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MANGLIETIA KAIFUI (MAGNOLIACEAE), A NEW SPECIES FROM YUNNAN, CHINA

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Abstract

Manglietia kaifui Q.W. Zeng & X. M. Hu, a new species of *Manglieta* Bl. (Magnoliaceae) from Yunnan, China, is described and illustrated. The new species was found growing only in the monsoon evergreen broad-leaved forests at 1300–2000 m of Mount Huanglianshan, Luchun County, Yunnan Province, China. Notes are also presented on the phenology, pollen morphology and conservation status of the new species. It is closely related to *M. fordiana* Oliv. and *M. hainanensis* Dandy, but differs from its closest allies by its glabrous twigs, glabrous upper and lower surfaces of leaves, more tepals (12–20) and more carpels (75–90).

Introduction

The genus *Manglietia* comprises more than 25 species, and only occurs in tropical and subtropical Asia (Nooteboom, 1985; Chen & Nooteboom, 1993; Law, 1984, 1996). China has more than 22 species mainly distributed from south to southwest China, with the diversity center of *Manglietia* in Yunnan, Guizhou, Guangxi and Guangdong provinces (Law, 1995, 1996, 2000, 2004).

Recently we collected an interesting specimen of *Manglietia* in South China Botanical Garden, which was introduced from Mount Huanglianshan, Luchun County, Yunnan Province, China. It was found to be very distinct when compared with the previously described taxa of the genus *Manglietia* (Gagnepain, 1939; Praglowski, 1974; Chen & Nooteboom, 1993; Law, 1996, 2004), and is described herein as a new species.

Delimitation of the genera *Magnolia* and *Manglietia*: Genus *Manglietia* was proposed by Blume (1823), but Baillon (1866) suggested that *Manglietia* should be reduced to *Magnolia*. Canright (1955) pointed out that only a few species of *Manglietia* were different from *Magnolia* in the wood anatomical structure and so that *Manglietia* should be assigned to *Magnolia*. Dandy (1964) thought that the genus *Magnolia* which has only 2 ovules per carpel was different from the genus *Manglietia* which has 4 to many ovules per carpel, so that *Manglietia* should be an independent genus. Keng (1978) supported Baillon's view (1866) because it was unnatural to distinguish *Manglietia* from *Magnolia* only on the number of ovules in each carpel, and there were multi-ovule phenomenon in the *Magnolia* species viz., *Magnolia paenetalauma* and *M. delavayi* (Gong *et al*., 1999). Although the two genera were very similar in the wood anatomy and the morphology of pollen (the sculpture and structure of exine) (Praglowski, 1974; Zhang, 1974), and the cladistic analysis showed that *Manglietia* should be reduced to *Magnolia* as a monophyletic group (Li, 1997; Li & Conran, 2003), but Law (1984) thought that *Manglietia* was the most primitive genus of Magnoliaceae basing on the interior and exterior morphological characteristics of its species because it had the most primitive characters and its own distributing area.

Based on the detailed studies on leaf epidermis, Baranova (1972) described that there were two general types of hair-base in Magnoliaceae. In the first type the hair rests on a normal or modified epidermal cell or group of cells. The position of the detached hair may readily be observed on the cuticular membrane because of the persistent hair-base. This type of hair-base may be with only 2–3 cells or many highly modified cells. In the second type the hair-base is between the epidermal cells, or replaces a normal epidermal cell, so that loss of the hair leaves a pore in the cuticular membrane. This type of hair-base was present only in *Manglietia* and was considered to be the most primitive type in the family. The study of foliar sclereids (Tucker, 1977) showed that in Magnoliaceae, only the sclereid of *Manglietia* did not exist in the veinlet terminal but in the mesophyll and the epidermis, so that Tucker considered *Manglietia* to be a specialized group in Magnoliaceae. Cai *et al*. (2000) thought that the structure of leaves of *Manglietia* was different from that of *Magnolia*. Leaves of *Manglietia* were thicker, 232–397μm, having hypodermis and 2–3 layers palisade tissue whose cells were regular long-columniform and arranged orderly and closely. The ratio of palisade tissue to spongy tissue in thickness was 0.4 or 0.5, only a few species was 0.6. The epidermis hairs of *Manglietia* were uniseriate, multicellular and the oil cells distributed mainly in the palisade tissue. But leaves of *Magnolia* were thinner, 128–338μm. Only a few species had hypodermis and 1–2 layers of palisade tissue. The cells of palisade tissue of most species were irregular dumbbell-shaped and arranged disorderly. The ratio of palisade tissue to spongy tissue in thickness was 0.7–1.0. The epidermis hairs of *Magnolia* were uniseriate, multicellular or unicellular and most of the oil cells dispersed in the mesophyll. The study of endotesta chalazal region morphology of Magnoliaceae (Xu & Wu, 2002) showed that the type of endotesta chalazal region morphology of *Manglietia* species was pore type, while the type of endotesta chalazal region morphology of *Magnolia* was tube type and pore type. Zhang (2001) also thought that the type of the endotesta chalazal region morphology of all *Manglietia* species was pore type, which was obviously different from the pore type of *Magnolia*, because the exterior surfaces of endotesta of *Magnolia* were strumous and the sinuses of seed raphe of *Magnolia* were broad and deep. The studies of *ndh*F and *mat*K sequence showed that the monophyletic clade which *Manglietia* forms was highly supported and there was no cross between *Manglietia* and *Magnolia* (Shi *et al*., 2000; Ueda *et al*., 2000; Kim *et al*., 2001; Wang *et al*., 2006). The results of artificial crossbreeding experiments also revealed that there was cross-compatibility within genus *Manglietia*, but reproductive isolation existed between genus *Manglietia* and genus *Magnolia* (Gong *et al*., 2001). As mentioned above, the delimitation between these two genera is obvious, so the generic status of *Manglietia* should be admitted.

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Manglietia kaifui Q. W. Zeng & X. M. Hu, **sp. Nov.**
Fig. 1 & Fig. 2

Type*:* China, Guangdong Province, Guangzhou, South China Botanical Garden. Introduced from Yunnan Province, Luchun County, Mount Huanglianshan, monsoon evergreen broad-leaved forests, 1300–2000 m a.s.l., 12. v. 2004, *Qing-Wen Zeng 88* (holotype and isotype: IBSC); the same locality, 20. ix. 2003, *Qing-Wen Zeng 84* (paratype: IBSC); the same locality, 25. xi. 2003, *Qing-Wen Zeng 85* (paratype: IBSC).

Species *M. fordianae* Oliver et *M. hainanensi* Dandy affinis, sed ramulis juvenioribus, petiolis, pedicellis et foliis utrinque glabris, nervis lateralibus utrinsecus 15–17, margine non revolutis, bracteis 2 extus hinnuleo-villosis, tepalis multioribus 12–20, carpellis multioribus 75–90 differt.

Evergreen trees to 10 m tall; bark grayish-brown; young twigs pale green, glabrous, becoming deep brown with age; buds and flower buds pale brown villose. Leaves leathery, elliptic or obovate-elliptic, (10–)16–22×(4–)6–7.5 cm, apex obtuse or acuminate, base broadly cuneate, green above, pale green beneath, glabrous on both surfaces, margins flat, not revolute; midribs impressed above, elevated beneath, lateral veins inconspicuous, 15–17 on each side, reticulation inconspicuous; petioles glabrous, 1.5–2 cm long, not swollened at base; stipules adnate to the petioles, stipule scars 0.8–1.4 cm long, as long as 1/3–2/3 of the petioles. Flowers bisexual, slightly fragrant, solitary and terminal; flower buds ellipsoid; spathaceous bract 1; pedicels glabrous, sometimes pubescent on bract scars, 1.5–2.5×0.7–0.8 cm, pedicles (the internode between the uppermost bract and the perianth) 0.7–1 cm long; tepals 12–20, outer 3 pale green, thinly leathery, glabrous, sometimes pubescent at base, obovate-elliptic, apex emarginated, 4.8–5×2.8–3.4 cm, inner tepals 9–17, white, sometimes with sparsely purplish spot or flush, fleshy, obovate-spathulate, 3.8–4.4×2–2.8 cm; stamens numerous, white with purplish base, 7–10 mm long, anthers 5–7 mm long, introrsely dehiscent, filaments purple, 1.5–2.5 mm long, connectives elongated into a short semicircular appendage; gynoecium pale green, glabrous, broadly ellipsoid, 1.7–2.2×1.45–1.8 cm, carpels 75–90, ovules 5–6 per carpel, styles triangular, deep brown, ca.2 mm long. Fruit aggregates pale brown, ellipsoid-ovoid, 2.8–3.5×2.3–2.7 cm, follicles longitudinally furrowed on exposed surface, dehiscent along dorsal sutures.

Etymology: The new species is named after Mr. Kai-fu Zhu, Board Chairman of Shenzhou Magnolia Garden and Breeding Center, Xuwen County, Guangdong Province, China, who greatly sponsored our researches on Magnoliaceae.

Distribution and habitat: Endemic to Mount Huanglianshan, Luchun County, Yunnan Province, China. Growing in the monsoon evergreen broad-leaved forests at 1300–2000 m a.s.l. The Huanglianshan Mountain Range lies between latitudes 22º 50´ and 23ºN, and between longitudes 102º10´ and 102º21´E. (Fig. 3).

Phenology and ecology: Flowering from March to May, or from November to December, fruiting from September to October. Growing with *Castanopsis hystrix*, *C. indica*, *Cyclobalanopsis glaucoides*, *Michelia fulgens*, *Manglietia duclouxii*, *Pinus yunnanensis*, *Schima villosa*, etc. This new species is an excellent garden tree for its handsome tree-shape, dense twigs and deep green leaves, and attractive fragrant big flowers.

Pollen morphology: Pollen grains of *Manglietia kaifui* Q. W. Zeng & X. M. Hu are prolate, bilaterally symmetrical, heteropolar, monocolpate, broadly long-elliptic in polar view, boat-shaped in equatorial view. Polar axis is 37.6 µm (35.0–39.7µm) long, equatorial axis is 43.1µm (40.8–46.8µm) long (Fig. 4).

Conservation status: *Manglietia kaifui* is known only from the Mount Huanglianshan in subtropical evergreen broad-leaved forests. It should be classified as Endangered (EN) according to the Anon., (2001) categorization, because of its local distribution and rather small population size. It is located in the Huanglianshan Natural Reserve. Six individuals of this new species were successfully transplanted to South China Botanical Garden, the Chinese Academy of Sciences; it grows very well in lateritic soil.

Discussion: This new species is closely related to *M. fordiana* and *M. hainanensis*, but it differs from the relatives in: glabrous twigs (vs. rufous appressed pubescent), glabrous upper and lower surfaces of leaves (vs. rufous pubescent beneath), more numerous tepals (12–20 vs. 9) and more carpels (75–90 vs. 23–30 and 18–32). More detailed morphological differences amongst the three species are given in Table 1 and key for the identification of *M. kaifui* and related species is given as follows.

Key for the Identification of *M. kaifui* and related species

1 + Tepals 12–20; carpels 75–90; twigs and both surfaces of leaves glabrous .... ***M. kaifui*** Q.W. Zeng & X. M. Hu

- Tepals 9; carpels 18–32; twigs and lower surfaces rufous pubescent ….....……... 2

2 + Leaves leathery, margins not wavy; outer tepals oblong-elliptic; lower carpels 5–6 mm long, styles ca.1mm long, carpels 23–30, with 8–10 ovules, apex with short beak ...……. ***M. fordiana*** Oliv.

- Leaves thinly leathery, margins wavy; outer tepals broadly ovate or obovate; lower carpels 7–10 mm long, styles unconspicuous, carpels 18–32, with 5–8 ovules, apex without beak ……...…… ***M. hainanensis***

Dandy

Fig. 1. *Manglietia kaifui* Q. W. Zeng & X. M. Hu, sp. nov. A, flowering twig, showing perianth, leaves and branch; B, leave bud; C, spathaceous bract; D, outer tepal; C – I, inner tepals; J, gynoecium; K, longitudinal section of gynoecium; L, stamens; M, fruit.

Fig. 2. The flower of *Manglietia kaifui* sp. nov.

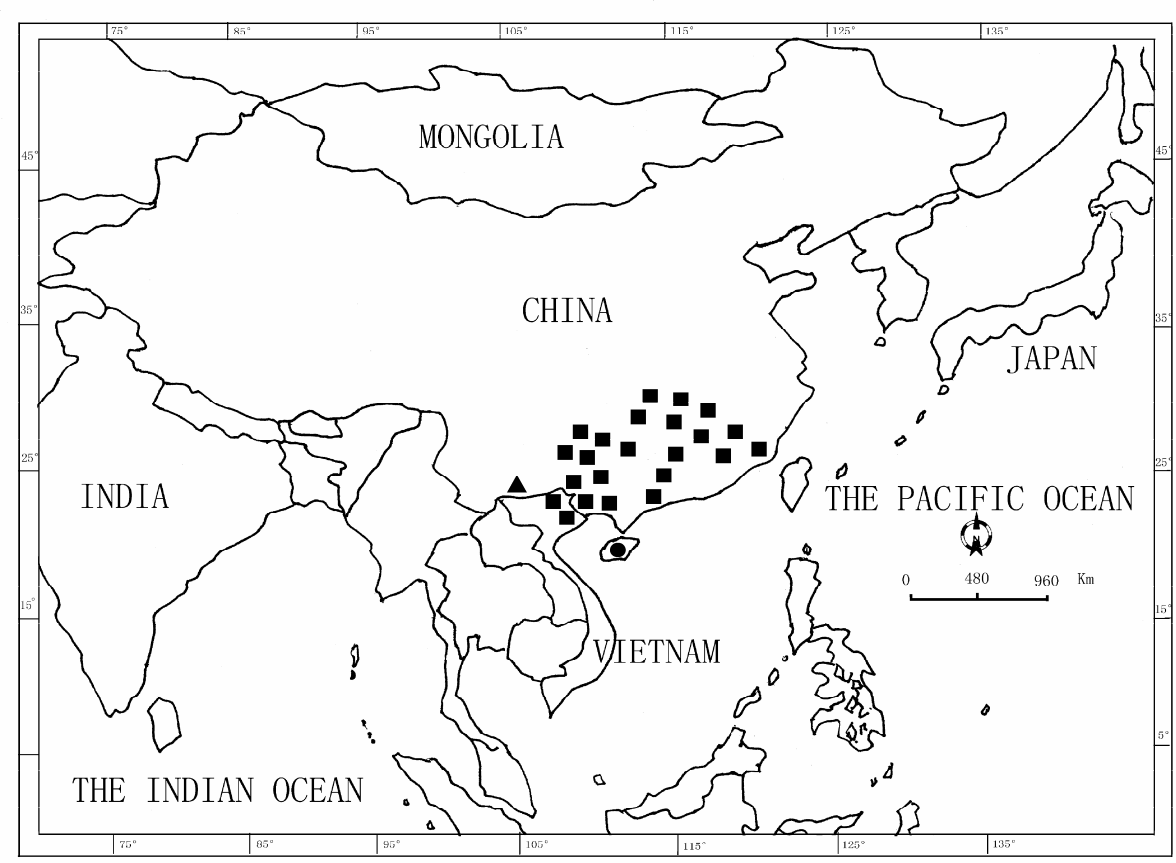

Fig. 3. Geographical distribution of *Manglietia kaifui* sp. nov. (▲), *M. fordiana* (■), and *M. hainanesis* (●).

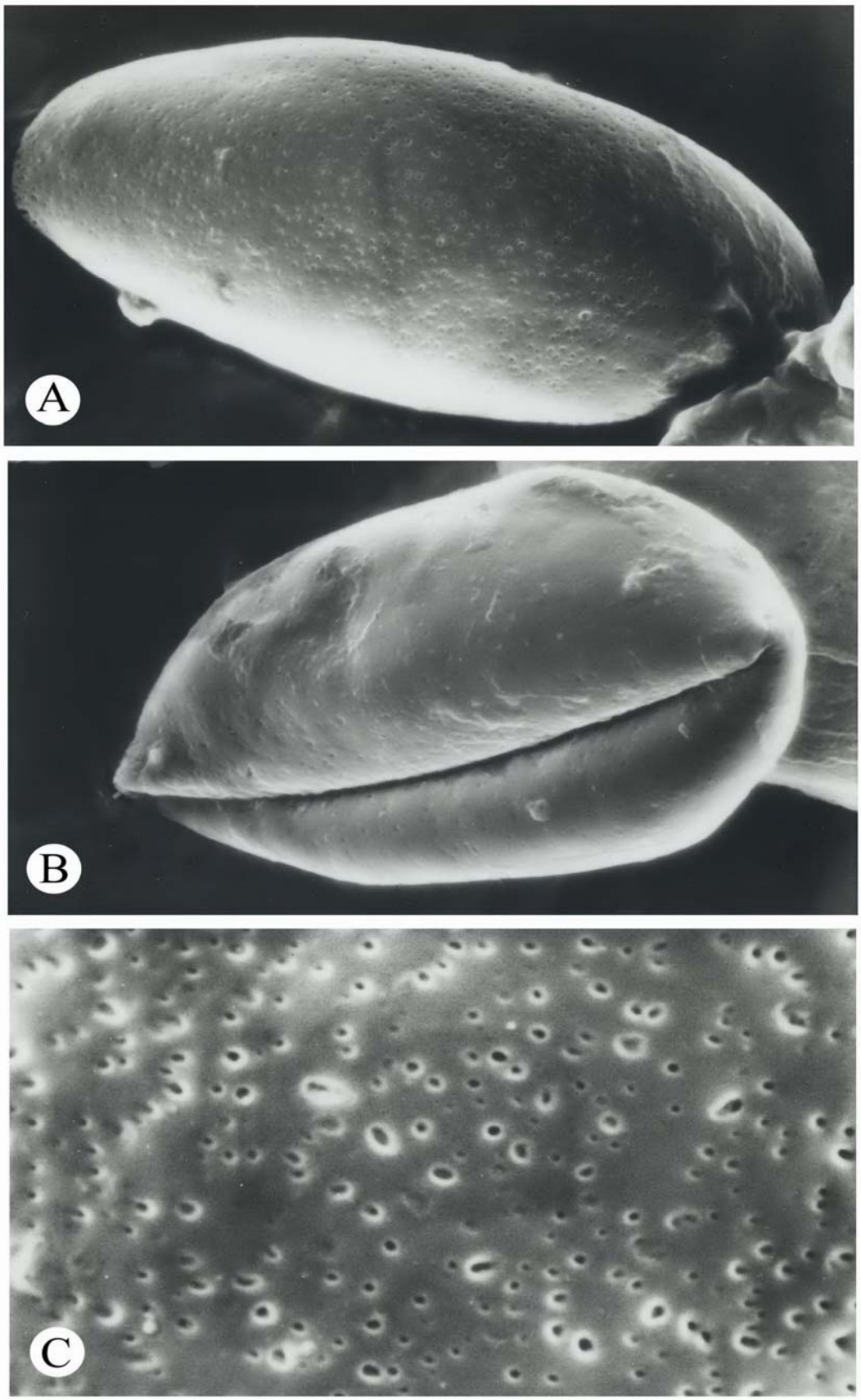

Fig. 4. Scanning electron micrograph of the pollen grain of *Manglietia kaifui* Q. W. Zeng & X. M. Hu, sp. nov. A, shape in polar view; B, shape in equatorial view; C, exine sculpture.

Table 1. Comparison of morphological characteristics of *Manglietia kaifui* sp. nov., *M. fordiana* and *M. hainanensis*.

Characters	*M. kaifui*	*M. fordiana*	*M. hainanensis*
Buds	Pale brown villose	Rufous appressed pubescent	Rufous appressed pubescent
Twigs	Pale green, glabrous	Rufous appressed pubescent	Rufous appressed pubescent
Leaves	Leather, elliptic or obovate-elliptic, 16–22 × 6–7.5 cm, glabrous on both surfaces	Leather, narrowly obovate, narrowly elliptic-obovate or oblanceolate, 8–17 × 2.5–5.5 cm, glabrous above, rufous pubescent beneath	Thinly leather, obovate or narrowly obovate, 10–16 × 3–6 cm, glabrous above, rufous pubescent beneath
Lateral veins	15–17 on each side	8–12 on each side	12–16 on each side
Margin	Flat, not revolute	Flat and revolute	Wavy and revolute
Petioles	1.5–2 cm long, not swollened at base	1–3 cm long, swollened at base	3–4 cm long, swollened at base
Stipule scars	0.8–1.4 cm long	3–4 mm long	3–4 mm long
Bract	1, brown villose	1, rufous pubescent	1, rufous pubescent
Pedicels	Glabrous, 1.5–2.5 × 0.7–0.8cm	Rufous appressed pubescent, 0.6–1.1 × 0.6–1.0 cm	Rufous appressed pubescent, 0.8–4 cm × 0.4–0.7 cm
Tepals	12–20, outer 3 obovate-elliptic, 4.8–5 × 2.8–3.4 cm, sometimes pubescent at base	9, 4–7 × 2–4 cm, outer 3 oblong-elliptic, 6–7 × 3–4 cm, glabrous	9, 2.5–4 × 1–2 cm, outer 3 obovate, 4–5 × 3–3.5 cm, glabrous
Stamens	White with purplish base, 7–10 mm long	Red, ca. 10 mm long	Red, 4–7 mm long
Gynoecium	Broadly ellipsoid, 1.7–2.2 × 1.4.5–1.8 cm	Ovoid, 1.3–1.5 × 1–1.2cm,	Ovoid, 1.5–2 × 1.2–1.5 cm
Carpels	75–90, with 5–6 ovules, apex without beak	23–30, with 8–10 ovules, apex with short beak	18–32, with 5–8 ovules, apex without beak
Fruit	Ellipsoid-ovoid, follicles longitudinally furrowed on exposed surface	Ovoid, follicles tuberculate on exposed surface	Ovoid or ellipsoid-ovoid, follicles tuberculate on exposed surface

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