# *Microtropis longicarpa* and *M. daweishanensis* (Celastraceae), two new species from Yunnan, China

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Two new species, *Microtropis longicarpa* Q.W. Lin & Z.X. Zhang and *M. daweishanensis* Q.W. Lin & Z.X. Zhang, are described and illustrated from Yunnan, China. Both of them resemble *Microtropis petelotii* in the vegetative characters, and are also partly sympatric in the same forest. However, the three species have different flowering periods, foliar epidermis, structures of flowers and fruits. An identification key to the three species is provided.

Key words: Celastraceae, Microtropis, morphology, new species, taxonomy

## Introduction

The genus *Microtropis* (Celastraceae) has ca. 70 species in the warm and tropical regions of eastern and southeastern Asia, as well as in Central America (Hou 1962, Fan 2006). Some authors recognize the Central American species in the genus *Quetzalia* (Lundell 1970, Simmons 2004). *Microtropis* is characterized by its opposite, entire leaves, cymose or thyrsoid inflorescences, acerose or leaf-shaped bud scales on the top of shoots, 4- to 6-merous bisexual (sometimes unisexual) flowers, weakly developed disks (sometimes absent) with the stamens marginally inserted, and the laterally splitting capsules with a single seed.

"Specific discrimination is very difficult in this genus", as Ding Hou (1962: 274) pointed out. We also found that the Chinese *Microtropis* were not well understood when we prepared the manuscript of this genus for the *Flora of China* (Zhang & Funston 2008). We had started revising Chinese *Microtropis* by examining the herbarium materials and observing the field populations since 2006.

The Daweishan Mountains of Yunnan Province in China is one of the most important regions of rich biodiversity, in which many *Microtropis* species thrive (Shui & Chen 2002). After several expeditions to the Daweishan Mountains, we found three populations of *Microtropis* mixed in the same location. Based on the similar vegetative characters, the three populations have been generally identified as *Microtropis petelotii* in herbaria and in the literature. But after careful examination of new collections from the Daweishan Mountains, the three populations were found to be quite different in phenology and the characters of reproductive organs, pollen, and foliar epidermis. Two of these are hereby recognized as new species.

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### Material and methods

The type specimens of *Microtropis petelotii* were examined. Also, other specimens from the herbaria A, BJFC, K, KUN, NY, P, PE, and SZ were examined.

Populations (located in Shuiweicheng, Pingbian County, Yunnan) were observed from September 2006 to November 2006, and abundant flowers and fruits were collected and studied.

Leaves and pollen were collected and fixed in 75% ethanol in the field. Leaves were dissected as suitably sized squares, and anthers and pollen were picked from mature flowers. Following slow dehydration through a graded ethanol series, samples in pure ethanol were transferred to iso-amyl acetate for 15 minutes, then dried using the  $CO_2$ -critical-point method, vacuum-desiccated at room temperature, fractured, attached to specimen stubs, and coated with gold-palladium prior to viewing with an SE-3400N scanning electron microscope operated at 15 kV.

### **Results and taxonomic treatment**

*Microtropis longicarpa* Q.W. Lin & Z.X. Zhang, *sp. nova* (Figs. 1 and 2)

Microtropis petelotii auct. non Merr. & Freeman: Y. M. Shui, Bot. Bull. Acad. Sin. 43: 309. 2002, pro parte.

Microtropis triflora auct. non Merr. & Freeman: Y. M. Shui, Seed Pl. Honghe S. Yunnan: 248. 2003.

Species Microtropi triflori affinis, sed foliis ellipticis, basi rotundis; nervis primariis; floris 4–5-meris; petalis oblongo-ovatis, basi rotundis; fructibus 1.5–2.5 cm longis differt.

Type: China. Yunnan: Pingbian County, Daweishan Mountains, nearby Shuiweicheng, 22°54′45′′N, 103°41′54′′E, 1900 m, in evergreen forest, 25.XI.2006 (fl.) *Q. W. Lin 647* (holotype BJFC; isotypes BJFC [7], PE [3]).

Shrubs or small trees, glabrous, height 2-5(-8) m; bark gray, coarse, shallowly furrowed. Branchlets terete or sub-tetragonous, green when young, brown when mature, 1-2 mm diam., internodes 2-4 cm. Leaves oblong, lanceolate, or elliptic, (3-)5-12(-14) cm  $\times (1-)2.5-4(-5)$  cm, coriaceous, smooth, upper surface

dark-green, lower surface yellowish-green, apex acuminate, or shortly caudate, base cuneate, or round, slightly decurrent; midrib evident on both surfaces, slender, lateral veins 7-10 pairs, slender, secondary venations numerous, indistinct, slender, slightly reticulate; petioles short, 0.2-1 cm. Cymes axillary, compact, narrow, generally 2-times dichotomous forked, rarely not forked or 1- or 3-times forked; peduncles slender, (1-)2-3(-5) cm, primary forked branches 0-1.5 cm, apex borne with 1-3 flowers or forked again, secondary forked branches 0-0.5 cm, apex borne with 1-3 flowers, rarely forked again; central flowers generally sessile, lateral flowers subsessile or with pedicels to 0.3 cm in length; under each branching point and flower borne 2 minute, subulate bracts about 1 mm long. Flower numbers vary from 1 to 15, generally 7; buds ovoid, ca. 3 mm long, green; flowers 4–5-merous, 6–8 mm diam. when fully opened. Calyx lobes semicircular, coriaceous, ca. 1.5 mm  $\times$  1 mm; petals oblong-ovate, white,  $3-4 \text{ mm} \times 1-2 \text{ mm}$ , base round, apex acuminate; stamens inserted on the edge of the disk, filaments slender, ca. 1.5-2 mm long, apex inflexed, white, anthers sub-reniform, ca. 0.5 mm; disk annular, ca. 2 mm diam., height ca. 0.8 mm, fleshy, green; pistil conical, ca. 0.8 mm diam., style thick, length ca. 1 mm, stigma round, slightly 4-lobed. Capsules fusoidellipsoid, 1.5-2.5 cm, 0.4-0.8 cm diam., surface smooth, base round, apex rostrate; rostrum crass, length ca. 0.5 cm; persistent sepals slightly swollen, ca.  $3 \text{ mm} \times 2 \text{ mm}$ .

FOLIAR EPIDERMIS. The corneous layers on both surfaces are thick; upper surface smooth, slightly waving; lower surface rugose, with sparse irregular stomata.

POLLEN. Pollen tricolporate, polar view triangular, convex, diam. ca. 15  $\mu$ m, equatorial view elliptic, obtuse, length ca. 10  $\mu$ m, extine layer foveolate.

PHENOLOGY. Flowering in November–December; fruiting in October–November of the following year.

DISTRIBUTION. So far this species is found in several counties of Yunnan, China-Pingbian, Hekou, Jinping, Funing, and Xichou. It is common in the Daweishan Mountains, and many specimens examined were collected from the scenic spot Shuiweicheng.



Fig. 1. Microtropis longicarpa (from the holotype). – a: Flowering branchlets, ca. 30 cm  $\times$  20 cm. – b–d: Opening flowers, ca. 6 mm diam. – e: Petals, ca. 3 mm  $\times$  1.5 mm. – f and g: Longitudinal sections, ca. 5 mm high. – h: Disk with inserted stamens, ca. 3 mm high. – i: Fruit, ca. 2.5 cm.

HABITAT. *Microtropis longicarpa* grows in dense evergreen broadleaf forests at altitudes from 1280 to 2310 m. It is a very common undergrowth species on the slopes or summit of subtropical mountains across its distribution.

OBSERVATIONS AND DISCUSSION. We noticed that one collection, *Henry 10491A* (K), which was collected from Mengzi, Yunnan, China, and was cited with the original description of *Microtropis petelotii*, in fact contains two species. The plants in the right part of the sheet have large cylindric young fruits and represent the new described species here, whereas only the plants in the middle part of the sheet with immature flower buds really represent *M. petelotii*. Many collections of the species described here in Chinese herbaria (such as KUN, PE) were identified as *M. petelotii*.

Additional specimens examined. China. Yunnan: Pingbian County: A. Henry 10491A (K, pro parte), Anonym Ping44 (KUN); The Daweishan Range, S. G. Wu et al. 1305, Sino.-Jap. Exped. 1723 (KUN), H. Li 091 (fr., KUN), C. J. Wang 938 (fl., SWFC); Dajianshan, Q. W. Lin 505, 506, 507, 510, 517, 519, 520 (BJFC); Shuiweicheng, Q. W. Lin
470, 472, 473, 474, 475, 476, 477, 478, 479, 480, 481, 482,
483, 484, 485, 486, 487, 488, 489, 490, 491, 492, 493, 494,
495 (BJFC), Q. W. Lin 656 (BJFC, fl.); Laojianshan, Sino.-Russ. Exped. 3749 (PE, KUN), Sino.-Russ. Exped. 4412
(PE, KUN); Shuitianqing, Sino.-Russ. Exped. 4501 (KUN);
Yiqu, Shibanxiang, A-da-kou, Laojianshan, K. M. Feng 4920
(KUN, SZ). Hekou County: Jianshan to Huazhushan, Y. M.
Shui et al. 10149 (KUN). Jinping County: Wuqu, Fenshuiling, Li L01280 (KUN, fl.). Funing County: Lida Qu, Q. A.
Wu 9536 (KUN, fr.). Xichou County: Xiaoqiaozhou, Q. A.
Wu Wen61-083 (KUN, fl.); Dajianshan, Q. A. Wu Wen62-008
(KUN).

# *Microtropis daweishanensis* Q.W. Lin & Z.X. Zhang, *sp. nova* (Figs. 2 and 3)

Microtropis petelotii auct. non Merr. & Freeman: Y. M. Shui, Bot. Bull. Acad. Sin. 43:3 09. 2002, pro parte.

Species Microtropi petelotii affinis, sed petalis candidis; disco carnoso, candidio; staminibus margini disci insertis; fructibus ellipsoideis, rostro brevi differt.



**Fig. 2. a–c**: *Microtropis longicarpa* (from the holotype). – **a**: Leaf upper surface. – **b**: Leaf lower surface. – **c**: Pollen grain. **d–f**: *Microtropis daweishanensis* (from the holotype). – **d**: Leaf upper surface. – **e**: Leaf lower surface. – **f**. Pollen grain. – **g–i**: *Microtropis petelotii* (from *Q. W. Lin 655*, BJFC). – **g**: Leaf upper surface. – **h**: Leaf lower surface. – **i**: Pollen grain.

TYPE: China. Yunnan: Hekou County, Daweishan Mountains, Yaoshan, 1800 m, in evergreen forest on ridge, 26.VIII.2006 (fl. and fr.) *Q. W. Lin 619* (holotype BJFC; isotypes BJFC [22]).

Small trees, glabrous, height to 15 m; trunks to 10 cm diam.; bark gray, coarse, shallowly furrowed. Branchlets sub-tetragonous, brown, 2–3 mm diam., internodes 2–4 cm. Leaves elliptic, (4-)8-12(-14) cm × (1-)3-4(-5) cm, coriaceous, smooth, upper surface dark-green, lower surface yellowish-green, apex acuminate, acute, or caudate, base cuneate, decurrent; midrib evident on both surfaces, slender, lateral veins 4–6 pairs, visible, rising on both surfaces, obliquely ascendant, apex forked, secondary venations not visible without magnification; petioles short, 0.5-1 cm. Cymes axillary, lax, (1-)2-3(-4)times dichotomously forked; peduncles thick, ca.

1 mm diam., (0.5-)1-2(-2.5) cm, primary forked branches 0-1 cm, secondary forked branches 0-0.5 cm, rarely forked again; under each branching point and flower borne 2 minute, triangular bracts about 1 mm long. Flower numbers vary from 1 to 31, generally 15, generally sessile or sub-sessile; buds ovoid, green, ca. 2 mm diam.; flowers 5-6-merous, ca. 6 mm diam. when fully opened. Calyx lobes sub-circular, coriceous, ca.  $1.5 \text{ mm} \times 1 \text{ mm}$ ; petals oblong, white, ca. 3 mm  $\times$  1.5 mm, base cuneate or truncate, apex round; stamens inserted on the edge of the disk, filaments slender, ca. 1 mm long, white, anthers subreniform, ca. 0.2-0.3 mm; disks ring-shaped, ca. 1.5 mm diam., height ca. 0.5 mm, fleshy; pistil conical, ca. 1 mm diam., style thick, length ca. 1 mm, stigma round, slightly 4-lobed. Capsules elliptoid, 1-1.5 cm long, ca. 0.8 cm diam., sur-



Fig. 3. Microtropis daweishanensis (from the holotype). — a: Flowering branchlets, ca. 20 cm  $\times$  10 cm. — b: Flower, ca. 6 mm diam. — c: Longitudinal section, ca. 4 mm high. d and e: Disk with inserted stamens, ca. 2 mm high. — f: Fruit, ca. 1.5 cm long.

face smooth, base round, apex rostrate; rostrum very short; persistent sepals slightly swollen, ca.  $3 \text{ mm} \times 2 \text{ mm}$ .

FOLIAR EPIDERMIS. The corneous layers on both surfaces are thick; upper surface smooth, flat; lower surface slightly rugous, with very sparse and irregularly arranged stomas.

POLLEN. Pollen tricolporate, polar view triangular, convex, diam. ca. 15  $\mu$ m, equatorial view elliptic, obtuse, length ca. 10  $\mu$ m, extine layer foveolate.

PHENOLOGY. Flowering in September; fruiting in November of the following year.

DISTRIBUTION. The new species is known from several locations in the Daweishan Mountains, Pingbian and Hekou Counties, Yunnan, China. The specimens examined were collected from the Yaoshan Mountains, Waga village, and Shuiweicheng Scenic Spot.

HABITAT. *Microtropis daweishanensis* grows in evergreen broadleaf forest at altitudes from

1400 to 2000 m. It is a common species on the ridge or summit of mountains.

OBSERVATIONS AND DISCUSSION. Numerous specimens of this species in herbaria were also identified as *Microtropis petelotii* by various authors, and it is so similar to the latter species that the present authors didn't recognize it immediately in the field. Later we found that *M. petelotii* flowers in October–November, and has chartaceous, slightly rugose leaves, more flowers per cyme, greenish flowers with stamens inserted at the outer surface of the thin disks, and different smaller fruits with larger rostra.

Additional EXAMINED SPECIMENS. China. Yunnan: Hekou County: Yaoshanxiang, Liangzi, Q. W. Lin 608, 609, 610, 611, 612, 613, 614, 615, 616, 617, 618, 625, 626, 628, 629 (BJFC). Pingbian County: Ao-ga-cun, Q. W. Lin 554 (BJFC); Dajianshan, Q. W. Lin 512, 514 (BJFC); Daweishan, Yakou, Z. H. Yang 87-0963 (KUN); Shuiweicheng, Q. W. Lin 657 (BJFC); Maweixiang, Huoshanchun, summit of Bomushan Mountain, P. I. Mao 3691 (KUN, PE, SZ).



Fig. 4. Microtropis petelotii (from Q. W. Lin 655, BJFC). — a: Flowering branchlets, ca. 15 cm  $\times$  15 cm. — b: Cyme, ca. 3 cm long. — c: Opening flower, ca. 6 mm diam. — d: Disk with inserted stamens, ca. 2 mm high. — e: Petal, ca. 3 mm long. — f: Longitudinal section, ca. 4 mm high.

*Microtropis petelotii* Merr. & Freeman (Figs. 2 and 4)

Proc. Am. Acad. 73: 291. 1940, pro parte. — Microtropis yunnanensis auct. non (Hu) C.Y. Cheng & T.C. Kao ex Q.H. Chen: Y. M. Shui, Bot. Bull. Acad. Sin. 43: 309. 2002.

TYPE: Vietnam. Tonkin: Fan Tsi Pan, route to Lo Qui Ho, near Chapa, ca. 1900 m., Sep. 1931, *Pételot 4428* (holotype A; isotypes A, NY, K, P).

FOLIAR EPIDERMIS. The corneous layers on both surface are thick; upper surface rugous, slightly waving; lower surface rugose, with dense stomas that are visible, irregular.

POLLEN. Pollen tricolporate, polar view triangular, convex, diam. ca. 20  $\mu$ m, equatorial view elliptic, obtuse, length ca. 12  $\mu$ m, extine layer foveolate.

PHENOLOGY. Flowering in October-November; fruiting in November of the next year.

DISTRIBUTION. Northern Vietnam and southeastern Yunnan, China.

HABITAT. *Microtropis petelotii* grows in dense evergreen broadleaf forest at altitudes from 1300 to 2200 m. It is a common species on the slopes or summits of mountains.

ADDITIONAL EXAMINED SPECIMENS. China. Yunnan: Without locality, 1963, Anonymous 63-101838 (KUN); Guangnan County: Muyi, Hua-guo-da-qing, C. W. Wang 87319 (KUN), C. W. Wang 87522, 87546, 87680 (KUN), Z. W. Lin 628, Q. A. Wu 9724, 9828 (KUN, fl.); Tianfangxiang, Y. M. Shui 1338 (KUN); Shijiacao, Y. M. Shui 10578 (KUN); Hekou County: Yaoshanxiang, Liangzi, Q. W. Lin 624, 627 (BJFC); Liangzi, Sanchaheqing, P. I. Mao 4099 (KUN, PE), Sanchaheqing, P. I. Mao 4105 (KUN, PE); Pingbian County: A. Henry 11417 (K), A. Henry 10491A (K); Jianshan, H. T. Tsai 61953 (A, PE); The Daweishan Range, Dajianshan, Q. W. Lin 504, 508, 513, 516, 521 (BJFC); from Shuiweicheng Scenic Spot to Shitouzhai, Q. W. Lin 530, 531, 532, 534, 536; Maweixiang, Huoshan, Q. W. Lin 568 (BJFC); Shuiweicheng, Q. W. Lin 469, 471, 496, 497, 498 (BJFC), Q. W. Lin 655 (BJFC); The back of Niuchang, Sino.-Russ. Exped. 3970 (KUN, YUKU, PE); Yiqu, Ao-ga-cun, Potou, K. M. Feng 4628 (KUN, PE); Yiqu, Shibanxiang, A-da-kou, Laojianshan, K. M. Feng 4914 (fr., KUN, PE, SZ); Xichou County: K. M. Feng 11978 (A, KUN), Q. A. Wu 7677 (KUN); Nanchang, Lengshuixi River, S. Z. Wang 358 (KUN); Qingping, C. W. Wang 85762 (fl., KUN, PE). Vietnam. Tonkin: route from Lo Qui Ho to Ta Rhinh, Chapa, Pételot 4405 (P).

#### Identification key to the three species

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