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Hedyotis xinyiensis (Rubiaceae), a new species from China

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A new species, *Hedyotis xinyiensis* X. Guo & R.J. Wang (Rubiaceae), from the west of the Guangdong province, China, is described and illustrated. It belongs to *Hedyotis* sect. *Diplophragma* due to its septicidal dehiscence of mature capsules. The morphological characters that distinguish it from the two similar species, *H. consanguinea* and *H. matthewii*, are listed in a table. The ultrastructure of pollen grains, seeds, and leaf epidermis was examined by SEM.

Hedyotis is one of the largest genera in the Rubiaceae (Verdcourt 1976), consisting of 500–700 species distributed in the tropical and subtropical regions of the world (Wang & Zhao 2001, Dutta & Deb 2004). Due to the disputed and uncertain delimitation of *Hedyotis* and *Oldenlandia* in some previous studies (summarized briefly in Wang 2008) and the insufficient phylogenetic analyses of the Chinese species, a broad concept of *Hedyotis* is applied here, as it was also in Ko (1999).

Recent studies have revealed that there are 67 species of *Hedyotis* in China (Ko 1999, Wang & Xing 2003, Wang 2007, Wang 2008, Chen 2007, Chen 2008). While examining the *Hedyotis* specimens at the herbarium IBSC and during field investigations in the Xinyi district, west of Guangdong province, China, we found specimens that differed from the previously recorded *Hedyotis* species. The specimens are described here as representing a new species.

Hedyotis xinyiensis X. Guo & R.J. Wang, *sp. nova* (Figs. 1; 2A–G, J; 3A–C, E, G)

Species nova simillima H. consanguineae inflorecentiis terminalibus vel superioribus axillaribus, a qua caule ramoso, petiolis 3–5 mm longis, foliis chartaceis, nervis lateralibus 4–7–jugatis, stipulis subtus adpresse pannosis, seminibus grandibus differt; etiam affinis H. matthewii Dunn, a qua floribus heterostylis, sessilibus vel subsessilibus, corollae tubo, lobis et stylis omnino brevioribus differt.

Holotype: China. Guangdong province, Xinyi City: Mt. Dawuling, under forests, alt. 1000–1700 m, 26.IX.2009 *Rui-Jiang Wang 1218* (holotype IBSC; isotypes IBSC). — Paratypes: China. Guangdong, Xinyi: Mt. Dawuling, 26.III.1931 *Xi-Peng Gao 51230* (IBSC); Fenshuiao, Pinghe, 9.V.1931 *Xi-Peng Gao 51447* (IBSC); Shangshi Cave, Mt. Hualoushan, 18.XI.1934 *Zhi Huang 37908* (IBSC); Yunkai nature reserve, 24.IX.2009 *Rui-Jiang Wang & Yi-Ding Gao 1182* (IBSC); Yunkai nature reserve, 1700 m, 25.IX.2009 *Rui-Jiang Wang & Yi-Ding Gao 1209* (IBSC).

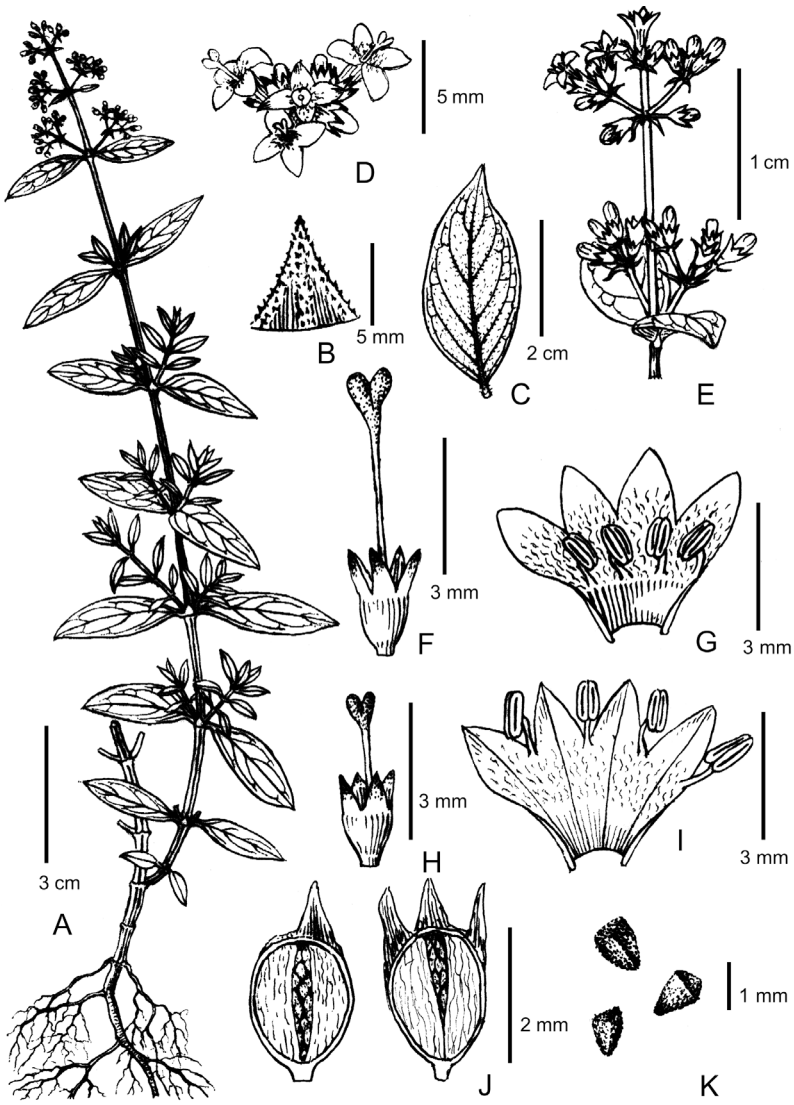

Fig. 1. *Hedyotis xinyiensis* (from the holotype, drawn by H. P. Yu). — **A**: Habit. — **B**: Stipule (abaxial side). — **C**: Leaf (adaxial side). — **D**: Inflorescence of long-styled flowers. — **E**: Inflorescence of short-styled flowers. — **F** and **G**: Dissected long-styled flower showing the attaching position of stamens and style. — **H** and **I**: Dissected short-styled flower showing style and position of stamens. — **J**: Septicidally dehiscent capsule. — **K**: Seeds.

Perennial herbs, 10–60 cm tall, erect, glabrous, branched. Stems quadrangular; internodes usually 2.5–5.5(–7.5) cm. Leaves (2–)3.5–5.0(–8.0) × (0.5–)1.0–1.5(–2.0) cm, lanceolate to ovate, abaxially usually light violet, acute at apex, cuneate at base, papyraceous; secondary veins 4 to 7 pairs; adaxially usually pubescent on the midrib and secondary veins; petiole distinct, 3–5 mm, usually glabrous; stipules triangular, 3–4 × 3–6 mm, with densely appressed pannose abaxially, margin minutely glandular serrulate, papyraceous. Inflorescence pleiochasiums, sparse, terminal and upper axillary, bractlet lanceolate, 1.5–2.5 mm. Flowers 4–5 mm in diameter while open, with 0.5–2.2 mm long pedicel, hermaphrodite, heterostylous; calyx tube 1–2 mm, ca. 1.2 mm in diam, lobes 4–5, triangular, 0.8–1.3 mm long, ca. 0.5 mm wide at base; corolla cylindric, white to purplish pink, tube 2.5–2.8 mm, pubescent adaxially, glabrous abaxially, lobes oblong to lanceolate, 4–5, ca. 1.6 mm long; stamens 4–5, anthers oblong-linear, ca. 0.6 mm long; stigma bilobed, papillate. Long-styled flower: styles exserted, ca. 4.2 mm long; stamens included, adnate to base of corolla tube; filaments ca. 1 mm long. Short-styled flower: styles included, ca. 1.8 mm long; stamens

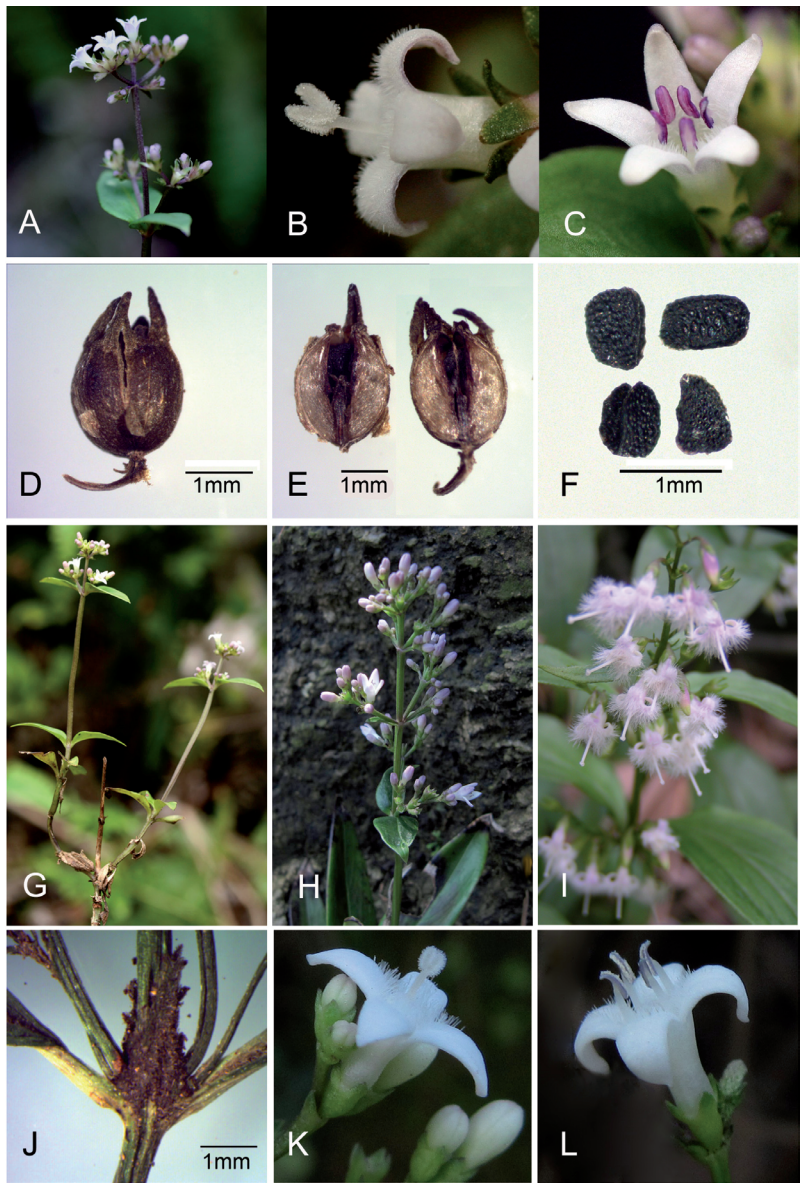

Fig. 2. A–G, J: *Hedyotis xinyiensis*. — **A**: Inflorescence. — **B**: Long-styled flower. — **C**: Short-styled flower. — **D**: Indehiscent capsule. — **E**: Septicidally dehiscent capsule. — **F**: Seeds. — **G**: Habit. — **J**: Stipule. — **H**: Inflorescence of *H. consanguinea*. — **I**: Inflorescence of *H. matthewii*. — **K**: Long-styled flower of *H. consanguinea*. — **L**: Short-styled flower of *H. consanguinea*.

exserted, adnate to throat of corolla tube; filaments ca. 1.5 mm long. Capsule spheroidal, 2–2.5 × 1.8–2.2 mm, appearing 3–3.5 mm long including persistent calyx limbs, dehiscing loculicidally at top initially, then septicidally when mature. Seeds ca. 15 per capsule, angular, 0.8–1.1 mm long, testa black, foveate at surface. Flowering from March to July, fruiting from August to October.

Hedyotis xinyiensis belongs to *Hedyotis* sect. *Diplophragma* because its ovoid capsules dehisce loculicidally first at the apex and then septicidally as the capsules mature. It is most similar to *H. consanguinea* and *H. matthewii* in having terminal or upper axillary inflorescences, but it differs from *H. consanguinea* by having 3–5 mm long distinct petioles, papyraceous leaves, 4–7 pairs of secondary veins, abaxially pannose stipules, and large seeds (0.8–1.1 mm *vs*. ca. 0.4 mm; Fig. 3C and D). Scanning electron microscope (SEM) observations of the leaf epidermal surface revealed that *H. xinyiensis* has reticulate and projected epidermal ridges adaxially (Fig. 3E)

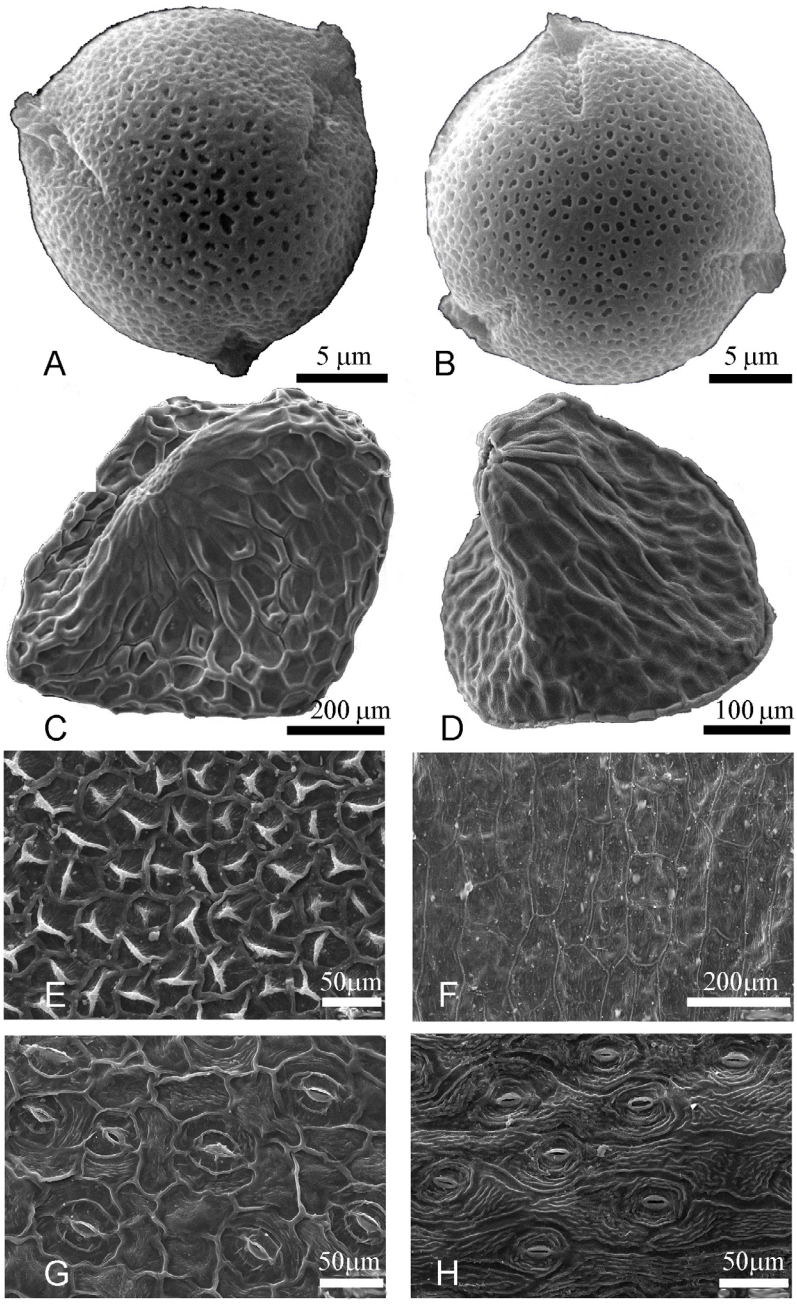

Fig. 3. Micromorphology of *H. xinyiensis* (**A**–**C**, **E**, **G**) and *H. consanguinea* (**D**, **F**, **H**). — **A** and **B**: Pollen grains of short-styled and long-styled flowers, respectively. — **C** and **D**: Seeds. — **E** and **F**: Epidermal cells on adaxial leaf surface. — **G** and **H**: Stomata on abaxial leaf surface.

and actinocytic stomata with distinct subsidiary cell walls abaxially (Fig. 3G), in which adjacent stomata share common subsidiary cells (Pant & Mehra 1965), whereas, *H. consanguinea* has parallel and plain epidermal cell walls adaxially (Fig. 3F) and stomata with parallel and striate ridges of cuticle that surround and overlap the guard cells (Fig. 3H). *Hedyotis xinyiensis* can be distinguished from *H. matthewii* by having heterostylous, sessile to subsessile flowers, and short corolla tube (2.5–2.8 mm *vs*. 7–8 mm), corolla lobe (1.6 mm *vs*. 3.0 mm) and style (4.2 mm or 1.8 mm *vs*. ca. 8.0 mm; Table 1).

This species mainly grows on cliffs and roadsides at 500 to 1700 m a.s.l. The associate plants are bamboos or herbs at the higher altitudes,

Table 1. Comparison of *H. xinyiensis* with two morphologically similar species.

Characters	*H. xinyiensis*	*H. consanguinea*	*H. matthewii*
Height	10–60 cm	30–40 cm	30–75 cm
Petiole	3–5 mm	0–1.0 mm	ca. 3 mm
Leaf	papyraceous, (2–)3.5–5(–8) × (0.5–)1–1.5(–2) cm	coriaceous, 2–3 × 0.8–1 cm	papyraceous, ca. 7 × 1–3 cm
Secondary vein	4–7 pairs	2–3 pairs	3–4 pairs
Stipule	triangular, with densely appressed pannose abaxially	triangular, glabrous	ovate-triangular, with sparse strigose hairs abaxially
Flower	heterostylous	heterostylous	homostylous
Corolla tube	2.5–2.8 mm	2.0–2.5 mm	7–8 mm
Corolla lobe	ca. 1.6 mm	2–2.5(–3.0) mm	ca. 3.0 mm
Style in pin flowers	ca. 4.2 mm	ca. 4.0 mm	ca. 8.0 mm
Style in thrum flowers	ca. 1.8 mm	ca. 1.5 mm	
Seeds	0.8–1.1 mm	ca. 0.4 mm	ca. 0.6 mm

while at lower altitudes, mainly species of the Fagaceae and Lauraceae plants. The shade density is 15%–50%.

The pollen grains of the new species are single, spheroidal, isopolar, and radially symmetrical, with 3-colporate apertures and perforate tectum. They are small, 23.7(22.4–24.9) × 22.1(21.1–22.7) μm in long-styled flowers, and 23.4(21.7–28.4) × 22.0(20.9–26.8) μm in short-styled flowers, with the *P*/*E* value of 1.1 (Fig. 3A and B). The pollen characters are congruent with those of the other *Hedyotis* species previously observed (Huang 1972).

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