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Zingiber nanlingensis sp. nov. (Zingiberaceae) from Guangdong, China

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Zingiber nanlingensis L. Chen, A. Q. Dong & F. W. Xing sp. nov. (Zingiberaceae) from northern Guangdong, China is described, illustrated, and compared with the morphologically similar species *Z. mioga* (Thunb.) Rosc.

The genus *Zingiber* Miller, with 158 species worldwide, is widely distributed from the tropics to warm–temperate Asia (Wu and Larsen 2000, Govaerts and Lock 2006). During the past decades, several new species have been published, such as *Zingiber gulinense* by Xia (1996) and *Z. simaoense* by Tong (1997) from Yunnan, China, *Z. phumiangense* from Thailand by Chaveerach et al. (2007), and *Z. anamalayanum* from India by Sujanapal and Sasidharan (2010). Meanwhile, a set of 13 new species from Borneo (Theilade and Mood 1997a, b, 1999a), one from Vietnam (Theilade and Mood 1999b) and two from the Philippines (Mood and Theilade 2001) was reported. Besides, Theilade (1999) compiled a synopsis of 26 *Zingiber* species in Thailand, including 4 new species. These reports reaffirm southeast Asia as the distribution center of *Zingiber*. In China, there are 42 species of *Zingiber*, of which 34 are endemic (Wu and Larsen 2000). *Zingiber* is divided into two sections: sect. *Zingiber* and sect. *Cryptanthium* (Wu and Chen 1981). The genus differs from other genera of the family Zingiberaceae by the following main features: a 3-lobed structure formed by the lateral staminodes adnate to labellum, and the connective appendage wrapped around the style (Wu and Chen 1981, Wu and Larsen 2000).

During an expedition to limestone mountains near the border of Guangdong Nanling National Nature Reserve, as a part of project ''Comprehensive survey on the plants in Nanling National Nature Reserve'', some specimens of the genus *Zingiber* were collected from the limestone slope. After careful comparison with morphologically similar taxa (Thunberg 1784, Tong and Liu 1991, Xia 1996, Tong 1997, Chaveerach et al. 2007), we believe that it represents an undescribed species.

Zingiber nanlingensis L. Chen, A. Q. Dong & F. W. Xing sp. nov. (Fig. 1–2)

Species Z. miogae (Thunb.) Rosc. affinis, sed planta 20–50 cm alta, laminis inaequilateralibus, inflorescentiis 2–5-ramosis, corolla flava, lobulis labelli mediis late obovatis, appendicibus connectivorum aurantiacis acutis postremo vadose cupuliformibus differt.

Type: China. Guangdong Province, Qingyuan City, Yangshan County, Chengjia Yao Autonomous Township, on the slope of limestone, beside the road, ca 100 m a.s.l., 5 Jun 2009, Dong An-Qiang 2873 (holotype: IBSC). Paratype: same locality, 22 Jul 2010, Chen Lin 2862.

Perennial herb. Rhizomes yellowish, roots fibrous. Leafy shoots 20–50 cm high and ca 5 mm in diameter at base, upright, slightly weakened. Leaf sheaths sparsely villous or glabrescent, with membranous margin, basal sheath purplish–red, upper sheath green with reddish veins and margin; petiole 0.2–1.2 cm; ligule membranous, 2-lobed, 2–6 mm long, lobes triangular or triangular-ovate. Leaves up to 18 × ca 4 cm, leaf blade falcate-lanceolate, or sometimes elliptic-lanceolate in the lower part, anisopleural, apex caudate-acuminate, margin entire, base rounded or broadly cuneate, decurrent, connected with leaf sheath, upper surface bright green, glabrous, lower surface green, glabrescent or thin villous, slightly more dense beside the midvein. Inflorescences arising from rhizomes, up to 14 cm high, with 2–5 branches, puberulent, ellipsoid or irregular. Peduncle short, almost absent to 3 cm long, with 5–8 bracts. Bracts imbricate, reddish yellow with purple veins, pubescence caducous; outer bracts wide and short, broadly lanceolate, 1–3 × 0.8–1.5 cm, the outermost much smaller

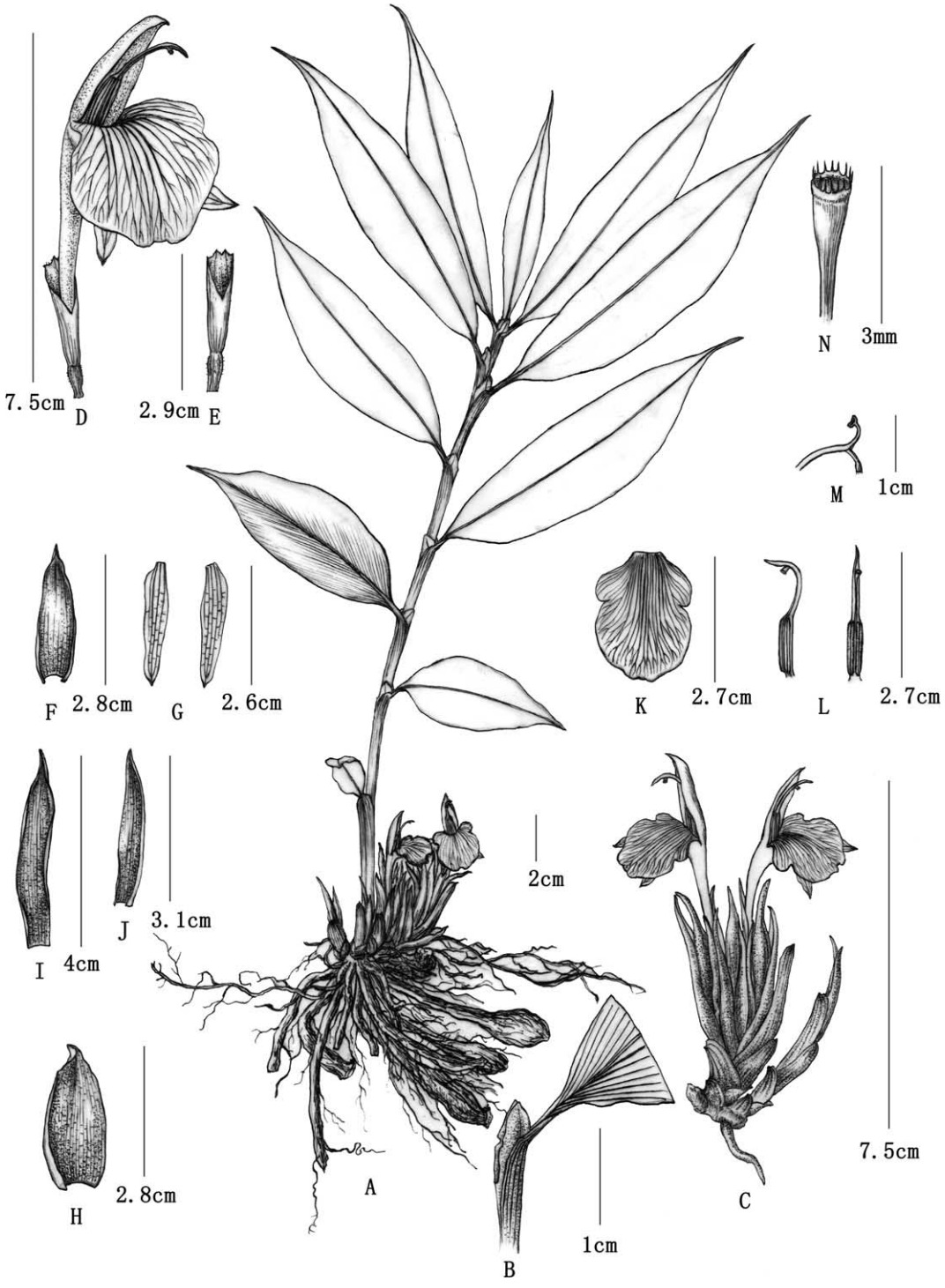

Figure 1. *Zingiber nanlingensis* L. Chen, A. Q. Dong & F. W. Xing sp. nov. (A) plant habit, (B) leaf sheath, (C) inflorescences with blooming flowers, (D) a flower with ovary and calyx tube, (E) ovary and calyx tube, (F) dorsal lobe of corolla tube, (G) lateral lobes of corolla tube, (H) outer bract, (I) inner bracts, (J) bracteole, (K) labellum with side lobes, (L) anther, appendage and stigma (side and ventral view), before fertilization, showing appendage with acute apex, (M) appendage after fertilization, with apex shallowly cupulate, (N) stigma. Drawn by Ms Liu Yunxiao from holotype.

than others; inner bracts long and thin, narrowly lanceolate, up to 5 cm long, ca 0.8 cm wide; bracteoles narrowly lanceolate, ca 3 cm long, thin pubescent, slightly folded. Calyx tube 2.2 cm long, yellowish–white, membranous, puberulent, lobed on one side, apex truncate, with 3–4 teeth, middle 1 or 2 teeth longer than the others. Corolla tube ca 5 cm, yellow, glabrous, apex 3-lobed; lobes yellow, glabrous, with conspicuous veinlets, dorsal lobe lanceolate, $3 \times$ ca 1 cm, boat-shape, apex hooded and acute, lateral lobes narrowly lanceolate, 2.6×0.5 cm. Labellum 3-lobed, yellow, with golden yellow striae; central lobe broadly obovate, 2.6×2.0 cm, apex retuse or slightly undulate;

Figure 2. *Zingiber nanlingensis* L. Chen, A. Q. Dong & F. W. Xing sp. nov. (A) habit, (B) inflorescence, (C) flower front view, (D) flower side view, with appendage after fertilization. Photo by An-Qiang Dong.

lateral lobes small, lobate, ovate, ca 0.5 cm, apex rounded. Stamen 2.8 cm long with filament very short or absent, flat; anther basifixed, oblong, 1.2 × 0.4 cm, yellow, glabrous, appendage linear, ca 1.6 cm long, recurved, directed upward and wilted after fertilization, longer than stigma, orange, apex converting from acute to shallowly cupulate after fertilization. Stigma conical, ca 1.5 mm long, apex ciliate, white; style filiform, slender, surrounded by stamens; ovary 6.0 × 3.5 mm, puberulent. Fruit not seen. Flowering Mar–May.

Ecology and conservation status

Zingiber nanlingensis is currently known to exist in its type locality only, near the border of Guangdong Nanling National Nature Reserve. Here it grows on limestone slopes, near the roadside or streamside under open forests, at an altitude of about 100 m a.s.l. Collected plants grew in association with *Selaginella delicatula*, *Adiantum malesianum*, *Nephrolepis auriculata*, *Oreocnide frutescens*, *Pilea peltata*, *Polygala caudata*, *Begonia leprosa*, *Humulus japonicus*, *Aster ageratoides* var. *laticorymbus*, *Petrocodon*

Table 1. Diagnostic characters for *Zingiber nanlingensis* sp. nov. and *Z. mioga*.

	Z. nanlingensis	*Z. mioga*
Height (m)	0.2–0.5	0.8–1.3
Leaf	falcate-lanceolate, or sometimes elliptic-lanceolate in the lower part, anisopleural, 18 × ca 4 cm	lanceolate-elliptic or linear-lanceolate, equilateral, 20–37 × 4–6 cm
Inflorescence	2–5-branched, ellipsoid or irregular, up to 14 cm	1–3-branched, ellipsoid, 5–7 cm
Peduncle	short, almost absent to 3 cm long	absent to 17 cm long
Calyx	2.2 cm long, yellowish–white, puberulent, apex truncate, with 3–4 teeth, middle 1 or 2 teeth longer than the others	2.5–3.0 cm long, light green, base densely pilose, apex truncate, with 2 teeth
Corolla tube	ca 5 cm long, yellow	4 cm long, white
Labellum	3-lobed, yellow, with golden yellow striae; central lobe broadly obovate, 2.6 × 2.0 cm, apex retuse or slightly undulate, lateral lobes small, lobate, ovate, ca 0.5 cm, apex rounded	3-lobed, ca 3 cm; central lobe ovate, yellow with white margin, ca 2.5 × 1.8 cm; lateral lobes obovate, ca 13 × 4 mm
Appendage	ca 1.6 cm long, directed upward and wilted after fertilization, longer than the stigma, orange, apex converting from acute to shallowly cupulate after fertilization	ca 1 cm long, as long as the stigma, apex purple, body mauve-pink
Habitat	limestone slope	moist places in mountain valleys

dealbatus, *Polygonatum cyrtonema*, *Microstegium ciliatum*, *Setaria palmifolia*, etc. At this site there are only a few small populations with less than 10 individuals in every one. Therefore, we consider this species 'Critically Endangered' (CR) according to the IUCN (2001) conservation categories.

Similar species

Zingiber nanlingensis resembles *Z. mioga* (Thunb.) Rosc., which is distributed in Anhui, Guangdong, Guangxi, Guizhou, Hunan, Jiangsu, Jiangxi, Yunnan, Zhejiang Provinces in China and in Japan. They both have distichous leaves, 2-lobed ligule, yellowish flower, 3-lobed labellum, basifixed anther and ciliate stigma. However, *Z. nanlingensis* is distinguished from *Z. mioga* primarily by its much shorter plant height (about 20–50 cm), anisopleural leaf blades, 2–5-branched inflorescences, yellow corolla, broadly obovate central lobe of labellum and orange appendage converting from acute to shallowly cupulate. A morphological comparison between *Z. nanlingensis* and *Z. mioga* is given in Table 1.

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