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Solms-laubachia zhongdianensis (Brassicaceae), a new species from the Hengduan Mountains of Yunnan, China

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Solms-laubachia zhongdianensis J.P. Yue, Al-Shehbaz & H. Sun *sp. nova* (Brassicaceae) is described from the Hengduan Mountains of Yunnan, China, and illustrated in line drawings. It resembles *S. xerophyta* but differs in having papery petioles, shorter leaves, dense pubescence on fruit valves, shorter fruiting pedicels, and larger seeds. *Solms-laubachia minor* Hand.-Mazz. is reduced to synonymy with *S. pulcherrima* Muschl.

Key words: Brassicaceae, new species, *Solms-laubachia*, taxonomy

The Sino-Himalayan endemic genus *Solms-laubachia* (Brassicaceae) consists of eight species, seven of which are confined to the Hengduan Mountains (western Sichuan, eastern Tibet, and northwestern Yunnan), and *S. platycarpa* extending into Bhutan and Sikkim. The plants grow on scree slopes and in rocky crevices at altitudes of 3400–5700 m.

In the course of a revision of *Solms-laubachia*, Al-Shehbaz and Yang (2001) noticed that the holotype of *S. minor* is a problematic one. As indicated by Handel-Mazzetti (1922), the species is similar morphologically to *S. pulcherrima* but differs solely by having narrower and shorter leaves. Several authors (e.g., Lan & Cheo 1981, Lan 1987, Li 1995) believed that *S. minor* is sufficiently distinct from *S. pulcherrima* based on leaf morphology alone. However, we examined numerous populations of this complex and conclude that *S. pulcherrima* varies extremely in the length and width of leaves.

In September 2003, the first author carried out fieldwork in the type locality of *S. minor* and collected many specimens (*Yue 0379*) now deposited at KUN and MO. Based on the field observations, it is very clear that the type collection of *S. minor* is conspecific with *S. pulcherrima*, and that all previous reports of *S. minor* from Yunnan (e.g., Lan & Cheo 1981, Wu 1984, Lan 1987, Wang 1993, Li 1995, Al-Shehbaz & Yan 2001) represent a new species. Although *S. minor* has long been recognized as an independent species, the morphological limits have clearly been misinterpreted, and *S. minor* is nothing but a minor variant and should be treated as synonym of *S. pulcherrima*. The Yunnan plants assigned by the above authors to *S. minor* belong to an entirely different species first described here.

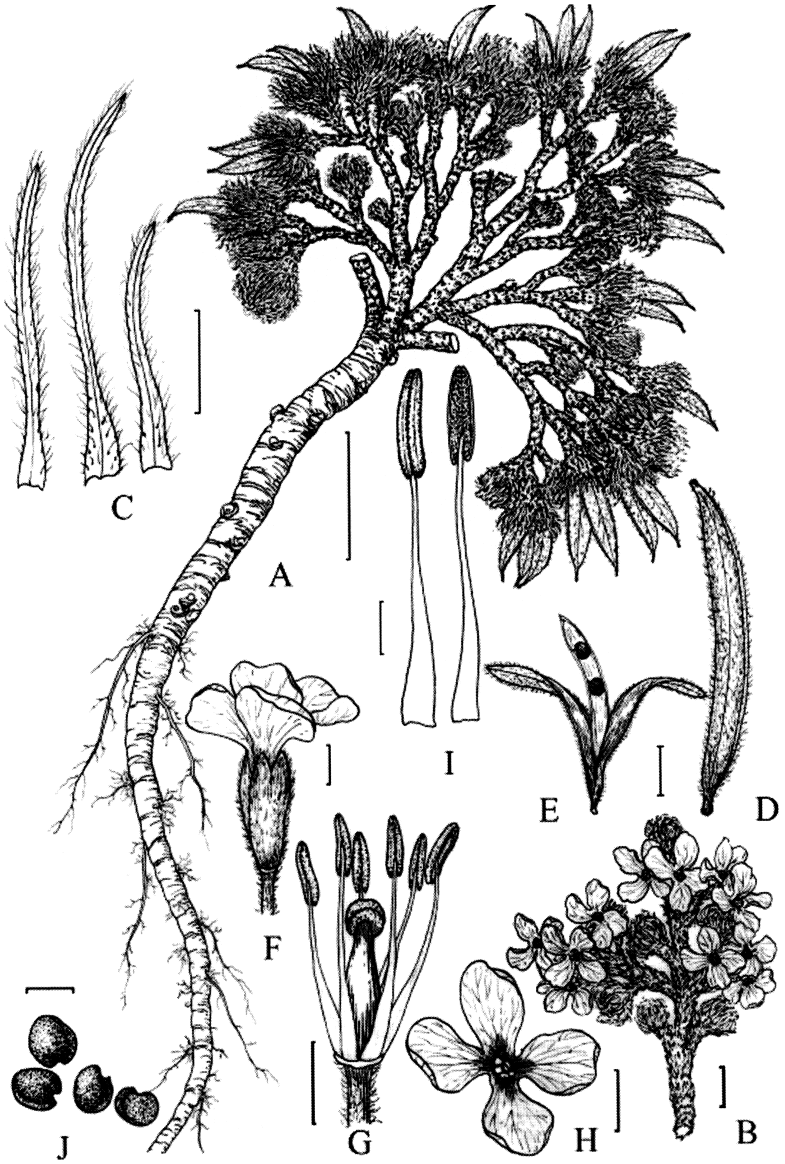

Fig. 1. *Solms-laubachia zhongdianensis* (**A**, **C**, **D**, **E**, **J** from holotype; others from paratype *Yue 0213*; drawn by Wang Hong-Bing). — **A**: Plant. — **B**: Portion of plant showing flowers. — **C**: Leaves. — **D** and **E**: Indehiscent and dehiscent fruits. — **F**: Flower. — **G**: Flower with perianth removed to show stamens and pistil. — **H**: Corolla. — **I**: Stamens. — **J**: Seeds. — Scale: **A**, **B**, **D**, **E** = 1 cm; **C**, **H** = 5 mm; **F**, **G** = 2 mm; **I** = 1 mm; **J** = 4 mm.

Solms-laubachia zhongdianensis J.P. Yue, Al-Shehbaz & H. Sun, *sp. nova* (Fig. 1)

Solms-laubachia minor auct. *non* Hand.-Mazz.: Lan & Cheo (1981), Wu (1984), Lan (1987), Wang (1993), Li (1995), Al-Shehbaz & Yang (2001).

Species S. xerophytae similis; sed foliis abbreviatis ad 0.3–2.2 cm longis, atque crispatis centripetis; petiolis papyraceis; fructibus lanceolatis, valves dense subhirsutis, pedicellis brevibus ad 1.3–10 mm; seminibus oblongis, 2.4–4.3 mm diametris differt.

TYPE: China. Yunnan, Shangri-La County, Mt. Shika, scree, sandy areas, 27°47´N, 99°35´E, ca. 4450 m, 27.IX. 2001 *Yue 0154* (holotype KUN; isotype MO).

Perennials, 1.4–4 cm tall, with well-developed caudex covered with petioles of previous years, densely pilose with trichomes 0.9–3.5 mm long. Petioles of basal leaves (0.7–)0.8–7.8(–9) mm long, extending to 2–3.9(–4) mm wide, persistent, papery, with a distinct midvein and membranous, ciliate margins; leaf blade filiform to narrowly linear, (3.5–)4.2–21.6(–22) mm long, (0.7–)0.8–2(–3.1) mm wide at middle, long

ciliate, often grooved adaxially, crisped centripetally, base attenuate, apex subacute; cauline leaves absent. Flowers solitary. Fruiting pedicels erect to ascending, 0.13–0.7(–1.0) cm long. Sepals oblong to oblong-linear, 4.5–7.3 × 1.0–1.8 mm, free, densely pilose. Petals pinkish, mauve, pale lilac to purple, obovate, distinctly differentiated into claw and blade; claw 6–8.5 mm long, blade 7–12 × 3.5–5.6 mm, apex rounded to emarginate. Stamens 6; median filaments 5.5–6 mm long; lateral ones 4.4–4.5 mm long; anthers 1.6–2 mm long. Ovules 4–12 per locule. Fruit lanceolate, (2.8–)3.3–5.5(–8) × (0.5–)0.6–0.8 cm; valves densely subhirsute, obscurely veined; septum complete or perforate; style 2.8–3.4 mm long; stigma slightly 2-lobed. Seed uniseriate or biseriate, suborbicular, minutely reticulate, 2.4–4.3 mm in diam. Flowering May–July, fruiting middle July–October.

Solms-laubachia zhongdianensis resembles *S. xerophyta* in having filiform to narrowly linear leaves, grooved adaxially. These features also readily distinguish the two species from all congeners. *Solms-laubachia xerophyta* has thickened petioles, longer leaves and fruiting pedicels, glabrous or sparsely pilose valves, and smaller seeds. By contrast, *S. zhongdianensis* has slender petioles, shorter leaves and pedicels, densely pubescent valves, and larger seeds (Table 1).

It is surprising that this species was misidentified as *Solms-laubachia minor* by several botanists (e.g., Lan & Cheo 1981, Wu 1984, Lan 1987, Wang 1993, Li 1995, Al-Shehbaz & Yang 2001) for a long time. According to Handel-Mazzetti (1922), *S. minor* is similar to *S. pulcherrima* in having thickened petioles, while *S. zhongdianensis* has distinctly papery ones. Had these authors observed this significant difference, they would have treated the Yunnan material as a new species instead of placing it under *S. minor*. Actually *S. minor* is a taxonomic synonym of *S. pulcherrima*. Therefore, all specimens misidentified by the previous authors as *S. minor* should be recognized as *S. zhongdianensis*, a specific epithet named after the locality from which most specimens were collected.

DISTRIBUTION: Shangri-la County (formerly Zhongdian County), Wei-si County, and Lijiang County in northwestern Yunnan, at altitudes of 3200–4500 m, on scree slope, and in sandy areas.

ADDITIONAL SPECIMENS EXAMINED (paratypes). — **China**. Yunnan: Zhongdian, Xianren Dong, *Yü 12160* (KUN); Xhungtien, Juatze, *Yü 13635* (A, BM, E, KUN); Zhongdian Xian, *Yang Jingshen 83043* (KUN); Shigao Shan, *Feng 23339* (KUN, PE); Shika Shan, 27°47´N; 99°35´E; 4200 M, 30.V.2002 *Yue 0213* (KUN, MO); Wei-si Xian, Yeh-chih, *Wang 68411* (A, PE); Lichiang Xian, *Wang 71304* (A, PE).

REPRESENTATIVE SPECIMENS EXAMINED of *Solms-laubachia xerophyta*. — **China**. Sichuan: Gonggalin, *Yü 13043* (A, KUN, PE); Mount Konka, Risonquemba, Konkaling, *Rock 16419* (NY, US, HUH); Xianuoduoji, Yading, 4530 m, 28.IX.2002 *Yue 0250* (KUN, MO); Muli Xian, *Qinghai-Xizang Team 13871, 13980* (KUN, PE); Yunnan: ZhongDian, Nilonggi, *Qian Zigang & Sun Hang 977* (KUN); Dongwang Xian, *Yang Jingshen 6757* (KUN); Daxue Shan, 4340 m, 4.VI.2002 *Yue 0225*, 30.IX.2002 *Yue 0251* (KUN, MO).

Solms-laubachia pulcherrima Muschl.

Notes Roy. Bot. Garden Edinb. 5: 206. 1912. — TYPE: China. NW Yunnan: E flank of Lichiang Range, 27°20´N, 12 000 ft, V.1906 *G. Forrest 2164* (holotype B!; isotypes BM!, E!, P!).

Parrya ciliaris Bureau & Franch., J. Bot. (Morot) 5: 20. 1891. — *Solms-laubachia ciliaris* (Bureau & Franch.) Botsch., Bot. Mater. Gerb. Bot. Inst. Komarova Akad. Nauk S.S.S.R. 17: 169. 1955. — TYPE: China. Tibet: route de Batang, 12.V.1890 *M. Bonvalot & H. d'Orléans s.n.* (holotype P!).

Solms-laubachia minor Hand.-Mazz., Anz. Akad. Wiss. Wien, Math. Naturwiss. Kl. 59: 246. 1922, *syn. nov.* — TYPE: China. Sichuan: Mt. Holoscha, 27°48´N, between Yenyuen and Kwapi, 4325 m, 18.V.1914 *H. F. Handel-Mazzetti 2318* (holotype WU!; isotypes E!, P!, W!).

Table 1. Diagnostic characters distinguishing *Solms-laubachia zhongdianensis* from *S. xerophyta*. 20 specimens of both species were measured.

	Pedicels	Leaf length (cm)	Fruiting pedicels length (cm)	Valves	Seed diameter (mm)
S. zhongdianensis	papery	(0.35–)0.4–2.2	0.13–0.7(–1.0)	densely subhirsute	2.4–4.3
S. xerophyta	thickened	(1.3–)1.9–7.4(–9.0)	1.4–2.5(–3.0)	glabrous or sparsely pilose	(1.2–)1.5–3.0(–3.2)

Pegaeophyton sinense (Hemsl.) Hayek & Hand.-Mazz. var. *stenophyllum* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 477. 1926. — TYPE: China. Yunnan: Yangtze watershed, Prefectural District of Likiang, E slope of Likiang snow range, 5300 m, 11.XIII.1922 *J. F. Rock 5719* (holotype B!; isotypes E!, GH!, P!, US!).

Solms-laubachia pulcherrima f. *angustifolia* O. E. Schulz, Notizbl. Bot. Gart. Berlin-Dahlem 9: 477. 1926. — TYPE: China. Yunnan: Yangtze watershed, W slope of Likiang snow range, 13 000 ft, 30.V.–6.VI.1922 *J. F. Rock 4277* (holotype B!; isotypes E!, GH!, P!, US!, W!).

Solms-laubachia pulcherrima f. *atrichophylla* Hand.-Mazz., Anz. Akad. Wiss. Wien, Math. Naturwiss. Kl. 62: 24. 1926. — TYPE: China. Sichuan: Mt. Gonschiga, Muli monastery, Yungning toward Dschungdien, 4500 m, *H. F. Handel-Mazzetti 7503* (holotype WU!; isotype W!).

Solms-laubachia pulcherrima is characterized by its leathery leaves, pink to light- or turquoise-blue flowers and subcorky petioles. It is highly variable in leaf shape, size, and indumentum (Al-Shehbaz & Yang 2001), and the above synonyms represent some of the many morphological variants of the species. As mentioned above, *Solms-laubachia minor* was described by Handel-Mazzetti (1922) as a relative of *S. pulcherrima*. Leaf shape and size in *S. pulcherrima* are highly variable among or within populations. For example, leaf size of one population from Lijian County (*Yue, 0245*, KUN, MO) was 0.5–3.7 cm × 1.5–7 mm. Furthermore, leaf size in fruiting period is certainly larger than that in flowering period. From the original description of *S. minor*, we now know that it was based on materials in flowering stage, while most of those of *S. pulcherrima* compared with it were based on fruiting material. Therefore, the use of leaf size to separate *S. minor* from *S. pulcherrima,* as was done by Handel-Mazetti (1922), is unreliable.

The latest taxonomic treatment of *Solms-laubachia* recognized nine species (Al-Shehbaz & Yang 2001). As a result of intensive field survey, *S. gamosepala* is now considered as conspecific of *S. eurycarpa* (Yue *et al*. 2004). With the new species and new specific synonym treated here, *Solms-laubachia* has eight species. The cytological results reported for *S. minor* (Yue *et al*. 2003) should accordingly belong to *S. zhongdianensis*.

REPRESENTATIVE SPECIMENS EXAMINED of *Solms-laubachia pulcherrima*. — **China**. Sichuan: Yinyuan Xian, 4360 m, 24.IX.2003 *Yue 0379* (KUN, MO); Danba, *Huang, Luo & Jiang 1445* (KUN); Dege, *Yang jingsheng 91-415* (KUN); Muli, Mt. Mitzuga, *Rock 18296* (E, GH, HUH, NY, US); Derong, 4200–4400 m, 19.VII.2004 *D. E. Boufford et al. 30895* (KUN, HUH); Xizang: Riwoqe, 4570–4850 m, 10.VIII.2004 *D. E. Boufford et al. 31975* (KUN, HUH); Yunnan: Haba Shan, *Zhongdian Expedition 1808* (KUN); N flank of Haba Shan, *Feng 1132* (A); Lijiang, *Yü 15536* (KUN); Yulong Shan, *Qinghai-Xizang Team 320* (KUN, PE); Chienchuan-Mekong divide, *Forrest 21525* (E, K, US); E flank of Lichiang range, *Forrest 23058* (E, K, P, US); Lijiang, Wu-Toudi, He-Bai Shan, 4210 m, 26.IX.2001 *Yue 0153* (KUN, MO); Lijiang, Gaheba, 3670 m, 11.IX.2002 *Yue 0245* (KUN, MO).

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