

Taxonomic Studies on Myanmar Zingiberaceae III: Two New Species of *Zingiber* (Sect. *Cryptanthium*) from Kayah State

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Abstract In the course of taxonomic studies on Zingiberaceae in Myanmar, two new species from Kayah State, *Zingiber purpureoalbum* Nob.Tanaka & M.M.Aung and *Z. reflexum* Nob. Tanaka & M.M.Aung, assignable to *Zingiber* section *Cryptanthium*, were discovered and described. Detail descriptions and color plates are provided.

Key words : Burma, Karen Hills, *Zingiber purpureoalbum*, *Zingiber reflexum*.

Introduction

The genus *Zingiber* Mill. is the second largest genus in the Zingiberaceae with 100–150 species (Wu and Larsen, 2000; Kishor and Leong-Škorničková, 2013) and occurs from S and SE Asia to China and Japan and to northern Australia, with its center of diversity in monsoonal continental Asia (Larsen, 2005).

Zingiber is traditionally divided into four sections based on the position of the inflorescence: *Zingiber* sect. *Zingiber*, sect. *Dymczewiczia* Horan., *Zingiber* sect. *Pleuranthesis* Benth. & Hook. and *Zingiber* sect. *Cryptanthium* Horan. Recently molecular study indicated that sects. *Dymczewiczia* and *Pleuranthesis* were not well segregated from sect. *Zingiber* (Theerakulpisut *et al.*, 2012). Since further molecular studies by wider sampling are required to propose the revised sectional classification (Leong-Škorničková *et al.*, 2015), we still followed the traditional sectional classification in this study.

In Myanmar, so far 33 taxa and three sections

of *Zingiber* have been recorded (Kress *et al.*, 2003; Tanaka, 2012a, 2012b; Aung *et al.*, 2015, 2017; Tanaka and Aung, 2017, 2019; Tanaka *et al.*, 2018; Aung and Tanaka, 2019). In the course of our taxonomic studies of Myanmar gingers (Tanaka and Aung, 2019), two new species of the genus *Zingiber* were discovered in Kayah State, eastern Myanmar. As the result of the morphological investigations of these plants, both of the two species are assignable to sect. *Cryptanthium* characterized by radical inflorescences with procumbent peduncles.

The first species is easily distinguished from any other taxa in sect. *Cryptanthium* by a combination of bifid hairy ligules, plicate lamina, strongly incurved lanceolate bracts, white flowers with purple tinged labellum and purple anther crest (Figs. 1, 2). The other species is similar to *Z. orbiculatum* S.Q.Tong [see, Fig. 1 in Aung *et al.* (2015)], but is easily distinguished from it by a combination of bi-lobed villous ligules, lanceolate bracts and larger reflexed labellum (Figs. 3, 4). They are considered to be a hitherto-undescribed taxa, and we describe them as *Zingiber purpureoalbum* Nob.Tanaka & M.M.Aung and *Z.*

reflexum Nob.Tanaka & M.M.Aung in the following taxonomic treatment. The description was made based on the living plants in the field, alcohol preserved and herbarium specimens, and the terminology follows Beentje (2016).

Taxonomic treatment

Zingiber purpureoalbum Nob.Tanaka & M.M.Aung, **sp. nov.** (sect. *Chryptanthium*)

(Figs. 1, 2)

Type:—MYANMAR. Kayah State: along the roadside between Mawthido village and Rae Parar village, 21 km SW of Phruso, Phruso Township, Loikaw District, ca. 1450 m elev., 19°21'50.5"N, 97°01'40.4"E, 10 August 2018, Nobuyuki Tanaka, Mu Mu Aung, Aung Kaing Win 3503 (holotype TNS, isotype RAF).

Zingiber purpureoalbum is well distinguished from any other species in *Zingiber* section *Chryptanthium* by a combination of the following characters; its bifid hairy ligules, prominent plicate lamina, loosely imbricated and strongly incurved bracts, white flowers with purple tinged labellum and purple anther crest.

Perennial rhizomatous herb, 1.2–1.5 m tall. **Rhizome** branched, thickened, fleshy, with few thick adventitious roots, 2 cm in diameter, externally light pinkish, internally very pale dull yellow, slightly aromatic. **Leafy shoots** leaning at an angle or arching, with 11–14 well-developed laminae at anthesis; **pseudostem** 1.2–1.3 cm in diameter basally, 0.9–1.2 cm in diameter in the central part; **bladeless sheaths** 2–3 pinkish, longitudinally striate, membranous; **ligule** deeply bifid, 3–4 mm long; **lobes** triangular, green, membranous, translucent at margin, pubescent, obtuse at apices; **petiole** 2–3 mm long, consisting of pulvinus only, light green, sparsely pubescent; **lamina** lanceolate, 35–36 cm long, 6–7 cm wide, attenuate at base, acuminate at apex, adaxially bright green, glabrous, prominently plicate, abaxially pale green and pubescent. **Inflorescence** arising from the rhizome close to the base of the pseudostem; **peduncles** up to 8 cm long, procum-

bent, embedded in ground; **spikes** long-ovoid to fusiform, 5–6 cm long, 2.5–3 cm wide, composed of 12–15 bracts; **basal sterile bracts** 2–3, ovate, pale reddish white with conspicuous raised longitudinal veins; **fertile bracts** each subtending one flower, narrowly lanceolate, 3.5–4 cm long, 0.8–1 cm wide when flattened, margin strongly incurved and overlapping in a tubular appearance, reddish white, slightly pubescent externally, glabrous internally, apex acute to attenuate; **bracteoles** 2.3–2.5 cm long, 0.9–1 cm wide; **flower** 7–8 cm long; **calyx** tubular, irregularly dentate at apex, translucent white, very slightly reddish tinged externally, 1.1 cm long, 7 mm in diameter at base, slightly wider toward apex; **floral tube** 5 cm long, narrowly funnel-shaped, slightly curved in upper part, 2 mm in diameter at base, 6 mm diameter at apex, sparsely pubescent; **dorsal corolla lobe** oblong, with conspicuous raised longitudinal veins, 2.5–3 cm long, 7–8 mm wide, translucent white, very slightly reddish tinged (spotted), apex attenuate; **lateral corolla lobes** narrowly lanceolate, with conspicuous raised longitudinal veins, 2.2–2.5 cm long, 4–6 mm wide, translucent white, very slightly reddish tinged (spotted); **labellum** obovate to slightly rhombic, 2.2–2.3 cm long, 0.7–0.8 cm wide, white, faded purplish red tinged in center; glabrous externally and internally, entire at margin, irregularly bifid at apex; **lateral staminodes** well-developed, connate to labellum at base ca. 1/5, narrowly obovate, 1.5–1.6 cm long, 6–7 mm wide, white, glabrous externally and internally, with undulate apices. **Stamen** 2.5–2.6 cm long; **filament** almost reduced, ca. 1.5 mm long; **anther** 2.5 cm long (with crest), apex entire; **anther connective tissue** cream-yellow, glabrous; **anther crest** beak-shaped, ca. 1.5 cm long when stretched, purple toward apex, whitish at basal 1/3. **Ovary** cylindrical, 2.3–2.5 mm long, 2–2.2 mm wide, pubescent; **epigynous glands** two, narrowly conical, acute at apex. **Style** white, glabrous, stigma thicker than style, white, ostiole front facing, margin ciliate. **Fruit** not seen.

Etymology:—The specific epithet refers to purple tinged white labellum and anther crest of



Fig. 1. *Zingiber purpureoalbum* Nob.Tanaka & M.M.Aung. A. Habit. B. Flowers on radical inflorescence. C. Ligule. D. Rhizome. Cross section of rhizome (inset). E. Showing a procumbent inflorescence arising from the base of leafy shoot. Scales: A in 10 cm, B in 3 cm, C in 3 mm, D in 2 cm, E in 5 cm.

this species.

Distribution:—Thus far known only from the type collection in Kayah State, Myanmar. The type locality is located in the mountain range, so

called “Karen Hills”, southeastern part of the country. This mountain range is widely extended to Kayin State, and further field works may find more populations. It is presently considered to be



Fig. 2. *Zingiber purpureoalbum* Nob.Tanaka & M.M.Aung. A. Inflorescence. B. Bract. C. Calyx. D. Bracteole. E. Dorsal corolla lobe. F. Lateral corolla lobes. G. Stigma. H. Labellum with lateral staminodes. I. Ovary and epigynous glands. J. Anther. K. Anther with crest and style. Scales: A in 3 cm, B, D, E, F, H, K in 1 cm, C, J in 5 mm, G, I in 1 mm.

stenoendemic to Myanmar.

Habitat, ecology and phenology:—Growing at the forest edge of ever green moist forest at ca. 1,400m elevation near a stream. Along the

stream, a Himalayan member of ginger, *Zingiber chrysanthum* Roscoe has also been discovered and reported (Aung and Tanaka, 2019). Flowering in rainy season from July to August. Fruit not

seen, and fruiting period unknown. The flowers open in the morning.

Zingiber reflexum Nob.Tanaka & M.M.Aung,
sp. nov. (sect. *Chryptanthium*)

(Figs. 3, 4)

Type:—MYANMAR. Kayah State: Htiri

watershed reserved forest, Tun Nyu, ca. 10 km N of Loikaw city, Loikaw Township, Loikaw District, 924 m elev., 19°46'11.64"N, 97°12'21.6"E, 9 August 2018, *Nobuyuki Tanaka, Mu Mu Aung, Aung Kaing Win 3485* (holotype TNS, isotype RAF).

Zingiber reflexum is similar to *Z. orbiculatum* S.Q.Tong, but it is easily distinguished from it by

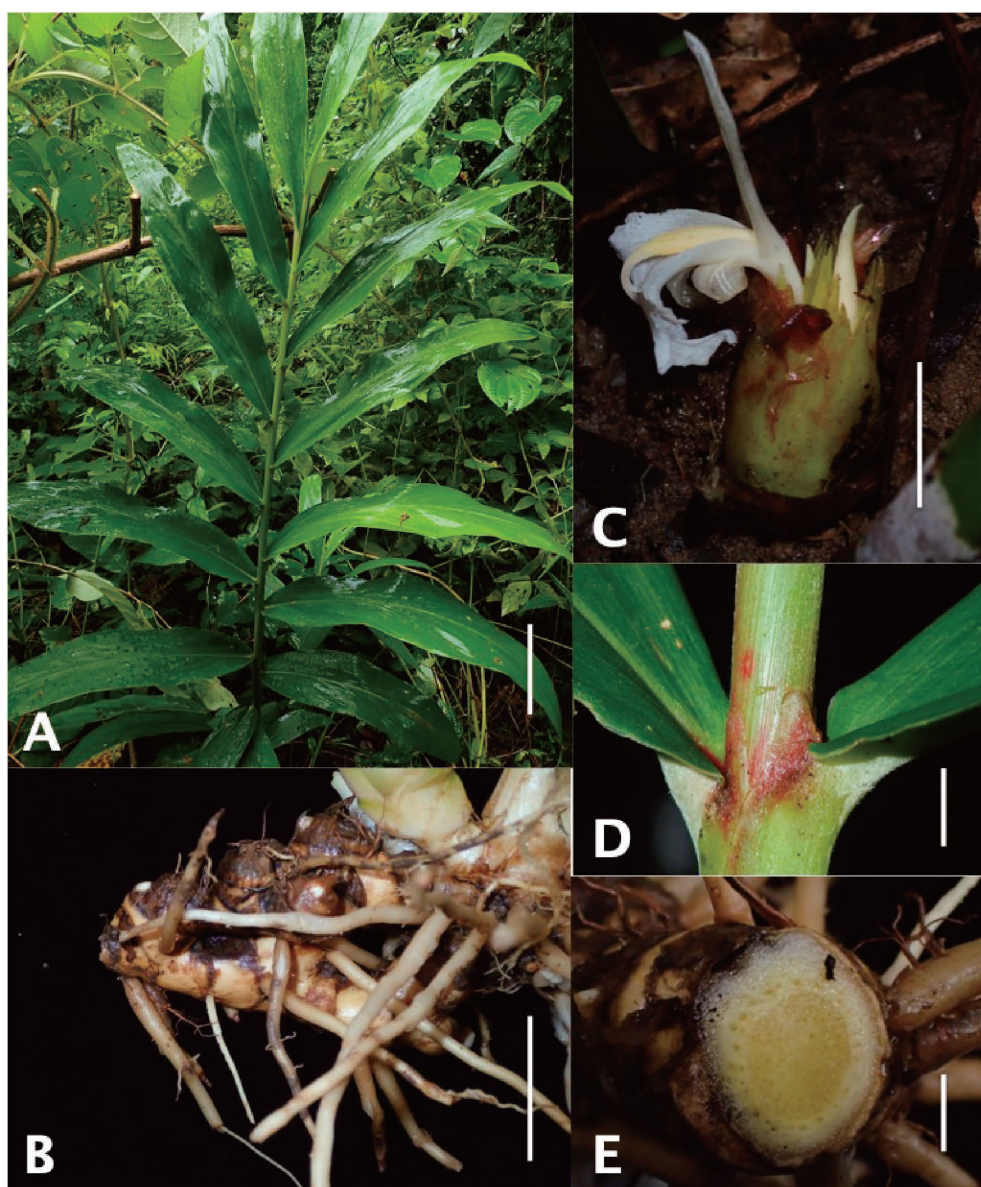


Fig. 3. *Zingiber reflexum* Nob.Tanaka & M.M.Aung. A. Habit. B. Rhizome. C. Inflorescence with a flower. D. Ligule. E. Cross section of rhizome. Scales: A in 5 cm, B, C in 3 cm, D, E in 5 mm.



Fig. 4. *Zingiber reflexum* Nob.Tanaka & M.M.Aung. A. Flower. B. Bract. C. Dorsal and lateral corolla lobes. D. Labellum with lateral staminodes. E. Front view of anther. F. Stigma. G. Ovary and epigynous glands. H. Cross section of ovary. Scales: A–D in 1 cm, E, G in 5 mm, F in 1 mm, H in 3 mm.

a combination of the following characters; bilobed villous ligules, two-colored bracts and larger reflexed labellum.

Perennial rhizomatous herb, 1.5–1.7 m tall. **Rhizome** branched, slender, fleshy, with many adventitious roots, 1.0–1.5 cm in diameter, externally brownish white, internally dull yellow, slightly aromatic. **Leafy shoots** almost erect, with 13–15 well-developed laminae at anthesis; **pseudostem** 0.8–1 cm in diameter basally, 5–6 mm in diameter in the central part, pubescent; **bladeless**

sheaths 2–3, green or reddish; **ligule** deeply bifid, 3–5 mm long; **lobes** triangular, green or red, membranous, translucent at margin, pubescent, obtuse at apices; **petiole** consisting of pulvinus only, light green, pubescent; **lamina** lanceolate, 25–40 cm long, 3.5–5 cm wide, attenuate at base, acuminate at apex, adaxially bright green, glabrous, smooth (not prominent plication), abaxially dull green and pubescent. **Inflorescence** arising from the rhizome close to the base of the pseudostem; **peduncles** up to 2 cm long, procum-

bent, embedded in ground; *spikes* ovoid to long-ovoid, 5.5–6 cm long, 2.5–3 cm wide, composed of 15–20 bracts; *basal sterile bracts* 4–7, ovate, pale green or red with longitudinal veins; *fertile bracts* each subtending one flower, lanceolate, 3.5–4.2 cm long, 1–1.1 cm wide when flattened, light green or reddish, basally pubescent externally, glabrous internally, apex acute; *bracteoles* 3–3.5 cm long, 1 cm wide; *flower* 6.5–7.3 cm long; *calyx* tubular, irregularly dentate or mucronate at apex, translucent white, 2 cm long, 1.7 cm in diameter at base, slightly wider basally; *floral tube* 3–3.5 cm long, narrowly funnel-shaped, curved, 2.5 mm in diameter at base, 5 mm diameter at apex; *dorsal corolla lobe* oblong, with conspicuous raised longitudinal veins, 3–3.5 cm long, 1–1.2 cm wide, translucent white, apex acute; *lateral corolla lobes* narrowly lanceolate to linear, with conspicuous raised longitudinal veins, 3–3.2 cm long, 5–6 mm wide, translucent white; *labellum* orbicular, 3.5–4 cm long, 2–2.5 cm wide, pure white throughout, glabrous externally and internally, slightly undulate at margin; *lateral staminodes* connated to labellum by basal ca. 1/2, narrowly obovate, 2.5–3 cm long, 5–6 mm wide, pure white, glabrous externally and internally, with undulate apices. **Stamen** 3–3.7 cm long; *filament* 5 mm long, 3 mm wide, white; *anther* 2–2.5 cm long (with crest), apex slightly bifid; *anther connective tissue* cream-yellow; *anther crest* beak-shaped, strongly curved, 1–1.2 cm long when stretched, white, semi-translucent white at the apex, slightly cream-yellow at base. **Ovary** cylindrical, flattened, 5–6 mm long, 4–5 mm wide, densely villous; *epigynous glands* two, 5 mm long, narrowly conical. **Style** white, strongly curved, hook-shape at the apex, glabrous; *stigma* almost the same width of style, slightly yellow tinged white, ostiole ciliate at margin. **Fruit** not seen.

Etymology:—The specific epithet refers to strongly reflexed lateral corolla lobes and labellum of this species.

Distribution:—Thus far known only from the type collection in Kayah State, Myanmar.

Habitat, ecology and phenology:—This spe-

cies is growing together with *Curcuma roscoeana* Wall. and *Boesenbergia maxwellii* Mood, L.M.Prince & Triboun in the conserved forest, the watershed area for Htiri village, however the forest is quite limited size, and only a few populations were found.

Other specimen examined: MYANMAR. Kayah State: Htiri watershed reserved forest, Tun Nyu, ca. 10 km N of Loikaw city, Loikaw Township, Loikaw District, 924 m elev., 19°46'11.64"N, 97°12'21.6"E, 9 August 2018, Nobuyuki Tanaka, Mu Mu Aung, Aung Kaing Win 3486 (TNS, RAF).

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