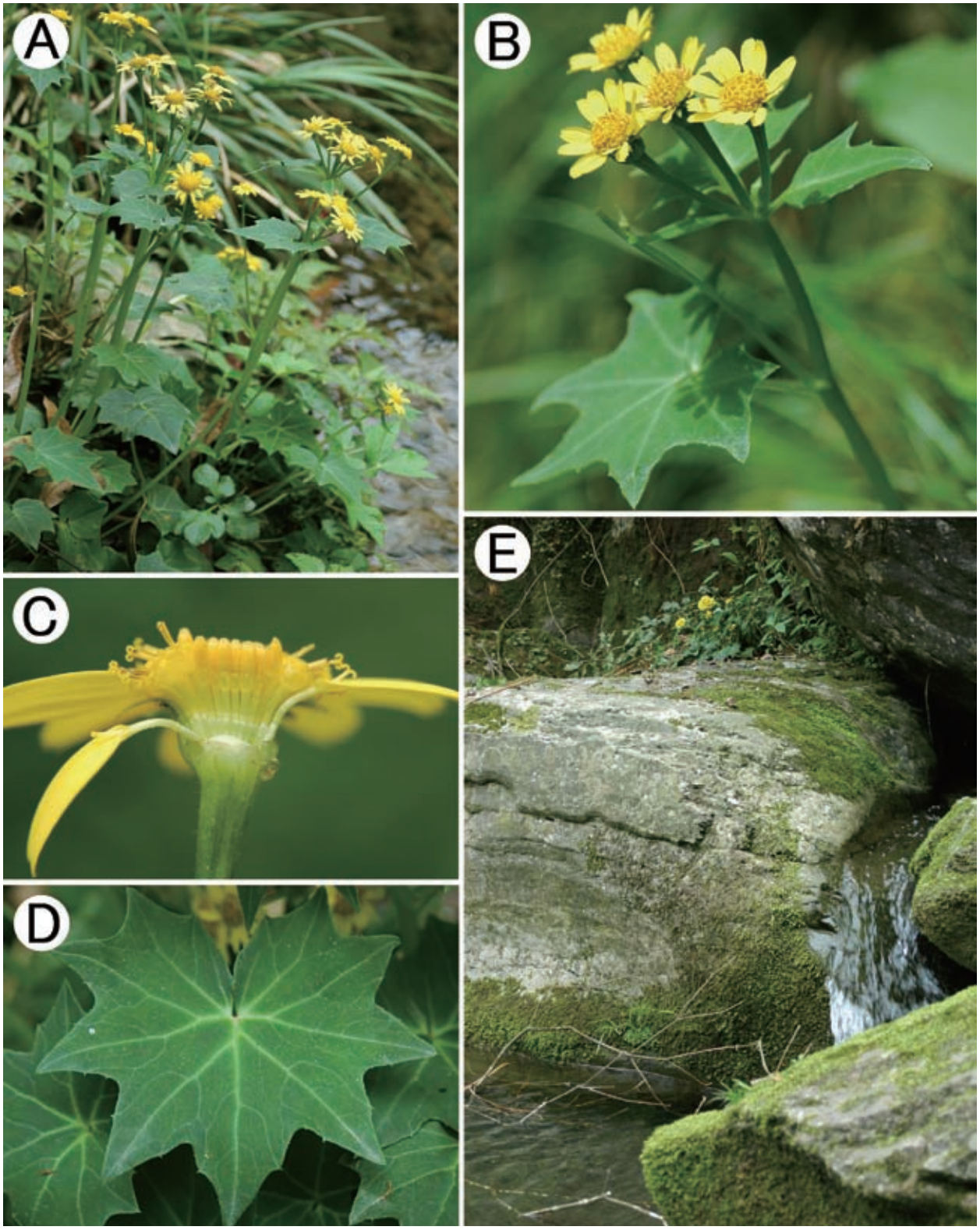

Figure 2. *Sinosenecio albonervius* Y. Liu & Q. E. Yang. A, Habit; B, Inflorescence; C, Capitulum opened, showing florets; D, Leaf; E, Habitat (All from type locality and vouched by *Qin-er Yang, Qiong Yuan & Ying Liu 632*, HAST, IBSC, PE).

Hubei, Wufeng County, northern slope of the Hupingshan Mountain, Chang-le, Mu-shui-xi, alt. 1,200 m, along streamside, 28 Apr 2008, *Houhe Exped. 080428057* (JIU).

Etymology. The specific epithet '*albonervius*' refers to the white nerves of leaves in the new species.

Phenology. Flowering April; fruiting May to June.

Distribution and habitat. Sinosenecio albonervius is currently known from two populations in the Hupingshan Natural Reserve, one on the northern slope within Hubei Province and the other on the southern slope within Hunan Province, China (Figure 3), growing in shady places along streamside at altitudes between 800-1,200 m above the sea level.

Floral micromorphological characters. For observation of the anther endothecial cell wall thickenings and filament collar of *Sinosenecio albonervius*, 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× (endothecial cell wall thickenings) magnification by light microscopy and photographed.

As shown in Figure 4A, the anther endothecial cell wall thickenings of *Sinosenecio albonervius* were polarized and radial, with the cells of polarized thickenings being predominant, conforming to the results reported previously for some other species of *Sinosenecio*, such as *S. jishouensis* D. G. Zhang, Y. Liu & Q. E. Yang (Zhang et al., 2008), *S. baojingensis* Y. Liu & Q. E. Yang (Liu et al., 2009) and *S. hupingshanensis* Y. Liu & Q. E. Yang (Liu et al., 2010). *Sinosenecio palmatisectus* had also the same pattern of anther endothecial cell wall thickenings (Liu and Yang, 2011b) as *S. albonervius*. The filament collar of *S. albonervius* consisted of uniformly sized cells (Figure 4B), which is one of the diagnostic features of the genus (Nordenstam, 1978; Jeffrey and Chen, 1984).

Chromosome cytology. For chromosome observation, root tips were pretreated with 0.1% colchicine for 2 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 (*Houhe Exped. 080428057*, JIU) of *Sinosenecio albonervius* was cytologically studied. In the interphase nucleus, 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 continuous condensation pattern (Figure 5B). The metaphase chromosomes were counted as $2n = 48$ (Figure 5C). The chromosome number of its putative close relative, *S. palmatisectus*, is also $2n = 48$ (Liu and Yang, 2011a). Ac-

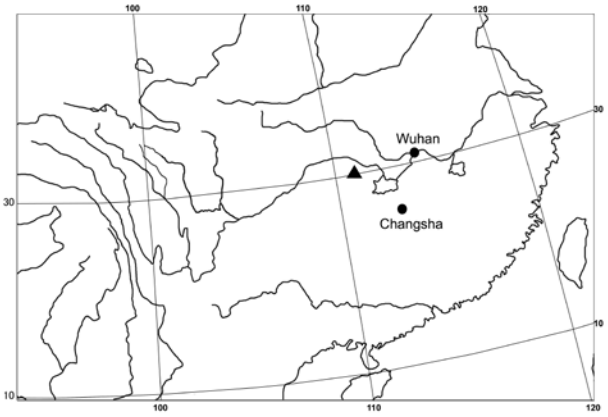

Figure 3. Distribution of *Sinosenecio albonervius* (▲).

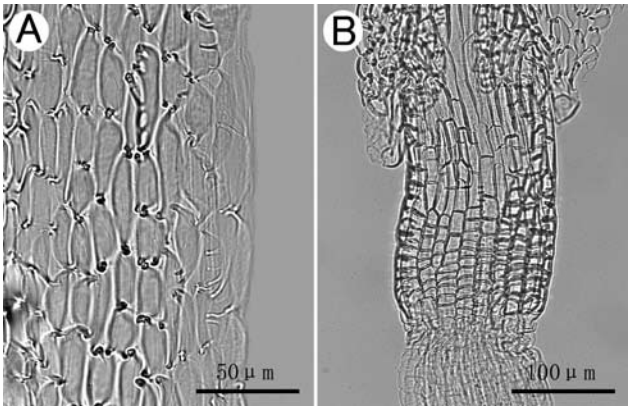

Figure 4. Anther endothecial cell wall thickenings (A) and filament collar (B) of *Sinosenecio albonervius.* A, Polar and radial thickenings, with the polar ones predominant but with few radial ones on the right side; B, Uniformly sized cells (All from *Qin-er Yang, Qiong Yuan & Ying Liu 632*, HAST, IBSC, PE).

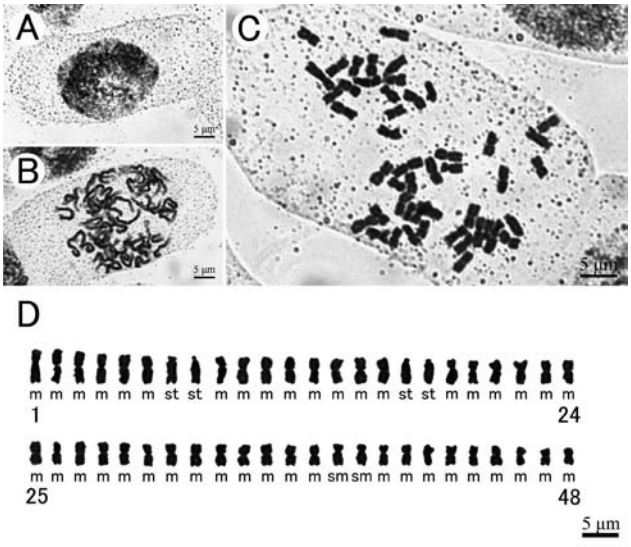

Figure 5. Interphase nucleus (A), mitotic prophase (B), metaphase (C, $2n = 48$) chromosomes and karyotype (D) of *Sinosenecio albonervius* (All from *Houhe Exped. 080428057*, JIU).

cording to the nomenclature of chromosomes of Levan et al. (1964), *S. albonervius* had 42 median-centromeric (m), 2 submedian-centromeric (sm) and 4 subterminal-centromeric (st) chromosomes (Figure 5D), i.e. $2n = 48 = 42m + 2sm + 4st$.

Notes. Although *Sinosenecio albonervius* may be confused with *S. palmatisectus* (Figure 6) owing to their similarities in posture, palmately-divided leaf-lamina and epappose achenes (Table 1), it differs from the latter in that the leaf-lamina is shallowly 7-9-palmatilobed to 1/4-

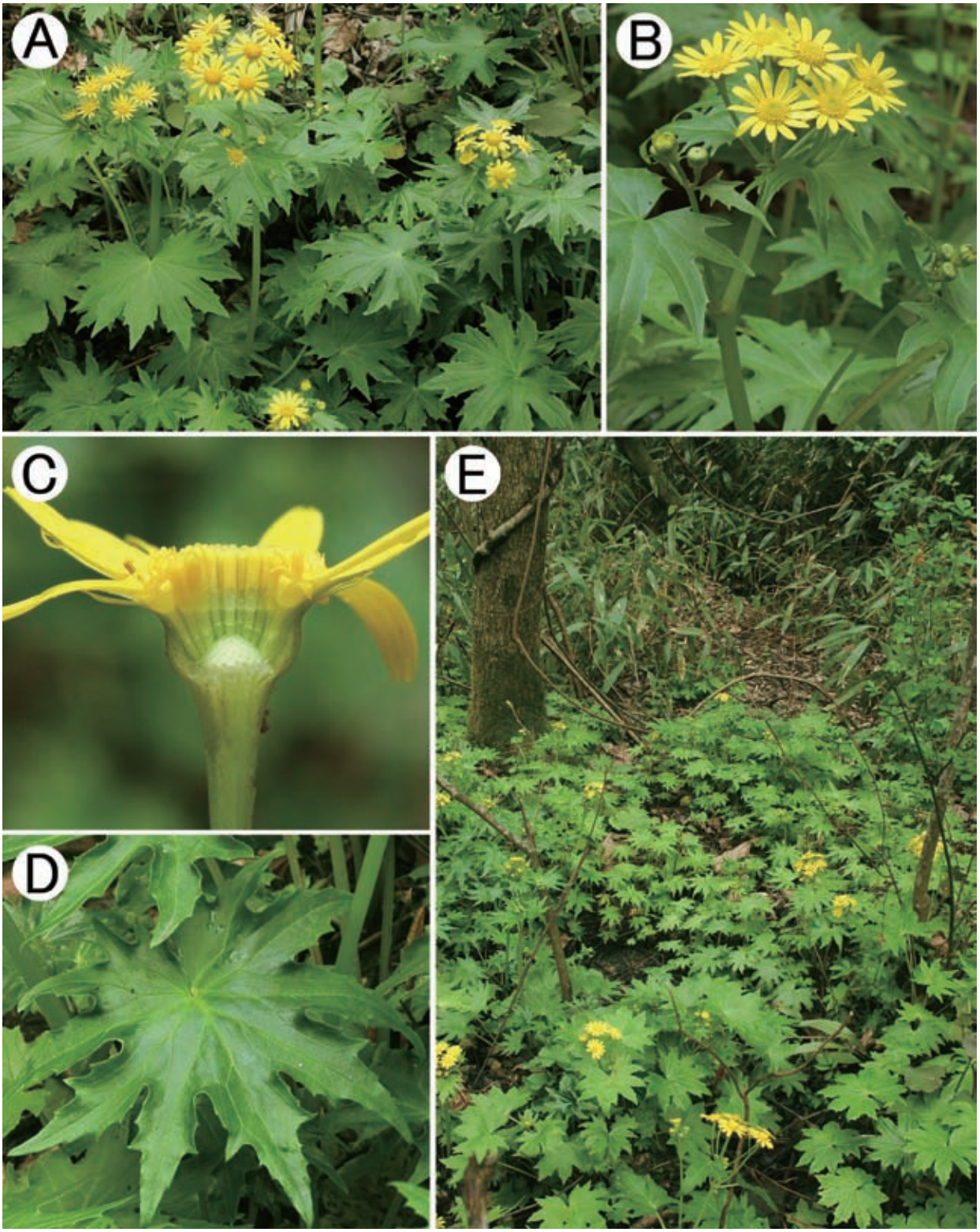

Figure 6. *Sinosenecio palmatisectus* C. Jeffrey & Y. L. Chen A, Habit; B, Inflorescence; C, Capitulum opened, showing florets; D, Leaf; E, Habitat (All from type locality and vouched by *Ying Liu & Tao Deng 2008006*, IBSC, PE).

Table 1. Comparison of *Sinosenecio albonervius* and *S. palmatisectus.*

	S. albonervius	*S. palmatisectus*
Height (cm)	24-45	30-55
Posture	Herb with leafy stems	Herb with leafy stems
Leaf shape	Lamina reniform to orbicular-reniform in outline, shallowly 7-9-palmatilobed to 1/4-1/3; lobes deltoid, remotely denticulate	Lamina reniform in outline, deeply 7-9-palmatifid to the middle; lobes oblong-lanceolate, 2-3-dentate or lobulate
Leaf size (cm)	3-13 × 4-13	8-15 × 8-18
Adaxial leaf surface	Matte-green, pubescent, white veined	Nitid-green, at first sparsely pubescent later glabrescent, yellowish-green veined
Base of petiole	Expanded	Expanded
Anther endothecial cell wall thickenings	Polar and radial	Polar and radial
Ray florets per capitulum	9-13	12-16
Epidermis of achene	Smooth, glabrous	Smooth, glabrous
Pappus	Absent	Absent
Florescence	April	April
Stolons	Absent	Absent
Chromosome number (2*n*)	48	48
Habitat	Shady places along the stream, 800-1,200 m a.s.l	Moist shady places in forests, 1,400 m a.s.l
Geographical distribution	Distributed in Shimen County, NW Hunan and Wufeng County, W Hubei	Distributed in Badong and Hefeng counties, W Hubei

1/3 (vs. deeply 7-9-palmatifid to the middle), matte-green above (vs. nitid-green), pubescent (vs. at first sparsely pubescent, later glabrescent), white veined (vs. yellowish-green veined), the lobes deltoid, margin remotely denticulate (vs. oblong-lanceolate, margin dentate or lobulate) and the ray florets 9-13 (vs. 12-16) (Table 1). Undoubtedly, these two species are closely related as demonstrated by their gross morphology, floral micromorphology as well as chromosome number.

Western Hunan and western Hubei in south-central China are remarkably mountainous and are well known biodiversity hotspots. The recent discovery of four new species of *Sinosenecio* there (Zhang et al., 2008; Liu et al., 2009; Liu et al., 2010; this paper) indicates that these two regions are far from being well botanized, particularly for a genus like *Sinosenecio* which is distinguished for the narrow endemism of many of its species (Jeffrey and Chen, 1984; Liu et al., 2011).

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中國湖南和湖北產蒲兒根屬一新種：白脈蒲兒根

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本文描述了中國湖南、湖北產蒲兒根屬一新種：白脈蒲兒根（*Sinosenecio albonervius* Y. Liu & Q. E. Yang）。其體細胞染色體數目為 2*n* = 48。核型公式為 2*n* = 42m + 2sm + 4st。本新種在體態、葉 7-9 裂和瘦果無冠毛方面與鄂西蒲兒根（*S. palmatisectus* C. Jeffrey & Y. L. Chen）相似，但以葉片 7-9 淺裂至 1/4-1/3、裂片三角形、不光亮、具白色葉脈、有柔毛、舌狀花 9-13 而與後者相區別。本文提供了白脈蒲兒根的彩色圖版、線繪圖、花部微觀性狀的光鏡照片、地理分佈圖以及鄂西蒲兒根的彩色圖版。

關鍵詞：菊科；染色體數目；核型 ; 千里光族；白脈蒲兒根。