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Dichocarpum lobatipetalum and *D. malipoense* (Ranunculaceae) are both merged with *D. hypoglaucum*

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Abstract

Dichocarpum hypoglaucum, *D. lobatipetalum*, and *D. malipoense* (Ranunculaceae) were all described from south-east Yunnan, China. Our critical examination of herbarium specimens (including type materials) indicates that the three names encompass only one species. As *D. hypoglaucum* is the earliest published name, we place both *D. lobatipetalum* and *D. malipoense* in synonymy with it.

Key words: *Dichocarpum* section *Dichocarpum*, new synonymy, taxonomy, south-east Yunnan

Introduction

Dichocarpum Wang & Hsiao in Hsiao & Wang (1964: 323) (Ranunculaceae) is a small genus of about 20 species mainly distributed from the warm to the subalpine zone of East Asia (Tamura 1995). Thirteen species are currently recognized in China for the genus (Fu & Robinson 2001, Jiang *et al*. 2015, Wang & Liu 2015).

Dichocarpum hypoglaucum Wang & Hsiao in Hsiao & Wang (1964: 327) was described on the basis of a single collection, *C.A. Wu 7885* (KUN; Fig. 1), from Xichou, south-east Yunnan, China. In the protologue, the authors stated that it was close to *D. dalzielii* (Drummond & Hutchinson 1920: 163) Wang & Hsiao in Hsiao & Wang (1964: 327), but differed in the much larger, abaxially glaucous, marginally crenate-dentate leaflets (the central one up to 12 cm long, 5.6 cm broad) with a thicker (herbaceous) texture, the lateral nerves anastomosing near the margin, and the dark purple seeds. In contrast, the leaflets in *D. dalzielii* were smaller (the central one up to 8 cm long, 3.5 cm broad) and much thinner in texture (membranous), abaxially not glaucous, and marginally irregularly lobate or coarsely dentate; the lateral nerves reached the margin; and the seeds were brown. Since its description *D. hypoglaucum* has been generally recognized as a distinct species (Tamura & Lauener 1968, Hsiao 1979, Wu 1984, Fu 1988, Fei 2000, Fu & Robinson 2001). Because of its very local occurrence *D. hypoglaucum* is categorized as a national key protected species of China (Tian *et al*. 2015).

Dichocarpum malipoense Tao (1989: 179; "*malipoenense*") was described on the basis of a single specimen, *C.W. Wang 83876* (KUN; Fig. 2), from Malipo, south-east Yunnan, China. In the protologue, the author stated that it was close to *D. hypoglaucum*, but differed by the short scape and the presence of a single basal leaf. Fei (2000) and Fu & Robinson (2001) recognized the independent specific status of *D. malipoense.* It is to be noted that Malipo is contiguous with Xichou, the type locality of *D. hypoglaucum.*

Dichocarpum lobatipetalum Wang & Liu (2015: 275) was described on the basis of a single collection, *B. Liu & Y. Yang 1958* (PE; Fig. 3), also from Malipo, south-east Yunnan, China. In the protologue, the authors stated that it was quite similar to *D. malipoense* by having a single basal leaf and larger lanceolate leaflets, but differed in its much taller scape, a much larger 9−14-flowered cyme which was twice or thrice branched, the larger flowers with pinkish, elliptic sepals which were 14−17 mm long, and the 2-lobed petal limbs with peltate bases. In contrast, the scape in *D. malipoense* was very low, only 4−6 cm tall; the cyme was very small, only once branched and 2−3-flowered; the flowers were very small, with obovate, white sepals which were only 4−5 mm long and broad; and the petal limbs

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were emarginate at the apex and not peltate at the base. They also mentioned that *D. lobatipetalum* was related to *D. hypoglaucum*. It is far from understandable to us, however, that the only point of difference which they gave for distinguishing between the two species was the leaflet shape: lanceolate leaflets in *D. lobatipetalum* vs. ovate ones in *D. hypoglaucum*.

The report of the occurrence of three *Dichocarpum* species with so similar leaflets (generally much larger than those of the remaining species in the genus and abaxially glaucous) in south-east Yunnan, a limestone area, caught our attention. The aim of this paper is to determine the identity of *D. lobatipetalum* and *D. malipoense*, both of which were later published than *D. hypoglaucum*.

FIGURE 1. Holotype (**A**) and isotype (**B**) sheets of *Dichocarpum hypoglaucum*.

Material and methods

For morphological comparisons, we critically checked herbarium specimens of *Dichocarpum* in HITBC, KUN and PE. We also consulted color photographs of both *D. hypoglaucum* (Jiang *et al*. 2015) and *D. lobatipetalum* (Wang 2016) in situ.

Results and discussion

As shown in Fig. 2, the holotype of *Dichocarpum malipoense* is a plant collected in January 15, 1940. The plant was not yet fully developed, with the scape just in sprouting and the flowers still almost in bud. The line illustration of *D. malipoense* in the protologue, in which a seemingly mature flower and a seemingly mature petal were given, is rather misleading. From this illustration the plant might be easily judged as a mature plant. Another two gatherings, *Anonymous 6111* (HITBC; Fig. 4A) and *Y.M. Shui et al. 20300* (PE; Fig. 4B), both from Malipo (the former made in

FIGURE 2. Holotype sheet of *Dichocarpum malipoense* (= *D. hypoglaucum*).

1970 but without precise collection date, the latter in March 23, 2002), are already full-grown plants. From these two gatherings it is evident that the scape bears a much larger cyme and exceeds the basal leaves in height. The gathering *Anonymous 6111* (HITBC) includes two fruiting plants (only one is shown here), while the specimen *Y.M. Shui et al.*

20300 (PE) is a flowering plant, and the petal limbs are 2-lobate at the apex. It is certain that *D. lobatipetalum* (Fig. 3) is no more than a full-grown form of *D. malipoense* (Fig. 2). It is very likely that in describing *D. lobatipetalum* as a new species Wang & Liu (2015) did not check the type specimen of *D. malipoense*. Their concept of *D. malipoense* should thus be based only on the original description and the accompanying line illustration, both of which are far from a precise representation of the plant itself. .

A further examination of the type specimens of *Dichocapum malipoense* and *D. lobatipetalum* against those and other gatherings of *D. hypoglaucum* has convinced us that the three names encompass only one and the same taxonomic entity. The relatively larger, abaxially glaucous leaflets (as illustrated in Jiang *et al*. 2015 and Wang 2016) are characteristic of this entity, readily distinguishing it from the remaining species in the genus. Moreover, the type gatherings of the three names were all made from south-east Yunnan, namely Xichou and Malipo counties which are closely contiguous with each other. This further indicates that the three names are conspecific. Although the type gathering of *D. hypoglaucum* includes only two fruiting plants, and thus the flowers of this species have long been unknown (Hsiao & Wang 1964, Hsiao 1979, Fei 2000, Fu & Robinson 2001), this species perfectly matches *D. lobatipetalum* in general aspect. Wang & Liu (2015) stressed the taxonomic value of the presence of a single basal leaf in both *D. malipoense* and *D. lobatipetalum*, but the number of basal leaves is not a reliable diagnostic character for *D. hypoglaucum*, since in this species the basal leaves vary from 1 to 5. The leaflets of *D. hypoglaucum* are unequal in size and also somewhat variable in shape, but generally they are obliquely rhombic-ovate.

From the above analyses we deem it justifiable to place both *Dichocapum malipoense* and *D. lobatipetalum* in synonymy with *D. hypoglaucum*. The following taxonomic treatment is necessary.

FIGURE 3. Holotype (**A**) and isotype (**B**) sheets of *Dichocarpum lobatipetalum* (= *D. hypoglaucum*).

Taxonomic treatment

Dichocarpum hypoglaucum Wang & Hsiao in Hsiao & Wang (1964: 327). Figs. 1−4.

Type:—CHINA. Yunnan, Xichou, Nanchang, in woods in ravine, 6 May 1959, *C.A. Wu 7885* (holotype KUN!, isotype KUN!). Fig. 1.

= *Dichocarpum malipoense* Tao (1989: 179; "*malipoenense*"), **syn. nov.**

Type:—CHINA. Yunnan, Malipo, Huang-Jing-Ying, 1300 m a.s.l., streamside in woods, 15 January 1940, *C.W. Wang 83876* (holotype KUN!). Fig. 2.

= *Dichocarpum lobatipetalum* W.T. Wang & B. Liu (2015: 275), **syn. nov.**

Type:—CHINA. Yunnan, Malipo, Xiajinchang Xiang, Yunling, Daxichang Village, 1537 m a.s.l., in woods on limestone hill, 2 April 2014, *B. Liu & Y. Yang 1958* (holotype PE!, isotype PE!). Fig. 3.

FIGURE 4. Specimens of *Dichocarpum hypoglaucum*. **A**. China, Yunnan, Malipo, *Anonymous 6111* (HITBC). **B**. Same locality, *Y.M. Shui et al. 20300* (PE; previously identified as *D. malipoense*).

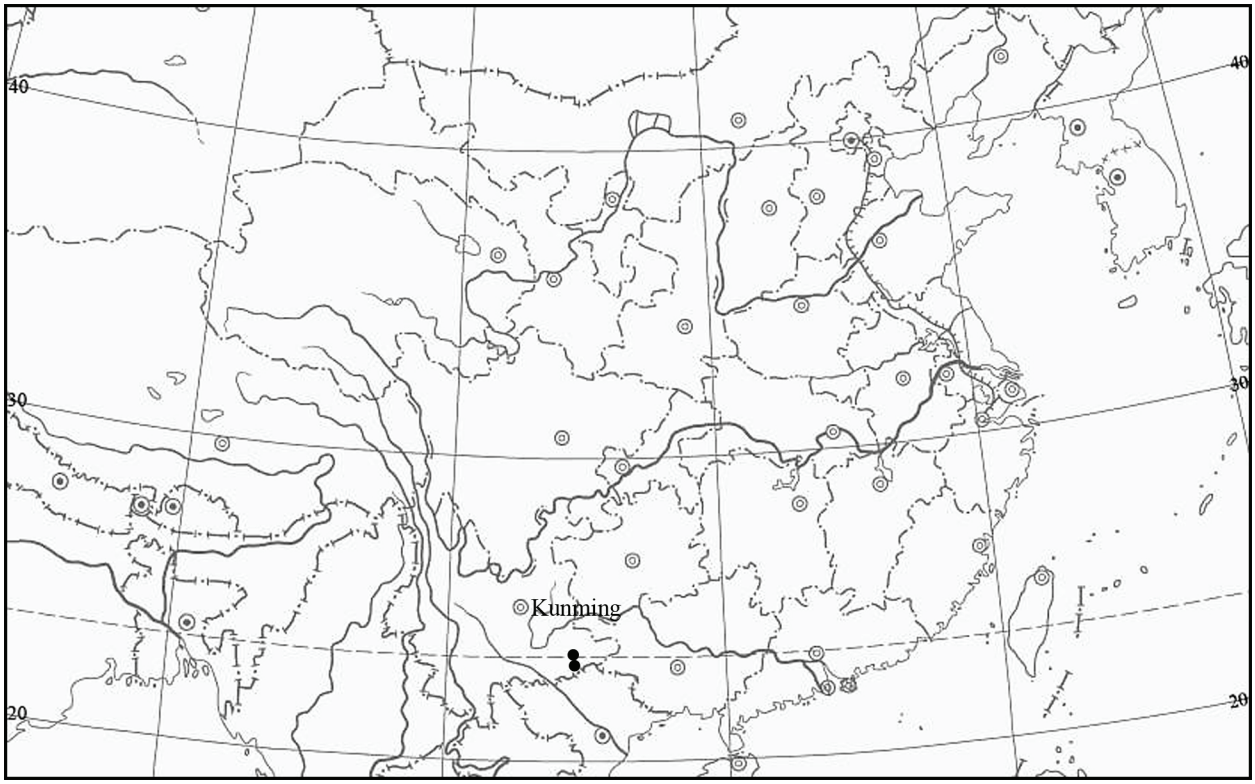

FIGURE 5. Distribution of *Dichocarpum hypoglaucum* (●).

For a full description of this species see Wang & Hsiao in Hsiao & Wang (1964), Hsiao (1979), Fei (2000), Fu & Robinson (2001), Wang & Liu (2015), and Wang (2016). The flower characters are given for the first time by Wang & Liu (2015).

Color illustrations:—Jiang *et al.* (2015), Wang (2016).

Distribution and habitat:—*Dichocarpum hypoglaucum* is currently known from Malipo and Xichou, south-east Yunnan, China (Fig. 5). It grows in woods at elevations of 1300 to 1700 m above sea level, preferring a limestone habitat.

Phenology:—Flowering March to April; fruiting April to May.

Additional specimens examined:—CHINA. Yunnan: Malipo, *Anonymous 6111* (HITBC), *Y.M. Shui 20300* (PE), *C.A. Wu* 89068 (KUN); Xichou, *D.Z. Fu 84329* (PE), *S.Z. Wang* 461 (KUN).

Note:—According to Tamura (1995), *Dichocarpum hypoglaucum* belongs to D. sect. *Dichocarpum* subsect. *Dalzielia* (Tamura & Lauener 1968: 270) Tamura (1992: 54). Its closest ally is *D. dalzielii*, a species widely distributed in China. The chromosome number of *D. hypoglaucum* is $2n = 24$ (Yang *et al*. 1993), indicating this species is a tetraploid based on $x = 6$ (Fu 1988).

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