



## *Zingiber arunachalensis* (Zingiberaceae): a new species from northeastern India

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In 2015, during a floristic expedition in northeastern India, a population of an unusual *Zingiber* Miller (1754: 525) was found near Durga Mandir, between Bomdilla and Balukpong, in West Kameng District, Arunachal Pradesh. At a first glance the species clearly belongs to section *Cryptanthium* Horaninow (1862: 27) in having a procumbent peduncle. Detailed studies revealed that it does not match any of the known species of Indian *Zingiber*, hence it is described here as new. Plants of this population are morphologically similar to *Z. bipinianum* Roy *et al.* (2015: 298) and *Z. mizoramensis* Kumar *et al.* (2015: 81), but detailed studies of the types and protologues confirm the novelty of this species. We also consulted relevant literature discussing Indian Zingiberaceae, which further confirms that this is a new species (e.g. Bai *et al.* 2015, Baker 1892, Leong-Škorničková *et al.* 2015, Kishor & Leong-Škorničková 2013, Kumar *et al.* 2013, 2015, Mood & Theilade 2002, Roscoe 1828, Sabu 2003, 2006, Sabu *et al.* 2009, 2013b, Talukdar *et al.* 2015, Thongam & Konsam 2014, Thongam *et al.* 2013, Triboun *et al.* 2014, Tripathi & Singh 2006, Wu & Larsen 2000).

*Zingiber arunachalensis* A.Joe, T.Jayakrishnan, Hareesh & M.Sabu, **sp. nov.** (Figure 1)

*Zingiber arunachalensis* is similar to *Z. bipinianum* but differs in having non-stoloniferous rhizomes, purple lateral staminodes with creamy spots and deep purple anther crests. It also resembles *Z. mizoramensis* but is distinct from it in having purplish-red, narrowly ovate spikes with 6.5–8.0 cm long peduncles, narrowly ovate bracts with acuminate apices, creamy yellow corolla lobes and free, ovate lateral staminodes with acute apices. A comparison is given in Table 1.

**Type**—INDIA. **Arunachal Pradesh**: West Kameng District, Durga Mandir, on the way to Bomdilla from Balukpong, 774 m, 30 June 2015, A. Joe & V. S. Hareesh 121844 (holotype CALI!, isotype CAL!).

Perennial, non-stoloniferous, clump forming, rhizomatous herbs. Rhizomes fleshy, little branched. Roots thick, externally light to dark brown, internally cream with an inner white circle; root tubers fusiform. Leafy shoots 70–145 cm, with 3–7 leaves when flowering; pseudostems green, glabrous towards the base and sparsely hairy towards the petiole; basal sheaths pale purple, glabrous. Ligules 5–6 mm, bilobed, apex truncate, light green, pubescent. Leaves subsessile, pulvinate, the blades ovate-lanceolate, 26.0–32.5 × 13.4–14.0 cm, adaxially green, glabrous, abaxially light green, slightly tomentose, base cuneate, apex acuminate, mid-rib abaxially pubescent, light green. Inflorescences 1–5 per plant, radical, 11–17 cm long; peduncle 4.5–8.0 cm, green, glabrous, spicate, the spikes narrowly ovate. Sterile bracts ovate, 4.5–6.0 × 3.5–4.5 cm, purplish red, apex acuminate, glabrous internally and pubescent externally. Fertile bracts narrowly ovate, 4–15 in number, each enclosing a single flower, 4.5–7.0 × 1.5–2.0 cm, purplish or purplish with green base or light green with purplish tinge, apex acuminate. Bracteoles linear-lanceolate, 4.0–4.5 × 0.8–1.0 cm, cream with a purple tinge at the apex, sparsely pubescent externally, glabrous internally, apex acute. Flowers 7.8–9.4 cm long. Calyx tubular 2.0–2.5 × 0.8–1.0 cm, unilaterally split, creamy white, externally pubescent, internally glabrous, apex trifid. Corolla tube cream, apex creamy yellow, 4.5–5.3 × c. 0.3 cm, glabrous; dorsal corolla lobe ovate-lanceolate, 3.5–3.8 × 0.9–1.3 cm, creamy with translucent veins, concave, glabrous acuminate at apex; lateral corolla lobes lanceolate, 2.0–2.7 × 0.3–0.4 cm, cream with slight yellow or orange tinge and with translucent veins, glabrous on both sides, acute or acuminate at apex, incurved soon after opening of flower; labellum ovate, 2.0–2.5 × 1.2–1.4 cm, deep violet-purple or purple with creamy yellow base and some cream dots towards the centre and lines at periphery, margin recurved. lateral staminodes ovate or narrowly ovate, 7–14 × 3–4 mm, free from labellum, apex purple with some cream dots, base cream or cream with yellow tinge, apex acute, curved inwards and attached to



**FIGURE 1.** *Zingiber arunachalensis*. **A.** habit. **B.** rhizome. **C.** portion showing leaf bases and ligules. **D.** basal part of plant showing inflorescences. **E–F.** flower showing the variations in labellum color pattern. **G.** single flower. **H–I.** bract showing variations in color pattern. **J.** portion of flower showing curved floral parts at later stage of flowering. **K.** calyx. **L.** corolla lobes. **M.** labellum with lateral staminodes. **N.** ovary with epigynous glands and basal portion of style. **O.** stamen with style and stigma. Photos by Alfred Joe and T. Jayakrishnan.

labellum at later stages. Stamen 2.4–2.8 cm long, filament reduced to c. 1 cm long, connective tissue glabrous, cream, anther thecae 1.0–1.2 × 0.3–0.4 cm, cream, anther crest (beak) 1.0–1.2 cm long, deep violet-purple, wrapped around stigma, glabrous. Style filiform, white, glabrous; stigma cup-like, white, ostiole ciliate. Ovary cylindrical, creamy white, 0.7–0.9 × 0.3 cm, trilobular with axile placentation, densely pubescent; epigynous glands same or much longer than the ovary, cream, 0.8–1.6 cm long, apex pointed. Fruits unknown.

**Phenology:**—Flowering from June to October.

**Etymology:**—The specific epithet refers to Arunachal Pradesh, the Indian state where this species occurs.

**Habitat and Ecology:**—*Zingiber arunachalensis* is known only from the vicinities of Durga Mandir, on the way to Bomdilla from Balukpong, West Kameng district of Arunachal Pradesh. The plants are growing in the under storey of evergreen forests at an elevation ranges from 700–800 m. in association with *Musa arunachalensis* A.Joe *et al.* (Sreejith *et al.*, 2013: 50), *M. markkuana* (Sabu *et al.* 2013a: 50) Hareesha *et al.* (2017: 283), etc.

**Conservation status:**—This species is found only in a restricted area of 1–2 km<sup>2</sup>. Further studies are needed to assess the threats and population trends to assess the conservation status. We therefore suggest this species to be listed as data deficient (DD).

**Additional specimens examined (paratype):**—INDIA. **Arunachal Pradesh:** West Kameng District, Chariduar-Tawang Road, on the way to Bomdilla from Balukpong, 600 m, 14 July 2016, *T. Jayakrishnan & Nikhil Krishna 150201* (CALI!).

**TABLE 1.** Comparison of *Zingiber arunachalensis* with *Z. bipinianum* and *Z. mizoramensis*.

	<i>Z. arunachalensis</i>	<i>Z. bipinianum</i>	<i>Z. mizoramensis</i>
Rhizome	non-stoloniferous, internally cream	stoloniferous	non-stoloniferous, creamy pale inside
Ligule	5–6 mm long, apex truncate, pubescent	5–9 mm long, apex acute, villous	7mm long, apex round, glabrous
Lamina	ovate-lanceolate, 26.0–32.5 × 13.4–14.0 cm	elliptic-lanceolate, 11.5–25.5 × 6.5–10.0 cm	oblong-lanceolate, 20–30 × 3–6 cm
Inflorescence	11–17 cm long	7–8 cm long	5.0–6.5 cm long
Spike	Lanceolate	ellipsoid	ovate or subglobose
Peduncle	6.5–8.0 cm long	5.0–6.0 cm long	1.0–1.5 cm long
Bracts	narrowly ovate, 4.5–7.0 × 1.5–2.0 cm, purplish, apex acute to acuminate	ovate-lanceolate, 4.0–5.2 × 1.0–2.0 cm, apex acuminate	oblong-obovate, 2.0–4.0 × 1.0–2.0 cm, reddish acute at apex
Bracteole	linear-lanceolate, 4.0–4.5 × 0.8–1.0 cm, apex acute	lanceolate, 2.3–2.5 × 0.4–0.5 cm, apex acute	oblong, 2.2–3.0 × 0.8–1.0 cm, apex truncate
Dorsal corolla lobe	ovate-lanceolate, 3.5–3.8 × 0.9–1.3 cm, creamy with translucent veins	lanceolate, 2.6–2.9 × 0.6–0.7 cm, creamy white	lanceolate, 3–4 × 0.80–1.25 cm, purplish pink with white base 5-nerved
Labellum	ovate, 2–2.5 × 1.2–1.4 cm deep violet-purple or purple with cream dots, creamy yellow at base	ovate-elliptic, 2.6 × 0.7 cm creamy-white, blotched with purple	broadly ovate, 1–2.2 × 1.5–1.8 cm purplish with creamy white spots and streaks
Lateral staminodes	free, ovate, 0.7–1.4 × 0.3–0.4 cm, purple with some cream dots	free, linear-lanceolate, c.0.55 mm, creamy-white throughout	adnate, ovate-lanceolate, 0–1.5 × 1.0 cm purplish with white base
Anther crest	deep violet-purple	creamy white	creamy white with purplish spots at apex.
Ovary	cylindrical, 7–9 × 3 mm, cream, densely pubescent	cylindrical, cream 6 × 2 mm, pubescent	oblong, c. 7 × 3.5 mm, creamy yellow with purplish spots and stripes, pubescent

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