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Original Article

Zingiber perenense, a new species in *Zingiber* section *Cryptanthium* (Zingiberaceae) from Nagaland, India

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ABSTRACT: *Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao, a new species belonging to *Zingiber* section *Cryptanthium* Horan. under family Zingiberaceae from Nagaland, Northeastern India is described and illustrated. Its affinities with the allied species are discussed.

KEY WORDS: new species, *Zingiber*, *Cryptanthium*, Zingiberaceae, Nagaland, India.

INTRODUCTION

In 2017, during field exploration in the month of September to Peren district of Nagaland, northeastern India under Approved Research Programme – "State flora of Nagaland" by the Botanical Survey of India, the authors encountered a population of an interesting *Zingiber* Miller (1754). The plant was found growing in moist shady places on the bank of a small stream in the hilly terrain forest of Tesen village under Peren subdivision. Some rhizomes of the said *Zingiber* plant were collected along with field notes and planted in the garden of Botanical Survey of India, Eastern Regional Centre, Shillong, Meghalaya (India). In July 2018 it started to bloom on radical inflorescences developed directly from the rhizomes, with the procumbent peduncle. The inflorescence development pattern shows that the plant belongs to *Zingiber* section *Cryptanthium* Horaninow (1862: 27). The flowers were dissected, and detailed morphological study was carried out based on the living specimens and in the fields described in field note book. Afterward, consultation of available literature on South and Southeast Asian *Zingiber* (Roxburgh, 1798; Roscoe, 1807; Baker, 1894; Rao and Verma, 1972; Theilade, 1998, 1999; Theilade and Mood, 1997, 1999; Wu and Larsen, 2000; Mood and Theilade, 2001; Sabu, 2003; Tripathi and Singh, 2006; Sabu *et al.*, 2009; Tanaka, 2012a,b; Kishor and Leong-Škorničková, 2013; Kumar *et al.*, 2013; Sabu *et al.*, 2013; Thongam *et al.*, 2013; Biseshwori and Bipin, 2014; Triboun *et al.*, 2014; Ardiyani, 2015; Aung *et al.*, 2015; Bai *et al.*, 2015a,b; Hu *et al.*, 2015; Kumar *et al.*, 2015; Leong-Škorničková *et al.*, 2015; Talukdar *et al.*, 2015; Ye *et al.* 2015; Bai *et al.*, 2016; Ly, 2016; Prabhukumar *et al.*, 2016; Singh and Singh, 2016; Triboun and Keeratikiet, 2016; Aung *et al.*, 2017; Joe *et al.*, 2017; Nurainas and Dayar, 2017; Aung and Tanaka, 2018; Bai *et al.*, 2018; Biseshwori and Bipin, 2018) revealed that the plant is closely related

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to *Z. kangleipakense* Kishor & Škorničk. (2013: 40) and *Z. roseum* (Roxburgh 1798: 15) Roscoe (1807: 348), but differs in many diagnostic characters (Table 1). Therefore, it is described and illustrated here as a new species.

Table 1. Comparison of morphological characters among *Z. perenense*, *Z. kangleipakense* and *Z. roseum*.

Character	*Z. perenense*	*Z. kangleipakense* (Kishor and Leong-Škorničková 2013)	*Z. roseum* (Roxburgh 1798; Liang 1988; Kishor and Leong-Škorničková 2013)
Rhizome	Creamy white internally, turn light bluish later	White to pale cream internally	White internally
Ligule	Bilobed, 1–3.5 cm long, pubescent	Entire or bilobed, 2–3.2 cm long, glabrous	-
Petiole	Up to 1.5 cm long, pubescent	0–5 mm long	-
Lamina	Ovate to oblanceolate, 14–45 × 6–12 cm, pubescent on both sides	Oblong-lanceolate, 35–42 × 7–8 cm, pubescent on both sides	Lanceolate, c. 30 × 8–10 cm, glabrous on both sides
Peduncle	1.5–3 cm long	0.5–1 cm long when arising from the rhizome, rarely protruding through the pseudostem up to 25 cm above ground	Up to 5 cm long
Bracts	Oblong-lanceolate to oblong-linear, 4–4.5 × 0.5–1.2 cm, pale green to creamy white, with purple tinges along margin, hairy	Oblong to oblong-lanecolate, 2.8–6.5 × 1.8–3.5 cm, green with purplish red tinges, hairy	Lanceolate, reddish
Bracteole	Longer than corolla tube, oblong-lanceolate, with 2-dentate apex	Shorter than corolla tube, lanceolate, with acute apex	Shorter than corolla tube, linear, with obtuse notched apex
Corolla tube	Shorter than the bracts, 2.7–3 cm long, pubescent	Shorter than the bracts, c. 5 cm long, glabrous	Longer than the bracts
Corolla lobes	Red	Yellow with reddish tinge terminally	Bright red
Labellum	Shorter than corolla lobes, white with purplish red streaks, obtuse	Longer than corolla lobes, light yellow, unspotted	Shorter than the corolla lobes, light yellow, slightly emarginated

Table 1. (Continued).

Character	*Z. perenense*	*Z. kangleipakense* (Kishor and Leong-Škorničková 2013)	*Z. roseum* (Roxburgh 1798; Liang 1988; Kishor and Leong-Škorničková 2013)
Lateral staminodes	Not well developed or reduced, ovate, yellowish white, with purplish red spots, 2-dentate at apex	Absent or reduced to a triangular vestige	Absent
Pollens	Ellipsoidal, 90–125 × 40–50 µm, striae non-confluent at apices	Ovoid, c. 277 × c. 158 µm	Ellipsoidal, 120–155 × 67–90 µm, striae confluent at apices
Anther	Stalked, with 3–4 mm long filament	Sessile	-
Anther crest	Orange	Light yellow	Orange
Style	4.5–5 cm long	c. 7.5 cm long	-

TAXONOMIC TREATMENTS OF THE NEW SPECIES

***Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao**, sp. nov. (Figs. 1, 2, 3)

Diagnosis: The new species differs from its allied congeners, *Z. kangleipakense* in pubescent, bilobed ligule, oblong-lanceolate bracteole longer than corolla tube with 2-dentate apex, pubescent corolla tube with red lobes, white with purplish red streaked labellum, stalked anther with 3–4 mm long filament and in comparatively shorter style, 4.5–5 cm long and from *Z. roseum* in ovate to oblanceolate leaf blade pubescent on both sides, comparatively shorter, 1.5–3 cm long peduncle, oblong-lanceolate to oblong-linear pale green to creamy white bracts, corolla tube shorter than bracts, white with purplish red streaked labellum, with reduced, ovate, 2-dentate lateral staminodes and in pollen grains with striae non-confluent at apices.

Typus: INDIA, Nagaland, Peren district, Tesen village, 16th July 2018 ex hort. in Garden of Botanical Survey of India (Eastern Regional Centre, Meghalaya, East Khasi Hills, Shillong, Woodland Campus), *N. Odyuo & D.K. Roy 138352* (holotype, ASSAM!).

Terrestrial, rhizomatous herb; rhizome almost runner, odorous, 2–3 cm high, creamy white in transverse section with two rings, turn light bluish later; roots many, fleshy, without tubers. Leafy shoot to 70 cm tall, with erect pseudostem 1–1.3 cm thick; leafless sheaths 2, 10–20 cm long, green with light purple tinges, pubescent; leaf sheath green, pubescent. Leaves 6–10, petiolate; petiole to 1.5 cm long, pulvinus, pubescent; ligule membranous, 1–3.5 cm long, bilobed, pubescent, lobes oblong-lanceolate, 0.5–1.5 cm long; lamina ovate to oblanceolate, 14–45 × 6–12 cm, adaxially dark green, smooth, pubescent, abaxially pale green, hairy throughout, cuneate at base, long acuminate at apex, margin entire. Inflorescences

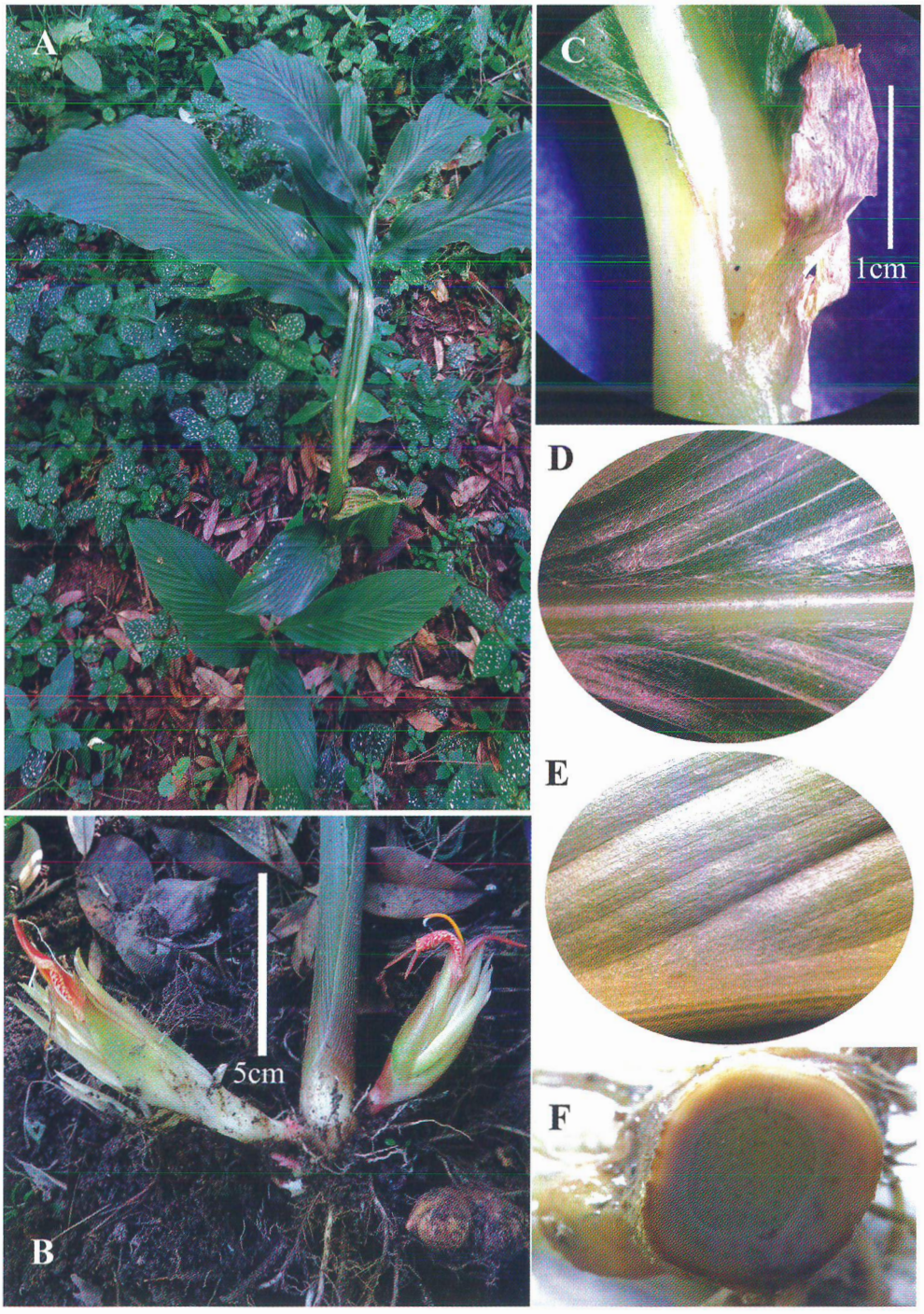


Figure 1. *Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao: A. Habit, B. Inflorescences, C. Petiole and ligule, D. Lamina surface above, E. Lamina surface beneath, F. Transverse section of Rhizome. Photographed by Dilip Kr. Roy.

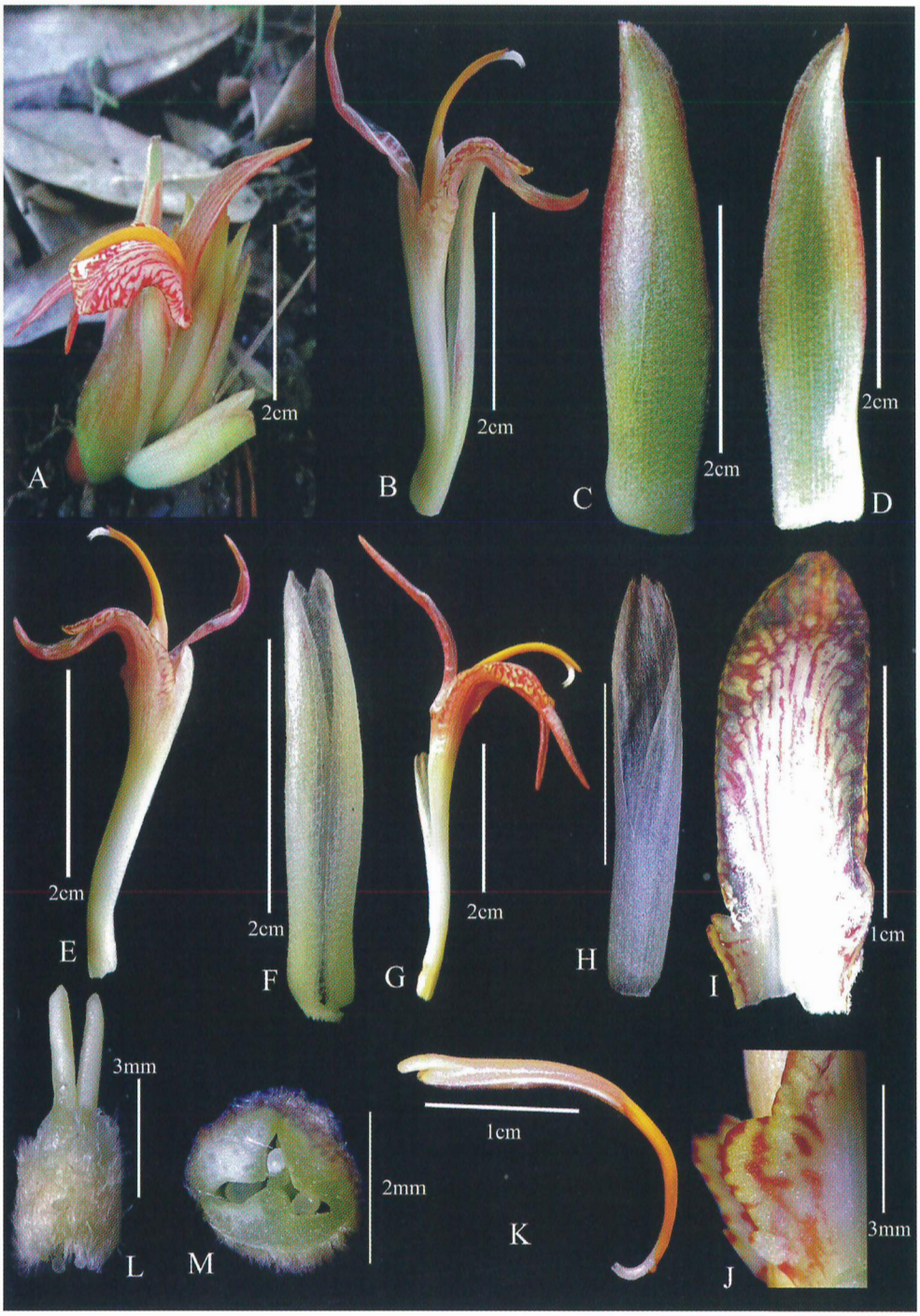


Figure 2. *Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao: A. Inflorescence, B. A flower with bract and bracteole, C. Bract (dorsal view), D. Bract (frontal view), E. A flower with bracteole, F. Bracteole (frontal view), G. A flower, H. Calyx, I. Labellum, J. Lateral staminodes, K. Stamen, with style and stigma, L. Ovary and epigynous glands, M. Transverse section of ovary. Photographed by Dilip Kr. Roy.

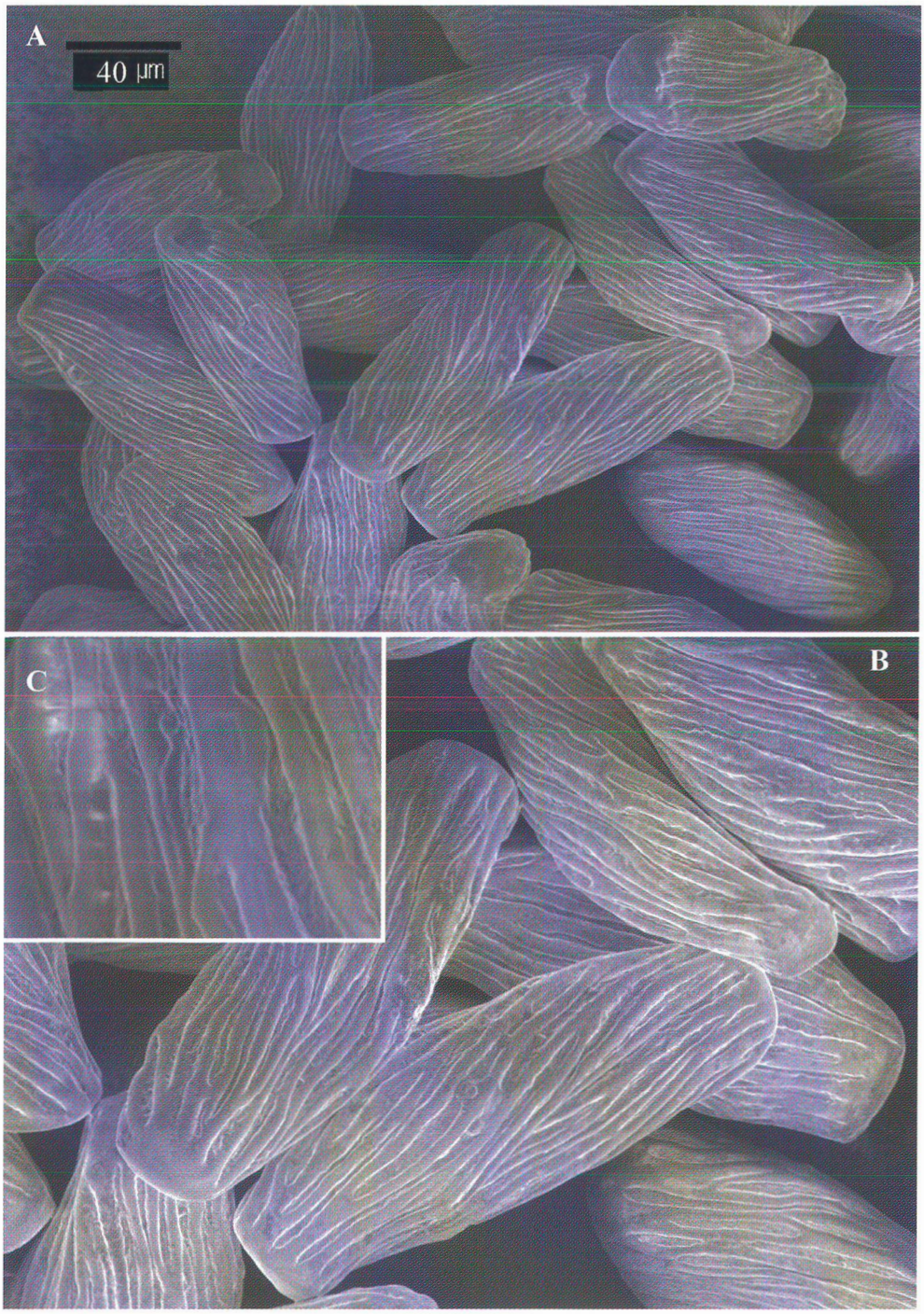


Figure 3. *Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao: A & B. Pollen grains, C. Surface of pollen grain (showing exine sculpturing) [N. Odyuo & D.K. Roy 138352]. SEM made by Dilip Kr. Roy.

producing directly from the rhizome, half immersed in the soil, 1–2 per pseudostem; peduncle 1.5–3 cm long, with 4–6 sterile bracts; sterile bracts, elliptic-ovate to ovate-lanceolate, 0.5–4.5 × 1–2 cm, creamy white to pale green with purple tinges, pubescent externally, glabrous internally, apex obtuse to acute. Spike erect, ellipsoid, 5–6 × 2–3 cm, with 15–25 fertile bracts; bracts oblong-lanceolate to oblong-linear, 4–4.5 × 0.5–1.2 cm, pale green to creamy white, with purple tinges along margin, pubescent, apex acute; bracteole longer than corolla tube, oblong-lanceolate, 3.5–4 × 0.6–1 cm, creamy white, pubescent, apex 2-dentate. Flower 1 per bract, 5.5–7 cm long; calyx tubular, 2–2.5 cm long, unilaterally split (up to 1.5 cm down from apex), pubescent, creamy white, 3-dentate at apex; corolla tube slender, white, 2.7–3 cm long, 0.3–0.4 cm in diam., pubescent; corolla lobes subequal, dorsally pubescent, red, apex acuminate; dorsal lobe oblong-lanceolate, 3–4 × 0.4–0.6 cm; lateral lobes linear-lanceolate, 2.5–3 × 0.3–0.5 cm, adhering basally to the abaxial surface of the labellum. Labellum shorter than corolla lobes, oblong-lanceolate, 1.8–2.3 × 0.7–1 cm, glabrous, white with purplish red streaks, apex obtuse; lateral staminodes not well developed or reduced, ovate, connate with labellum by 3/4, yellowish white, with purplish red spots, 2-dentate at apex. Stamen 2.5–3 cm long; filament distinct, 3–4 mm long, pale orange-yellow; anther thecae parallel, 1.2–1.5 × 0.3–0.4 cm, creamy white; anther crest elongate, beaked, 1–1.3 cm long, orange, wrapped around style, glabrous. Pollens ellipsoidal, 90–125 × 40–50 μm, with spiro-striate exine sculpturing and psilate caps; striae continuous along axis of grains, spirally twisted, branched, non-confluent at apices. Ovary oblong, 3–5 mm long, 3–4 mm in diam., creamy, densely hairy, trilocular with axile placentation; style filiform, 4.5-5 cm long, white, glabrous; stigma white, ostiole circular with stiff hairs on the perimeter; epigynous glands 2, linear, 4–5 mm long, apices acute, creamy-white. Fruit not seen.

Phenology. Flowering in July to August.

Distribution. INDIA: Nagaland (Peren district, Tesen village forest). So far only known from the type locality.

Etymology. The specific epithet refers to the place of occurrence of this species

Notes. Superficially *Zingiber perenense* N. Odyuo, D.K. Roy, C. Lyngwa & A.A. Mao is close to *Z. kangleipakense* Kishor & Škorničk. (2013: 40) and *Z. roseum* (Roxburgh 1798: 15) Roscoe (1807: 348). But it differs from *Z. kangleipakense* in pubescent, bilobed ligule (vs entire or bilobed, glabrous), oblong-lanceolate bracteole longer than corolla tube with 2-dentate apex (vs lanceolate, shorter than corolla tube, with acute apex), pubescent corolla tube with red lobes (vs glabrous, with yellow lobes), white with purplish red streaked labellum shorter than corolla lobes (vs light yellow, unspotted, longer than corolla lobes), stalked anther with 3–4 mm long filament (vs sessile) and in comparatively shorter style, 4.5–5 cm long (vs ca. 7.5 cm long). The new species differs from *Z. roseum* in ovate to oblanceolate leaf blade pubescent on both sides (vs lanceolate, glabrous on both sides), comparatively shorter, 1.5–3 cm long peduncle (vs up to 5 cm long), oblong-lanceolate to oblong-linear pale green to creamy white bracts (vs lanceolate, reddish), corolla tube shorter than bracts (vs longer than the bracts), white with purplish red streaked labellum, with reduced, ovate, 2-dentate lateral staminodes (vs light yellow, without

lateral staminodes) and in pollen grains with striae non-confluent at apices (vs striae confluent at apices). Comparison of morphological characters among *Z. perenense*, *Z. kangleipakense* and *Z. roseum* is presented in Table 1. Z. perenense is placed in *Zingiber* sect. *Cryptanthium* Horan. (1862) based on its inflorescence borne on procumbent peduncle, with the spike appearing at ground level (Baker, 1894; Schumann, 1904) and its ellipsoidal pollens, with spiro-striate exine sculpturing (Theilade *et al.*, 1993).

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REFERENCES

Ardiyani, M. 2015. A new species of *Zingiber* (Zingiberaceae) from Enggano Island, Indonesia. *Reinwardtia* 14(2): 307–310.

Aung, M.M. and N. Tanaka. 2018. A new species of *Zingiber* (Sect. *Dymczewiczia*: Zingiberaceae) from northwestern Myanmar. *Phytotaxa* 316(2): 195–199.

Aung, M.M., N. Tanaka and N. Miyake. 2015. Two Gingers, *Zingiber orbiculatum* and *Z. flavomaculosum* (Zingiberaceae), newly recorded from Myanmar. *Bulletin of the National Museum of Nature and Science*, Series B 41(3): 1–6.

Aung, M.M., N. Tanaka and N. Miyake. 2017. A New Species of *Zingiber* (Zingiberaceae) from Mt. Victoria, Western Myanmar. *Bulletin of the National Museum of Nature and Science*, Series B 42(2): 1–5.

Bai, L., J. Leong-Škorničková and N.H. Xia. 2015a. Taxonomic studies on *Zingiber* (Zingiberaceae) in China I: *Zingiber kerrii* and the synonymy of *Z. menghaiense* and *Z. stipitatum*. *Garden Bulletin Singapore* 67: 129–142. http://dx.doi.org/10.3850/S2382581215000149

Bai, L., J. Leong-Škorničková and N.H. Xia. 2015b. Taxonomic studies on *Zingiber* (Zingiberaceae) in China II: *Zingiber tenuifolium* (Zingiberaceae), a new species from Yunnan, China. *Phytotaxa* 227: 092–098.

Bai, L., J. Leong-Škorničková, D. Li and N. Xia. 2018. Taxonomic studies on *Zingiber* (Zingiberaceae) in China IV: *Z. pauciflorum* sp. nov. from Yunnan. *Nordic Journal of Botany* 36(3), https://doi.org/10.1111/njb.01534

Bai, L., J. Leong-Škorničková, N.H. Xia and Y.S. Ye. 2016. Taxonomic studies on *Zingiber* (Zingiberaceae) in China III: *Z. ventricosum*, a new species from Yunnan, and notes on three closely related species. *Phytotaxa* 261: 101–120.

Baker, J.G. 1894. Scitamineae. In: Hooker, J.D. (ed.) *Flora of British India*, vol. 6, pp. 198–264. London: L Reeve & Co.

Biseshwori T. and K. Bipin. 2014. A new species of *Zingiber* (Zingiberaceae) from Nagaland, India. *Phytotaxa* 178(3): 221–224.

Biseshwori T. and K. Bipin. 2018. A New Species of *Zingiber* (Zingiberaceae) from Northeast India. *Journal of Japanese Botany* 93(1): 31–36.

Hu, G.-X., J.-Q. Pan, Z.-E. Zhao and S. Huang. 2015. *Zingiber zhuxiense* (Zingiberaceae), a New Species from Hubei, Central China. *Annales Botanici Fennici* 52: 145–148.

Horaninow, P. 1862. *Prodromus Monographiae Scitaminearum*. Typis Academiae Caesareae Scientiarum, Petropoli, pp. 27–28.

Joe, A., T. Jayakrishnan, V.S. Hareesh and M. Sabu. 2017. *Zingiber arunachalensis* (Zingiberaceae): a new species from

northeastern India. *Phytotaxa* 309 (1): 95–98. http://dx.doi.org/10.11646/ phytotaxa.309.1.11

Kishor R. and J. Leong-Škorničková. 2013. *Zingiber kangleipakense* (Zingiberaceae): A new species from Manipur, India. *Garden Bulletin Singapore* 65(1): 39–46.

Kumar R., J. Mood, S.K. Singh and B.K. Sinha. 2013. A new species of *Zingiber* (Zingiberaceae) from Northeast India. Phytotaxa 77: 61–64.

Kumar, R., S.K. Singh, S. Sharma and T. Triboun. 2015. Two new *Zingiber* (Zingiberaceae) species from Northeast India. *Phytotaxa* 233: 80–84.

Leong-Škorničková, J., N.Q. Binh, T.H. Dang, O. Sida, R. Rybkova and T.V. Vuong. 2015. Nine new *Zingiber* species (Zingiberaceae) from Vietnam. Phytotaxa 219(3): 201–220. https://doi.org/10.11646/ phytotaxa.219.3.1

Liang, Y.-H. 1988. Pollen morphology of the family Zingiberaceae in China - pollen types and their significance in the taxonomy. *Acta Phytotaxa Sinica* 26: 265–286.

Ly, N.-S. 2016. *Zingiber skornickovae*, a new species of Zingiberaceae from Central Vietnam. *Phytotaxa* 265(2): 139–144.

Miller, P. 1754. *The Gardeners Dictionary*. ed. 4. vol. 3. Printed for the author, London.

Mood, J. and I. Theilade. 2001. Two new species of *Zingiber* (Zingiberaceae) from the Philippines. *Nordic Journal of Botany* 21: 129–133.

Nurainas, N. and A. Dayar. 2017. A new species and a new record of Zingiberaceae from Sumatra, Indonesia. *Taiwania* 62(3): 294–298.

Prabhukumar, K.M., A. Joe and I. Balachandran. 2016. *Zingiber sabuanum* (Zingiberaceae): a new species from Kerala, India. Phytotaxa 247: 92–96. https://doi.org/10.11646/ phytotaxa. 247.1.7

Rao, A.S. and D.M. Verma. 1972. Materials towards a monocot flora of Assam-II (Zingiberaceae & Marantaceae). Bulletin of *Botanical Survey of India* 14(1–4): 114–143.

Roscoe, W. 1807. XIX. A new arrangement of the plants of the *Monandrian* Class usually called Scitamineae. *Transactions of the Linnean Society of London* 8: 347–349. http://dx.doi.org/10.1111/j. 1096-3642.1807.tb00321.x

Roxburgh, W. 1798. *Plants of the Coast of Coromandel*. Vol. 2. London: W. Bulmer & Co.

Sabu, M. 2003. Revision of the genus *Zingiber* in South India. *Folia Malaysiana* 4: 25–52.

Sabu, M., V.P. Thomas and M.C. Shameer. 2009. *Zingiber parishii* (Zingiberaceae): a new record for India from Andaman and Nicobar Islands. Acta *Botanica Hungarica* 5: 363-366. http://doi.org/ 10.1556/ABot.51.2009.3–4.12

Sabu M., P.E. Sreejith, A. Joe and A.K. Pradeep. 2013. *Zingiber neotruncatum* (Zingiberaceae): a new distributional record for India. *Rheedea* 23(1): 46–49.

Schumann, K. 1904. Zingiberaceae. In: Engler, H.G.A. (ed.) Das *Pflanzenreich*, IV (46), fas. 20, pp. 1–458. Leipzig: W. Engelmann.

Singh, L.J., and P. Singh 2016. *Zingiber pseudosquarrosum* sp. nov. (Zingiberaceae) from Andaman and Nicobar Islands, India. *Nordic Journal of Botany*, 34(4): 421–427. doi:10.1111/njb.01045.

Talukdar A.D., D. Verma, D.K. Roy and M. D. Choudhury. 2015. A new species of *Zingiber* (Zingiberaceae-Zingibereae) from Northeast India. *Journal of Japanese Botany* 90: 298–303.

Tanaka, N. 2012a. Studies of Zingiberaceae in Myanmar I: Newly Recorded Species of *Zingiber*, *Zingiber idae*. *Makinoa* New Series 10: 153–157.

Tanaka, N. 2012b. Studies of Zingiberaceae in Myanmar II: A New Species, *Zingiber popaense* from Mt. Popa. *Makinoa* New

Series 10: 159–163.

Theilade, I. 1998. Revision of the genus *Zingiber* in Peninsular Malaysia. *Garden Bulletin Singapore* 48: 207–236.

Theilade, I. 1999. A synopsis of the genus *Zingiber* (Zingiberaceae) in Thailand. *Nordic Journal of Botany* 19: 389–410.

Theilade, I. and J. Mood. 1997. Five new species of *Zingiber* (Zingiberaceae) from Borneo. *Nordic Journal of Botany* 17: 337–347.

Theilade, I. and J. Mood. 1999. Six new species of *Zingiber* (Zingiberaceae) from Borneo. *Nordic Journal of Botany* 19: 513–524.

Theilade, I., M.L. Mærsk-Møller, J. Theilade and K. Larsen. 1993. Pollen morphology and structure of *Zingiber* (Zingiberaceae). *Grana* 32(6): 338–342. DOI: 10.1080/00173139309428961.

Thongam, B., N. Sarangthem and B. Konsam. 2013. *Zingiber kerrii* (Zingiberaceae): A New Record for India from Manipur. *Taiwania* 58(4): 291–294.

Triboun, P. and K. Keeratikiet. 2016. *Zingiber sirindhorniae*, a remarkable new species in *Zingiber section Dymczewiczia* (Zingiberaceae) from Thailand. The *Thailand Natural History Museum Journal* 10(1): 1–6

Triboun, P., K. Larsen and P. Chantaranothai. 2014. A key to the genus *Zingiber* (Zingiberaceae) in Thailand with descriptions of 10 new taxa. *Thai Journal of Botany* 6: 53–77.

Tripathi S. and K.K. Singh. 2006. Taxonomic revision of the genus *Zingiber* in North-East India. *Journal of Economic and Taxonomic Botany* 30(3): 520–532.

Wu, T.L. and K. Larsen. 2000. *Zingiberaceae*. In: Wu, Z.Y., P.H. Raven eds. *Flora of China* 24: 333–346. Beijing: Science Press.

Ye, Y.S., L. Bai and N.H. Xia. 2015. *Zingiber hainanense* (Zingiberaceae), a new species from Hainan, China. *Phytotaxa* 217(1): 073–079. http://dx.doi.org/10.11646/phytotaxa.217.1.6

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