
A New Variety of *Tripterospermum chinense* (Gentianaceae) from Zhejiang Province, Eastern China

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ABSTRACT. The new variety *Tripterospermum chinense* var. *linearifolium* X. F. Jin (Gentianaceae) is described from Zhejiang, eastern China, and distinguished from *T. chinense* (Migo) Harry Smith. Leaf characteristics of both varieties were statistically analyzed, and pollen grain and seed morphology was observed under SEM. SEM results showed that pollen and seed morphology did not differ between the new variety and the autonymic variety. According to the results of statistical analysis, *T. chinense* var. *linearifolium* differs mainly from the autonymic variety in having narrower leaves (3–9 mm vs. 11–43 mm) and solitary flowers (vs. two to five flowers).

Key words: China, Gentianaceae, IUCN Red List, *Tripterospermum*, Zhejiang.

Tripterospermum Blume is widely accepted by taxonomists (Satake, 1951; Liu & Kuo, 1978; Wu, 1984, 1988; Murata, 1989; Ho & Pringle, 1995). The genus comprises 25 species worldwide and is distributed primarily in East and South Asia (Murata, 1989). Nineteen species belonging to two sections are recognized in China, namely section *Platyspermum* C. J. Wu and section *Tripterospermum* (Wu, 1984, 1988). C. B. Clarke (1875) treated the genus *Tripterospermum* in *Crawfurdia* Wallich as a section, and later he changed its rank to subgenus (Wu, 1988). Marquand (1931) reduced *Tripterospermum* and *Crawfurdia* in *Gentiana* as two different sections, but his treatment of some species was confused.

Hul (2002) described three new species from Vietnam. Recently, Fang and Qin (2001) described *Tripterospermum brevilobum* D. Fang as a new species from Guangxi, China, and Chen et al. (2006: 203) described *T. lilungshanense* Chih H. Chen & J. C. Wang (spelled by the authors as “*lilungshanensis*” in the protologue) from Taiwan.

In August 2004, during botanical exploration in Fengyang Mountain of Zhejiang Province, China, we discovered a new variety of *Tripterospermum chinense* (Migo) Harry Smith characterized by narrower leaves and pale purplish white, solitary flowers. A statistical analysis of the leaves was performed on specimens

from HHBG, HTC, HZU, and ZM. Twenty-four specimens of *T. chinense* var. *chinense* and nine of the new variety were examined. SPSS Statistics 11.5 (Chicago, Illinois, U.S.A) and SigmaPlot 8.0 (Chicago, Illinois, U.S.A.) software applications were used to analyze and illustrate the leaf variation, respectively (Fig. 1). Mature pollen grains and seeds of the new variety were obtained for SEM observation from type collections X. F. Jin 808A (for pollen grains: holotype, HTC) and X. F. Jin 808C (for seeds: paratype, HTC). Material of *T. chinense* var. *chinense* was taken from *anonymous s.n.* (for pollen grains, HZU) and L. X. Hong & B. Y. Ding 1185 (for seeds, HZU), respectively. The seeds and pollen grains were directly observed under a Hitachi S-570 (Tokyo, Japan) scanning electron microscope.

Comparing the morphological characters of the two varieties of *Tripterospermum chinense*, the distinguishing characters were the shape of the cauline leaves (especially leaf width) and the number of flowers. Leaves of *T. chinense* var. *chinense* are ovate or narrowly ovate to ovate-lanceolate, with the base rounded, truncate, or cordate, and are 11–43 mm wide, whereas those of the new variety are linear, with the base cuneate, and are 3–9 mm wide (Fig. 1). Test of significance for leaf width showed a significant difference ($P < 0.01$). Each fertile node of *T. chinense* var. *chinense* is 2- to 5-flowered, while the new variety has solitary flowers at each node. Under SEM, the seeds of the two varieties of *T. chinense* are similar: the shape is oblong, with broad wings on margins, and seed surface ornamentation is finely reticulate, with distinct muri and small lumina with irregular folds. The pollen morphology of the two varieties is also similar in its spheroidal and 3-colporate form with distinct, irregular, and smooth raphes on the surface sculpture. Although pollen and seed morphology are similar, the differences in floral and leaf morphology clearly distinguish the two varieties.

1. *Tripterospermum chinense* (Migo) Harry Smith, Grana Palynol. 7: 144. 1967. Basionym:

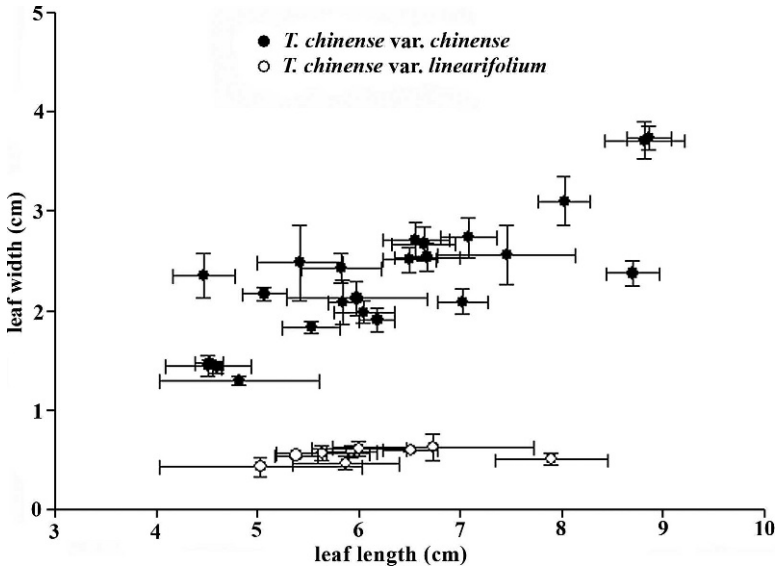


Figure 1. Leaf size variation in *Tripterospermum chinense* var. *chinense* and *T. chinense* var. *linearifolium*, showing mean and standard error (SE) values for each measured specimen.

Crawfordia chinensis Migo, J. Shanghai Sci. Inst. 3: 154. 1939. TYPE: China. Zhejiang: Lin'an, Changhua, *H. Migo* s.n. (holotype, TI).

1a. *Tripterospermum chinense* (Migo) Harry Smith var. *chinense*.

1b. *Tripterospermum chinense* (Migo) Harry Smith var. *linearifolium* X. F. Jin, var. nov. TYPE: China. Zhejiang: Longquan, Mt. Fengyang, under forests, 1650 m, flowers pale purple, 26 Aug. 2004, X. F. Jin 808A (holotype, HTC; isotypes, MO, ZM). Figure 2.

Haec varietas a *Tripterospermo chinensi* (Migo) Harry Smith var. *chinensi* foliis caulinis linearibus (vs. ovatis, anguste ovatis vel ovato-lanceolatis), 3–9 mm (vs. 11–43 mm) latis, basi cuneatis (vs. rotundis, truncatis vel cordatis) atque floribus solitariis (vs. 2 ad 5) differt.

Perennial herb; stems terete, twining, green or brown. Basal leaves in 2 pairs, nearly prostrate, sessile, papyraceous, ovate, obovate, or rounded, 1.2–5 × 1–3 cm, apex acute, base cuneate or broadly cuneate, margin entire, dark green on adaxial surface, sometimes with yellowish green spots, pale green on abaxial surface; cauline leaves linear, membranaceous, 5–10 × 0.3–0.9 cm, base cuneate, margin entire, apex acuminate to caudate; veins 3; petiole 0.2–0.3 mm. Inflorescences axillary, with solitary flower per node; pedicel very short, 1–2 mm, with 1 or 2 pairs of bracts, linear, herbaceous, 3–4 mm. Calyx campanulate, 1.5–1.8 cm; tube 8–9 mm, wingless; lobes linear-lanceolate, 6–9 mm; corolla pale purplish white, with opalescent plicae; tube narrowly

campanulate, 3–3.5 cm; corolla lobes triangular-ovate, 4–5 × 3–4 mm, apex acuminate; plicae semiorbicular, ca. 5 × 3 mm; filaments linear, 1.5–1.7 cm; anthers ovoid, ca. 1.5 mm; ovary elliptic-lanceolate, attenuate on both sides, ca. 2.5 cm, with a long stipe to 10 mm long; style linear, 9–11 mm; stigma persistent, ca. 1 mm. Capsules ellipsoid, compressed, 2.5–2.7 cm × 3–4 mm, included in corolla; seeds brown, orbicular, compressed, ca. 2 mm diam.; wings discoid.

Habitat and distribution. *Tripterospermum chinense* var. *linearifolium* is known currently only from its type locality, on Mt. Fengyang and Mt. Jiulong, southern Zhejiang Province, eastern China. It grows in forests of *Fokienia hodginsii* A. Henry & H. H. Thomas and *Pseudotaxus chienii* (W. C. Cheng) W. C. Cheng at ca. 1650 m in elevation.

IUCN Red List Category. According to IUCN Red List categories and criteria (IUCN, 2001), the new variety should be considered Near Threatened (NT), and there is a need for its future conservation. *Tripterospermum chinense* var. *linearifolium* grows on Mt. Fengyang and Mt. Jiulong, two natural reserves of China, and its habitats are well preserved. However, its area of distribution is less than 10,000 km² and the population is less than 5000 individuals.

Phenology. The new variety was collected in flower and fruit from July to August.

Paratypes. CHINA. **Zhejiang:** Longquan, Mt. Fengyang, 1650 m, 26 Aug. 2004, X. F. Jin 808B, 808C (HTC), 21 July

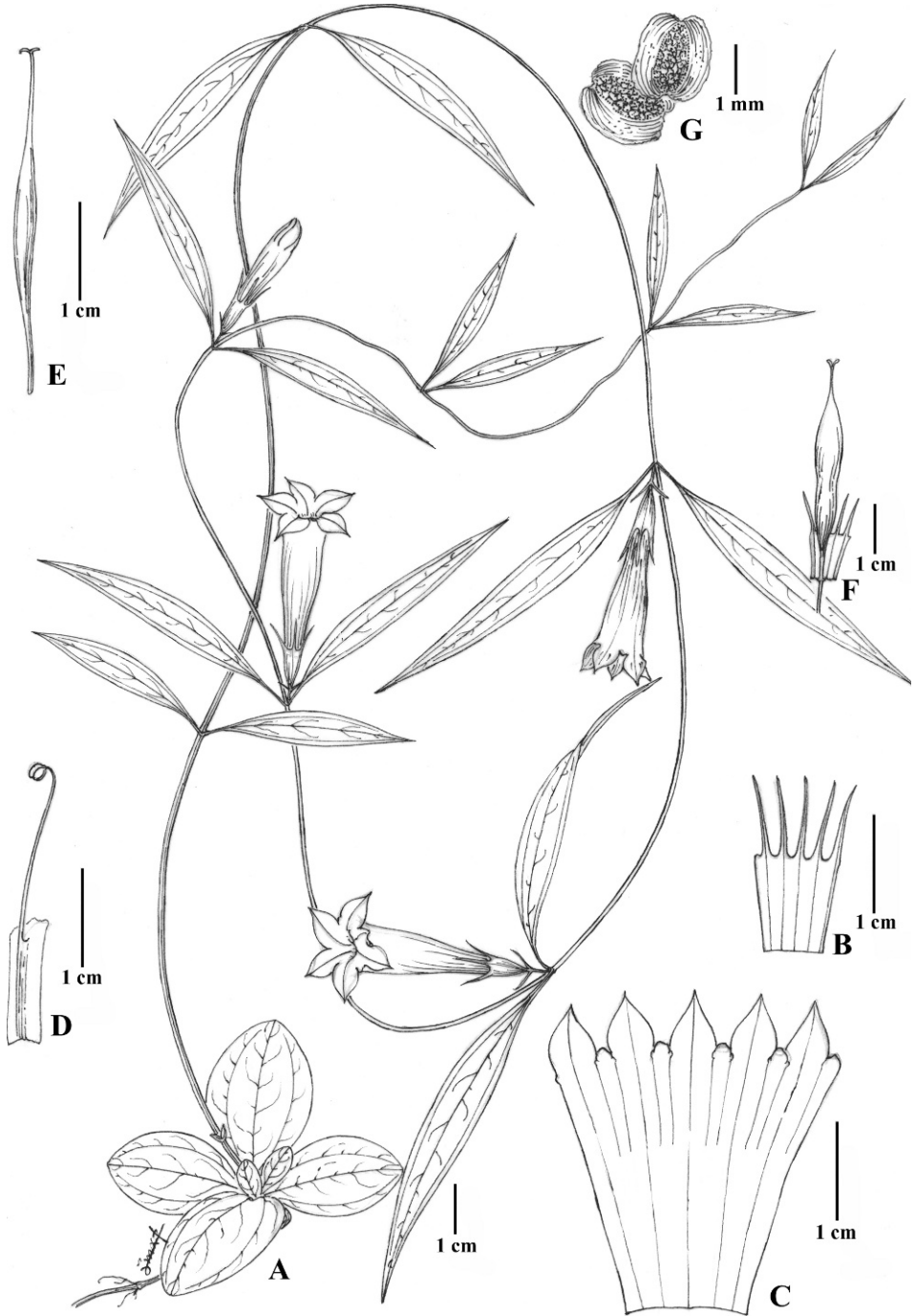


Figure 2. *Tripterospermum chinense* var. *linearifolium* X. F. Jin. —A. Habit. —B. Calyx. —C. Corolla. —D. Filament and anther. —E. Ovary, style, and stigma. —F. Capsule. —G. Seed. Drawn by Xiao-Feng Jin. A–E from the holotype X. F. Jin 808A (HTC); F, G from the paratype X. F. Jin 808C (HTC).

1972, *Zhejiang Med. Bot. Exped. s.n.* (HTC); Suichang, Mt. Jiulong, Zhongkeng, 15 Aug. 1985, *F. G. Zhang, M. H. Wu & Z. Y. Li 4406* (HTC).

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