

Primulina moi sp. nov. (Gesneriaceae) from a limestone area in northern Guangdong, China

Shou-Biao Zhou, Xin Hong, Yi-Gang Wei, Le-Ping He and Fang Wen

S.-B. Zhou, X. Hong and L.-P. He, College of Life Science, Anhui Normal Univ., CN-241000 Wuhu, PR China. – W.-Y. Gang and F. Wen (wenfang760608@139.com), Gesneriad Conservation Center of China, Guilin Botanical Garden, Guangxi Inst. of Botany, no. 85, Yanshan Town, CN-541006 Guilin, PR China.

A new species of *Primulina*, *P. moi*, from Guangdong, China, is described and illustrated. It is similar to *P. lijiangensis* in leaf shape, but can be distinguished by several characters, such as base of corolla tube constricted, lobes of adaxial lip ovate, abaxial lip 3-lobed from base, lobes elliptic or oblong elliptic with cuspidate apex, yellow corolla and filaments, two non-adhesive anthers when corolla is open, adnate only before anthesis and 2 stamnoïdes.

The genus *Chirita* Buch.-Ham. ex Don has been revised several times, e.g. by Candolle (1845), Clarke (1883), Wood (1974), Wang (1984), Wang et al. (1990, 1998). However, the genus remains difficult to circumscribe and delimit based on morphological characteristics (Li and Wang 2007, Möller et al. 2009). Therefore, based on recent molecular phylogenetic analysis (Wang et al. 2011, Weber et al. 2011, 2013), *Chirita* was recently incorporated in the previously monotypic genus *Primulina* Hance (Hance 1883) with all species of *Chirita* sect. *Gibbosaccus*, *Chiritopsis* W.T. Wang (Wang 1981), *Deltocheilos* W.T. Wang (Wang 1981) and almost all of *Wentsaiboea* D. Fang & D.H. Qin (Fang and Qin 2004) (exclude *W. tiandengensis*). *Primulina* is widely distributed in subtropical and tropical Asia from eastern China and southward to southern Indonesia (Wood 1974, Wang 1985a, 1985b, Wang et al. 1990, 1998, Li 1996, Nguyen and Kiew 2000, Burt 2002, Li and Wang 2004, Weber 2004), and widely distributed and highly diverse in the limestone regions of southern China. In China it has about 150 species eastward to Zhejiang, northward to Sichuan, Hubei and Shan'xi (Wei 2010, Wang et al. 2011), but most species are narrow endemics and/or only locally abundant (Li and Wang 2004, 2007, Wei 2010).

In June 2009, an enthusiastic Gesneriaceae fan, Mr Shi-Lian Mo, showed some photos of an unknown *Primulina* plant with beautiful yellow flowers, with two non-adhesive anthers to one of us, Dr Fang Wen, for identification. Already by then we thought it could be a new species and we informally included it in the monograph of 'Gesneriaceae of south China' (Wei 2010), but without a formal name. During the past 5 years, living plants of this species have been studied in the field, and introduced to the nursery of the Gesneriad Conservation Center of China. Based on comparisons with

the relevant literature (Wang et al. 1990, 1998, 2011, Li and Wang 2004, Wei 2010, Weber et al. 2013) and descriptions of some recently published species (Cai et al. 2013, Chung et al. 2013, Jiang and Li 2013, Lu et al. 2013, Ning et al. 2013, Li et al. 2014, Liang et al. 2014, Wen and Wei 2014, Zheng et al. 2014, Zhou et al. 2014), we concluded that it was indeed an hitherto undescribed species.

Primulina moi F. Wen & Y.G. Wei sp. nov. (Fig. 1–2)

Differs from *Primulina lijiangensis* (B. Pan & W.B. Xu) W.B. Xu & K.F. Chung by short petiole; corolla golden-yellow, mustard-yellow, or orange to reddish orange; corolla tube base constricted; lobes of adaxial corolla lip ovate; abaxial corolla lip 3-lobed from base with elliptic or oblong elliptic lobes and cuspidate apex; mustard-yellow filaments; two non-adhesive anthers (adnate only before full-blooming period) and 2 stamnoïdes.

Type: China. Guangdong province: Shaoguan city, Wengyuan County, growing in the northern slopes of a limestone hill, elevation ca 200 m a.s.l., 30 Sep 2010, Fang Wen and Xin Hong 10093001 (holotype: IBK!, isotype: ANU!).

Etymology

The species is named after Mr Shi-Lian Mo, who first collected this rare species in Wengyuan County, Shaoguan City, Guangdong province.

Description

Acaulescent perennial herb. Rhizome subterete, 2–4(–6) cm long, 1–2 cm wide, glabrous. Leaves 7–8 or more, basal; petioles applanate, extremely shortly pubescent, 5.2–9.5 cm long, 5–9 mm wide; leaf blade papyraceous, oblong, elliptic-oblong

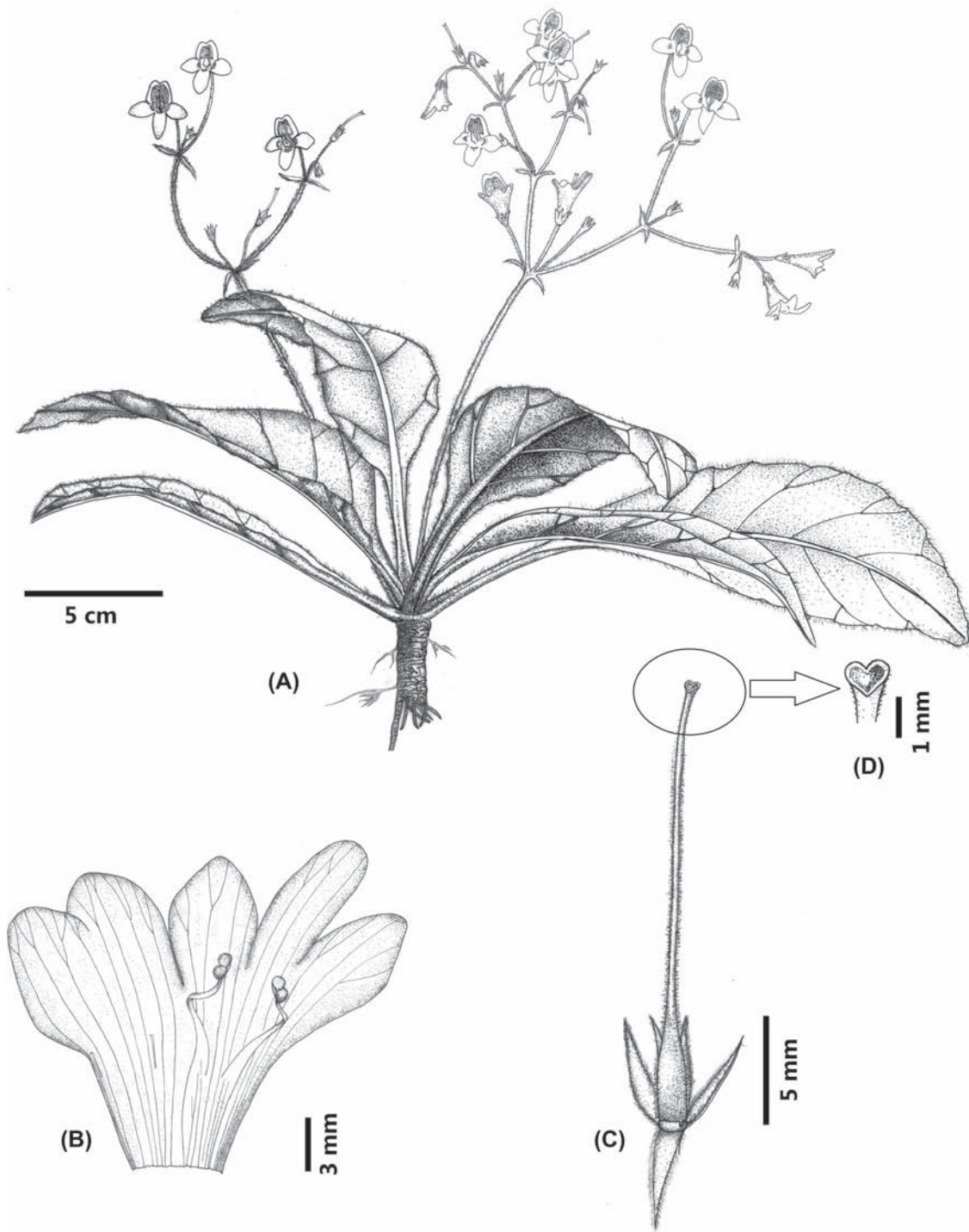


Figure 1. *Primulina moi* sp. nov. (A) flowering plant, (B) corolla opened with stamens and staminodes, (C) pistil, ovary, style and opened calyx lobes, (D) stigma. From the holotype, drawn by Xiao-Ming Xu.

to rhomboid-ovate, 18–25 × 10.5–14.5 cm, acute at apex, cuneate-attenuate at base and decurrent into broad wings on the petiole, inequilateral; leaf margin sinuously obtusely serrate, serrate to repand; both leaf surfaces viscidulous velutinous, with 7–9 pairs of lateral veins, impressed adaxially and prominent abaxially. Cymes 4–6, 2–3-branched, 15–25-flowered; peduncle 16–21 cm long, ca 3 mm wide, densely pilose; bracts 2, opposite, linear, 10–20 × 2.0–3.5 mm,

with entire margin and obtuse apex, pilose on both sides. Pedicel 1.2–2.5 cm long, densely pubescent and glandular pilose. Calyx 5-parted to the base; lobes narrowly lanceolate, 6 × ca 1 mm, densely pubescent and glandular pubescent outside, sparsely pubescent inside. Corolla 2.2–3.9 cm long, golden-yellow, mustard-yellow, or orange to reddish orange, inside of corolla tube and adaxial lip lobes reddish-orange or tan-orange, densely pubescent and glandular pubescent

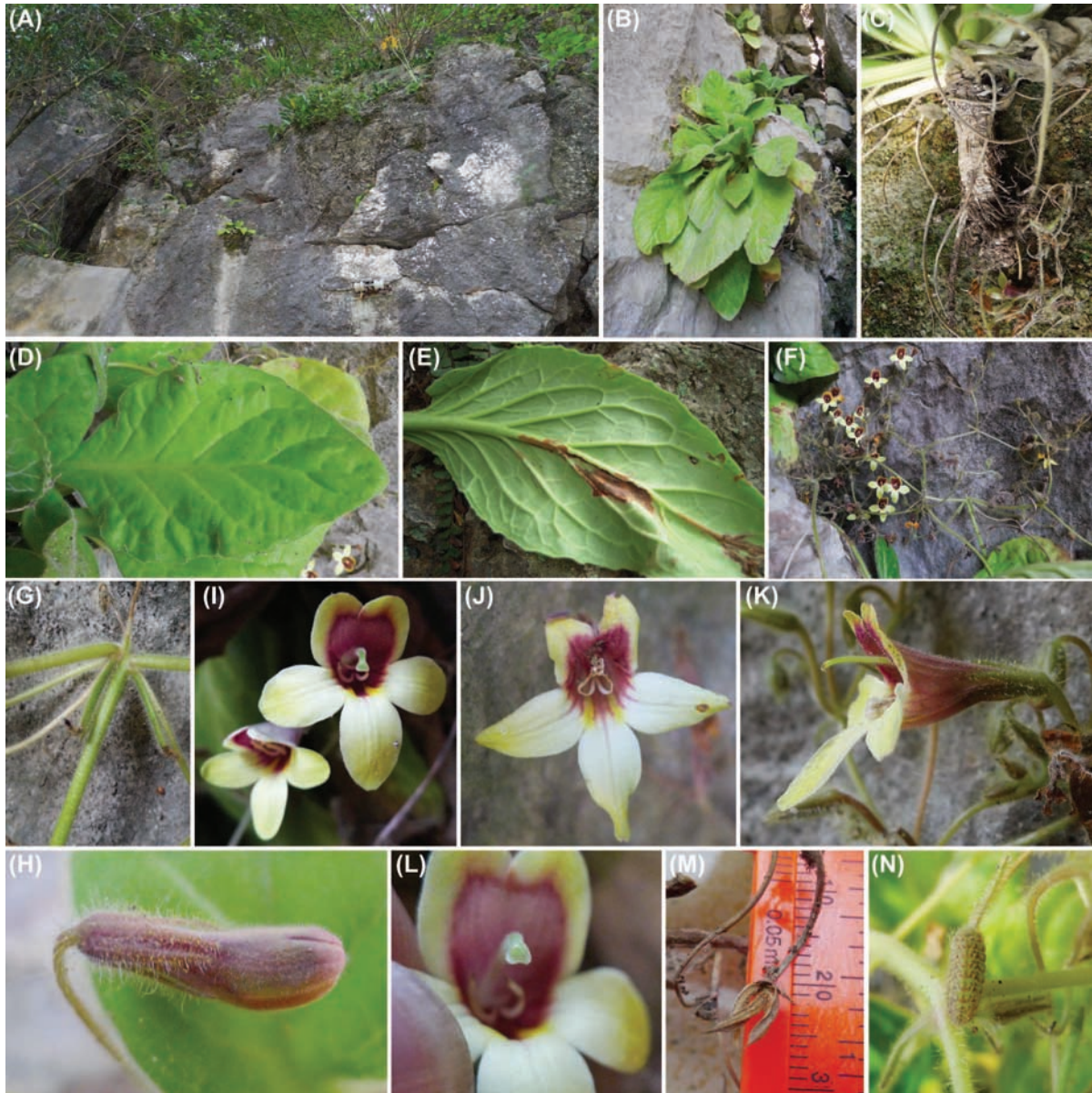


Figure 2. *Primulina moi* sp. nov. (A) habitat, (B) habit, (C) rhizome, (D) adaxial leaf blade, (E) abaxial leaf blade, (F) cyme, (G) bracts, (H) bud, (I) flower form I: frontal view of flower, (J) flower form II: frontal view of flower, (K) lateral view of flower, (L) stigma, (M) mature and opened capsule, (N) certain butterfly juvenile which feeds on buds and flowers.

outside; corolla tube tubular, ca 1.9–2.3 cm long, its base sparsely constricted and ca 5 mm in diameter, ca 9 mm in diameter at middle and ca 1.7 cm in diameter at mouth; limb distinctly 2-lipped with adaxial lip 2-lobed; limb lobes ovate, rounded at apex, 4–5 × 5–6 mm; abaxial lip 3-lobed from base, elliptic or oblong elliptic, cuspidate at apex, 6–8 × 4–5 mm. Stamens 2, inserted to 7 mm above corolla tube base; filaments mustard-yellow, ca 8 mm long, geniculate near the middle, glabrous; anthers reniform, yellow, ca 2 mm long, glabrous, free, sometimes adnate before full-blooming period. Staminodes 2, 2 mm long, adnate to 7 mm above corolla tube base. Disc annular, ca 1 mm high, with repand margin. Pistil 2–3 cm long; ovary ovoid, ca 2.5 × 1.5 mm, pubescent; style puberulent, ca 0.6 cm long; stigma translucent

to green, obtuse-trapeziform with emarginate apex, 1.0–1.5 mm long. Capsule narrowly ovoid, 5–6 mm long.

Phenology

Flowering from the end of September to the middle of October, and fruiting occurs in November.

Distribution, ecology and conservation status

Primulina moi is a narrow endemic but locally abundant species, only known from the type locality, i.e. Wengyuan County, Shaoguan City in northern Guangdong province of southern China (Fig. 3). It grows in rocky crevices on moist and shady surfaces and crevices of limestone hills, 200 m a.s.l. The average temperature of Wengyuan County is



Figure 3. Known distribution of *Primulina moi* sp. nov. (A) and *P. lijiangensis* (B).

16.5°C, and the average annual precipitation has been estimated as ca 1525 mm. *Primulina moi* occurs in subtropical evergreen broad-leaved forest.

Table 1. Diagnostic differences between *Primulina moi* sp. nov. and its close relative *P. lijiangensis*.

Characters	<i>P. moi</i>	<i>P. lijiangensis</i>
Size of petiole (cm)	5.2–9.5	6–15
Apex and base of leaf blade	apex acute, base cuneate-attenuate	apex obtuse to rounded, base cuneate to broadly cuneate
Colour of corolla	golden-yellow, mustard-yellow, or orange to reddish orange	purple
Base of corolla tube	constricted	swollen
Lobes of adaxial lip	ovate	oblong
Abaxial lip	3-lobed from base, elliptic or oblong elliptic, apex cuspidate	3-lobed to over half-length, lobes oblong, apex round
Colour of filaments	mustard-yellow	purple
Anthers	usually free, sometimes adnate only before full-blooming period	adnate
Number of staminoidea	2	3

Similar species

Primulina moi is morphologically close to *Primulina lijiangensis* (B. Pan & W.B. Xu) W.B. Xu & K.F. Chung (Xu et al. 2011, 2012). However, apart from the different color of the flower, it can easily be distinguished by several characteristics (Table 1). Actually, the morphology of *P. moi*, especially the flower, is totally different from other *Primulina* species native in Wengyuan County and Northern Guangdong.

Acknowledgements – We thank Prof. Xin-Hu Guo for checking the specimens and reviewing the description of this new species, and Xiao-Ming Xu for drawing the handsome illustration. This study was supported by National Natural Science Foundation of China (31270236), Key Foundation of Education Dept of Anhui Province (KJ2011A129), Provincial Key Laboratory of Biotic Environment and Ecological Safety in Anhui (2004sys003), Project of Graduate Students Innovation of Anhui Normal Univ. (2014-95), the Guangxi Natural Science Foundation (2013GXNSFAA019071), Science Research Foundation of Guangxi Academy of Sciences (no. 12YJ25ZW013), International S and T Cooperation Projects of Guangxi (Guikehe 1347004-4) and Guilin (Shike [2013]79).

References

- Burtt, B. L. 2002. New Gesneriaceae: a *Chirita* from Vietnam and a *Monophyllaea* from Sulawesi. – Gard. Bull. Singap. 54: 239–242.
 Candolle, A. P. 1845. Cyrtandraceae. – In: Prodrromus systematis naturalis regni vegetabilis 9. Treuttel and Würtz, pp. 258–286, 564.

- Clarke, C. B. 1883. Cyrtandraeae – In: Candolle, A. and Candolle, C. (eds), *Monographiae phanerogamarum* 5. Masson, pp. 1–303, 32 pl.
- Cai, X.-Z. et al. 2013. *Primulina jianghuaensis* sp. nov. (Gesneriaceae) from a limestone cave in southern Hunan, China. – *Nord. J. Bot.* 32: 70–74.
- Chung, K.-F. et al. 2013. *Primulina mabaensis* (Gesneriaceae), a new species from a limestone cave of northern Guangdong, China. – *Phytotaxa* 92: 40–48.
- Fang, D. and Qin, D.-H. 2004. *Wentsaihoa* D. Fang & D.H. Qin, a new genus of the Gesneriaceae from Guangxi, China. – *Acta Phytotax. Sin.* 42: 533–536.
- Hance, H. F. 1883. New Chinese *Cyrtandraeae*. – *J. Bot.* 21: 165–170.
- Jiang, N. and Li, H. 2013. *Primulina debaoensis* sp. nov. (Gesneriaceae) from a limestone cave in Guangxi, China. – *Nord. J. Bot.* 31: 1–4.
- Li, J. et al. 2014. *Primulina pseudoroosealba* (Gesneriaceae), a new species from a karst cave in Guangxi, China. – *Ann. Bot. Fenn.* 51: 86–89.
- Li, J.-M. and Wang, Y.-Z. 2007. Phylogenetic reconstruction among species of *Chiritopsis* and *Chirita* sect. *Gibbosaccus* (Gesneriaceae) based on nrDNA ITS and cpDNA trnL-F sequences. – *Syst. Bot.* 32: 888–898.
- Li, Z.-Y. 1996. The geographical distribution of the subfamily Cyrtandroideae Endl. emend. Burt. (Gesneriaceae). – *Acta Phytotax. Sin.* 34: 341–360.
- Li, Z.-Y. and Wang, Y.-Z. 2004. Plants of Gesneriaceae in China. – *Henan Sci. Technol. Publ. House*, pp. 170–260.
- Liang, H.-L. et al. 2014. *Primulina tsoongii* sp. nov. (Gesneriaceae) from a limestone area in north Guangxi, China. – *Nord. J. Bot.* 32: 75–79.
- Lu, S.-N. et al. 2013. *Primulina bullata*, a new species of *Primulina* (Gesneriaceae) from Guangxi. – *Guihaia* 33: 42.
- Möller, M. et al. 2009. A preliminary phylogeny of the ‘didymocarpoid Gesneriaceae’ based on three molecular data sets: incongruence with available tribal classifications. – *Am. J. Bot.* 96: 989–1010.
- Ning, Z.-L. et al. 2013. *Primulina huaijiensis* (Gesneriaceae), a new species from Guangdong, China. – *Ann. Bot. Fenn.* 50: 119–122.
- Nguyen, T.-H. and Kiew, A. 2000. New and interesting plants from Ha Long Bay, Vietnam. *Gardens’ – Bull. Singap.* 52: 185–202.
- Wang, W.-T. 1981. *Quinque-genera nova gesneriacearum e Sina.* – *Bull. Bot. Res. Harbin* 1: 21–28.
- Wang, W.-T. 1984. *Notulae De Gesneriaceis Sinensibus* (V). – *Bull. Bot. Res. Harbin* 4: 9–35.
- Wang, W.-T. 1985a. A revision of the genus *Chirita* in China (I). – *Bull. Bot. Res. Harbin* 5: 71–97.
- Wang, W.-T. 1985b. A revision of the genus *Chirita* in China (II). – *Bull. Bot. Res. Harbin* 5: 37–86.
- Wang, W.-T. et al. 1990. Gesneriaceae. – In: Wang, W.-T. (ed.), *Flora Reipubl. Pop. Sin.* 69. Science Press, pp. 340–416.
- Wang, W.-T. et al. 1998. Gesneriaceae. – In: Wu, C.-Y. and Raven, P. H. (eds), *Flora of China*. Vol. 18. Science Press, Miss. Bot. Gard., pp. 77–120.
- Wang, Y.-Z. et al. 2011. Phylogenetic reconstruction of *Chirita* and allies (Gesneriaceae) with taxonomic treatments. – *J. Syst. Evol.* 49: 50–64.
- Weber, A. 2004. Gesneriaceae. – In: Kubitzki, K. and Kadereit, J. (eds), *The families and genera of vascular plants*. Vol. 7. Springer, pp. 63–158.
- Weber, A. et al. 2011. Molecular systematics and remodelling of *Chirita* and associated genera (Gesneriaceae). – *Taxon* 60: 767–790.
- Weber, A. et al. 2013. A new formal classification of Geineriaceae. – *Selbyana* 31: 68–94.
- Wei, Y.-G. 2010. Gesneriaceae of south China. – *Guangxi Sci. Technol. Publ. House*, pp. 457–490.
- Wen, F. and Wei, Y.-G. 2014. *Primulina dongguanica* F. Wen, Y. G. Wei & R. Q. Luo (Gesneriaceae), a new species from south China. – *Candollea* 69: 9–19.
- Wood, D. 1974. A revision of *Chirita* (Gesneriaceae). – *Notes R. Bot. Gard. Edinb.* 33: 123–205.
- Xu, W.-B. et al. 2011. *Chirita lijiangensis* (Gesneriaceae), a new species from limestone area in Guangxi, China. – *Ann. Bot. Fenn.* 48: 188–190.
- Xu, W.-B. et al. 2012. Nine new combinations and one new name of *Primulina* (Gesneriaceae) from south China. – *Phytotaxa* 64: 1–8.
- Zheng, Y.-L. et al. 2014. A new species of *Primulina* (Gesneriaceae) from Guangdong, China. – *Phytotaxa* 163: 48–53.
- Zhou, S.-B. et al. 2014. *Primulina diffusa* (Gesneriaceae), a new species endemic to the karst limestone area in southwestern Guangxi, China. – *Ann. Bot. Fenn.* 51: 212–216.