

Short Communication: *Curcuma wanenlueanga* (Zingiberaceae), a new species of subgenus *Curcuma* from Thailand

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Abstract. Saensouk S, Boonma T, Thomudtha A, Thomudtha P, Saensouk P. 2021. Short Communication: *Curcuma wanenlueanga* (Zingiberaceae), a new species of subgenus *Curcuma* from Thailand. *Biodiversitas* 22: 2988-2994. *Curcuma wanenlueanga* Saensouk, Thomudtha & Boonma, a new species of *Curcuma* subgenus *Curcuma* (Zingiberaceae) from Thailand was described with detailed illustrations, and photographs. The dominant morphological description is terminal inflorescence, leaf adaxially green with reddish-purple along the midrib, leaf-sheath with reddish-brown tinge. Moreover, the color and smell rhizome of *C. wanenlueanga* has yellow with a darker core internally. It is distributed in Mae Hong Son Province, Northern Thailand, and cultivated throughout the country, i.e. Nakhon Nayok, Maha Sarakham, Chiang Mai, Tak, Chantaburi, Suratthani, and Kanchanaburi Provinces. It is used as Thai traditional medicinal. It grows in sandy loam soil and well-drained in the mixed-deciduous forest, at elevation 700-900 m asl. It is accompanied by a revised key to 26 species of *Curcuma* subgenus *Curcuma* from Thailand.

Keywords: *Curcuma*, new species, Thailand, Zingiberaceae.

INTRODUCTION

The genus *Curcuma* L. is an important natural resource that provides many useful products from ancient times. As prescribed by Ayurveda, turmeric (*Curcuma longa*) has been used to treat sprains and swelling (Araujo and Leon 2001). *Curcuma* is one of the largest genera in the family Zingiberaceae, distributed from India to South China, Southeast Asia, Papua New Guinea, and Northern Australia (Larsen and Larsen 2006; Sirirugsa et al. 2007). The study of Závěská et al. (2012) supports the recognition of two subgenera within genus *Curcuma* namely subgenus *Curcuma* and *Hitcheniopsis*. They also suggest the recognition of a new subgenus *Ecomata* (Leong-Škorničková et al. 2015), proposed a new classification of subgenus, and also included some genera and species under the *Curcuma*, due to that the number of species of genus *Curcuma* in Thailand significantly increased.

Thailand is one of the diversity centers for *Curcuma* with all three subgenera and 66 species have been reported which 23 species belong to subgenus *Hitcheniopsis*, 18 species of subgenus *Ecomata*, and 25 species of subgenus *Curcuma* (Larsen and Larsen 2006; Sirirugsa et al. 2007; Saensouk et al. 2021). An undescribed species of *Curcuma* well known in the Thai vernacular name of “Wan-En-Lueang” was found during the revision of the family

Zingiberaceae for the Flora of Thailand project. After comparing it with its allied ones, we found that this species did not match with any existing taxa, hence it is described and illustrated here as new species. A revised key to 26 species of *Curcuma* subgenus *Curcuma* in Thailand is provided for facilitating their identification.

MATERIALS AND METHODS

Plant materials were collected on 28 August 2017 from Mae Hong Son Province, Sob Moei District, 810 m above sea level, *Boonma 60* (Figure 1) and the living specimens have been planted at Brio Garden in Nakhon Nayok Province and spirit specimens preserved in alcohol from Maha Sarakham Province, Mueang Maha Sarakham District, *Thomudtha 1*, 05.04.2021 (KKU) and additional specimens were also compared. The descriptions of morphologically similar species, *Curcuma longa* (Sabu 2006) and *C. amada* (Roxburgh 1810; Sabu 2006), and type specimens housed in various herbaria (BK, BKF, KKK, QBG) in Thailand, digital images available online, including all existing published literature of *Curcuma* especially in subgenus *Curcuma* were compared.

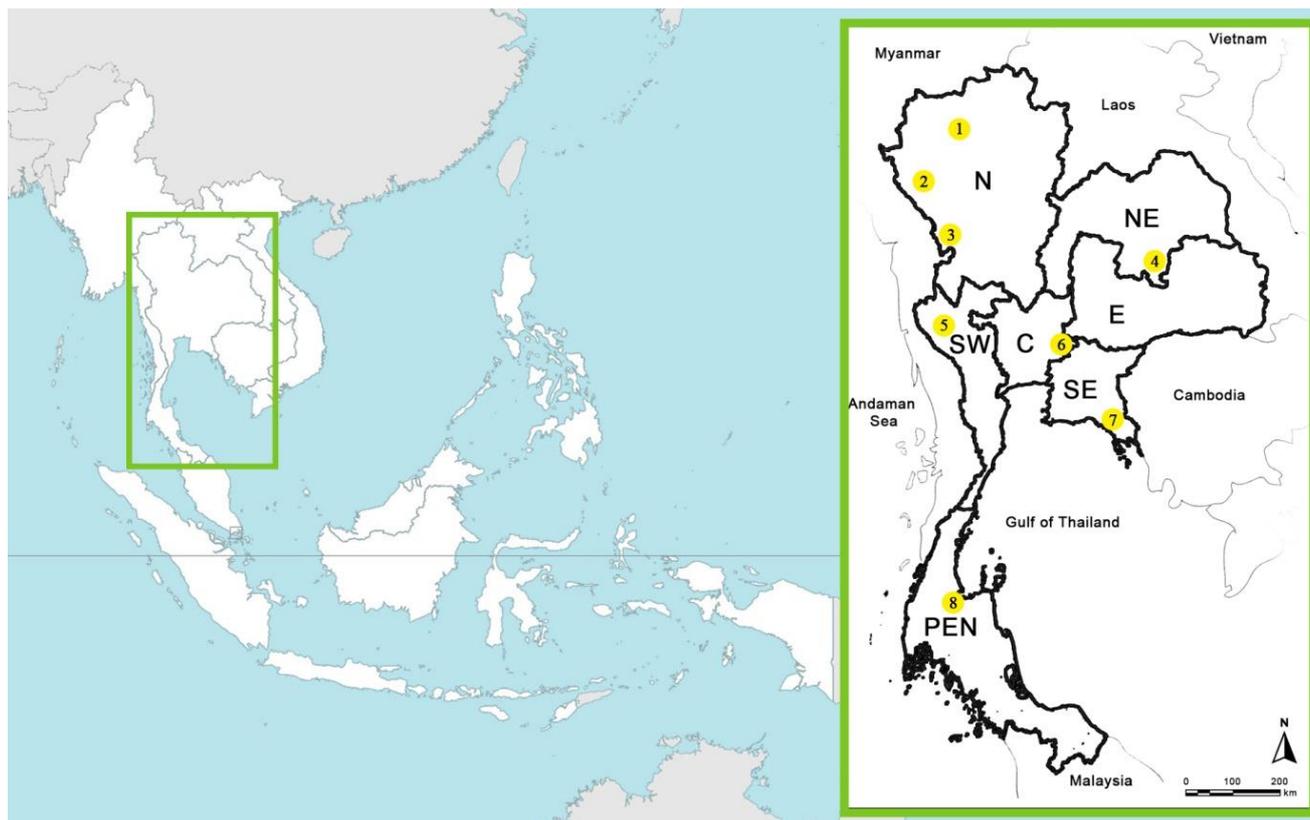


Figure 1. Distribution map of *Curcuma wanenlueanga* Saensouk, Thomudtha & Boonma sp. nov. Abbreviations in the map are the floristic region after the "Flora of Thailand" project which N = Northern, NE = Northeastern, SW = Southwestern, C = Central, E = East, SE = Southeastern, and PEN = Peninsular. [Chiang Mai (1), Mae Hong Son (2), Tak (3), Maha Sarakham (4), Kanchanaburi (5), Nakhon Nayok (6), Chantaburi (7), and Surat Thani (8)] (source: <https://aseanup.com/wp-content/uploads/2015/04/ASEAN-map-white-blank.jpg>).

RESULTS AND DISCUSSION

During the study of species diversity of the Zingiberaceae for the Flora of Thailand, on 12 October 2019, an undescribed species to science which collected from Mae Hong Son Province and other specimens of this species in cultivation, but all of them did not match with any of the existing taxa. Detailed description, illustrations, photographs, distribution, ecology, and notes (Figures 2–3 and Table 1) have been provided. Additionally, a revised key to 26 species of *Curcuma* subgenus *Curcuma* from Thailand is provided for facilitating their identification.

Taxonomic treatment

Curcuma wanenlueanga Saensouk, Thomudtha & Boonma, sp. nov. –Figures 2–3, Table 1–subgenus *Curcuma*

Curcuma wanenlueanga is belonged to the subgenus *Curcuma* according to the presence of epigynous glands, inflorescence with coma bracts, flowers closed-form, anther spurs acute, and downward-pointed. The morphological description and producing terminal inflorescence of *C. wanenlueanga* make it similar to *C. longa* and *C. amada*, but differ in having leaf adaxially green with reddish-purple along the midrib, leaf-sheath

with reddish-brown tinge, whereas *C. longa* and *C. amada* are green without reddish tinge. Moreover, the color and smell of their rhizome can easily distinguishable from each other which *C. amada* has light yellow, white towards the periphery, and smell of green mango while *C. wanenlueanga* has yellow with a darker core internally and *C. longa* has deep orange-yellow internally, slightly to strongly aromatic respectively without the smell of green mango as in *C. amada* (Table 1).

Type: THAILAND. Mae Hong Son Province, Sop Moei District, 810 m, 28 August 2017, *Boonma 60* (Holotype: KKU!; isotypes: QBG! BKF! BK!)

Perennial herb to 150 cm tall. *Rhizome* ovoid, 5.3–8.9 × 3.8–4.6 cm, externally brown, internally yellow with darker core, 3–4 branch in the opposite side, 5–12 cm long, 1.2–2.5 cm in diam., each branches rhizome with sub-branching, taste bitter slightly aromatic. *Roots* fleshy. *Leafy shoot* with 7–10 leaves; *pseudostem* to 70 cm long, green with reddish-brown tinge, composed of sheathing bracts and leaf sheaths; *sheathing bracts* 2–3, apex slightly mucronate; *leaf-sheath* distichous, green with reddish-brown tinge, pubescent; *ligule* up to 1 cm long, bilobed, hyaline, green with a reddish tinge; *petiole* up to 35 cm long (petiole of innermost leaves longest, outermost leaf shortest), canaliculate, green with a reddish tinge at the

base, sparsely pubescent; *lamina* narrowly lanceolate, 50–70 × 15–18 cm, base attenuate, margin entire, apex acuminate, adaxially green with reddish-purple tinge along the midrib (reddish-purple patch may fade when the leaves grow old), abaxially lighter green. *Inflorescence* terminal appears between the leaf-sheaths; *peduncle* 30–38 cm long, with up to 1 cm in diam., pale green to white at the base, pubescent; *spike* 8–10 cm long, 4–6 cm in diam.; *sterile bract* 1, apex slightly mucronate, pale green to white at base; *coma bracts* 5–6, inconspicuous, 2.5–3.2 × 1.5–2 cm, distal part hooded, apex acute with slightly mucronate, pink at distal part and gradually fade to pale green at the base, fused only at base pubescent; *fertile bracts* 12–15 per inflorescence, bract ovate, 3–4.5 × 2–2.6 cm (larger at the base of the inflorescence), margin hyaline, apex acute with slightly mucronate, uppermost with slightly hooded, pubescent, pale green with a reddish tinge at distal part (except veins pale green), connate in the lower 1/2; *bracteoles* 2 per flower, narrowly obovate-oblong, 2–2.4 × 0.8–1 cm, apex hooded, mucronate, pubescent, pale greenish-white with pale pink at the apex. *Flowers* c. 5 cm long; *calyx* tubular, 13–15 mm long, 3-toothed, with unilateral incision up to 8 mm long, pubescent, pale yellowish-white; *floral tube* tubular, 3.2–3.5 cm long, yellow with pink at distal part; *dorsal corolla lobe* ovate, 14–16 × 9–11 mm, concave, hooded, sparsely hairy, apex mucronate, mucro c. 4 mm long with fine short hairs, pink; *lateral corolla lobes* ovate, 13–15 × 8–9 mm, concave, hooded, sparsely hairy, pink; *labellum* obovate, 15–17 mm long and 15–16 mm at widest part apex emarginate, incision to 5 mm, yellow with embossed two darker yellow median band; *lateral staminodes* irregularly obovate, 11–13 × 7–8 mm, apex rounded, with short fine hairy on the adaxial side, yellow. *Stamen* 8–9 mm long; *filament* c. 4 mm long, pale yellow, c. 5 mm broad at base; *anther* c. 8 mm long (measured in side-view including spurs), pale yellow, spurred; connective pale yellow; *anther spurs* c. 4 mm long, pale yellow, pointing downwards; *anther crest* not obvious. *Epigynous glands* 2, linear, 3–5 mm long, yellowish, apex acute. *Style* filiform, white, glabrous, placed in the groove in the dorsal side of floral tube; *stigma* slightly exerted above the anther lobes 1.2–1.3 × 1.2–1.3 mm, pale yellowish-white; *ostiole* ciliate. *Ovary* trilobular, c. 3 × 3 mm, pubescent. Fruit and seeds not seen.

Vernacular name: “Wan-En-Lueang” in Thai language.

Phenology: Flowering in July to October; flowers fully open about 5.00–6.00 a.m. and last a single day. Leafy shoot emerging in late April and dormancy begins in late November.

Distribution: Sop Moei District, Mae Hong Son Province, Northern Thailand, and cultivated throughout the country, e.g. Nakhon Nayok, Maha Sarakham, Chiang Mai, Tak, Chantaburi, Suratthani, and Kanchanaburi Provinces (Figure 1).

Habitat: It grows in sandy loam soil and well-drained in the mixed-deciduous forest, at elevation 700–900 m asl.

Etymology: The specific epithet ‘*wanenlueanga*’ derived from Thai vernacular name of this species which “wan” means “herbs”, “en” means “tendons” referred to its medicinal properties used in traditional medicine to treat beriberi related to tendons and “lueang” means “yellow” referred to its yellow rhizome.

Uses: Thai traditional medicinal use its mature rhizomes which harvest after dormancy (fresh or made it dry powder) combined with other herbs for the treatment of beriberi related to tendons, treatment of paralysis, etc. (Oranuch 2007).

Specimen Examined: THAILAND, Mae Hong Son Province, Sop Moei District, 700 m, *Boonma* 61 (dry specimen), 19.10.2020 (KKU). Additionally cultivated living specimens and spirit specimens preserved in alcohol: Nakhon Nayok Province, Ban Na District, 10 m. above sea level, *Boonma* 6, 12.10.2019 (BBRG), Mae Hong Son Province, Mae Sariang District, 900 m, *Boonma* 62, 20.10.2020 (BBRG), Chiang Mai Province, Chiang Dao District, 850 m, *Boonma* 63, 27.08.2019 (BBRG), Chantaburi Province, Khlung District, 52 m, *Boonma* 64, 25.09.2019 (BBRG), Surat Thani Province, Don Sak District, 30 m, *Boonma* 65, 18.09.2020 (BBRG), and Kanchanaburi Province, Mueang Kanchanaburi District, *Boonma* 66, 12.08.2020 (BBRG) and cultivated spirit specimens preserved in alcohol from Maha Sarakham Province, Mueang Maha Sarakham District, *Thomudtha* 1, 05.04.2021 (KKU); Nakhon Nayok Province, Ban Na District, 10 m., *Boonma* 21, 12.10.2019 (KKU).

Notes: *C. wanenlueanga* is cultivated and used as a traditional medicine for more than four decades as recorded in a short morphological description and uses in Thai Herb books (Saman and Tassana 1973). In our preliminary survey, only one natural habitat was found in Sop Moei District, Mae Hong Son Province, northern Thailand, and cultivated throughout the country popularly among the collectors of sacred plants and herbs. According to all information about this species is still insufficient information for a proper assessment of conservation status as Data deficient (DD). Further fieldwork and observations are needed to assess changes in population, distribution, and abundance in the future.

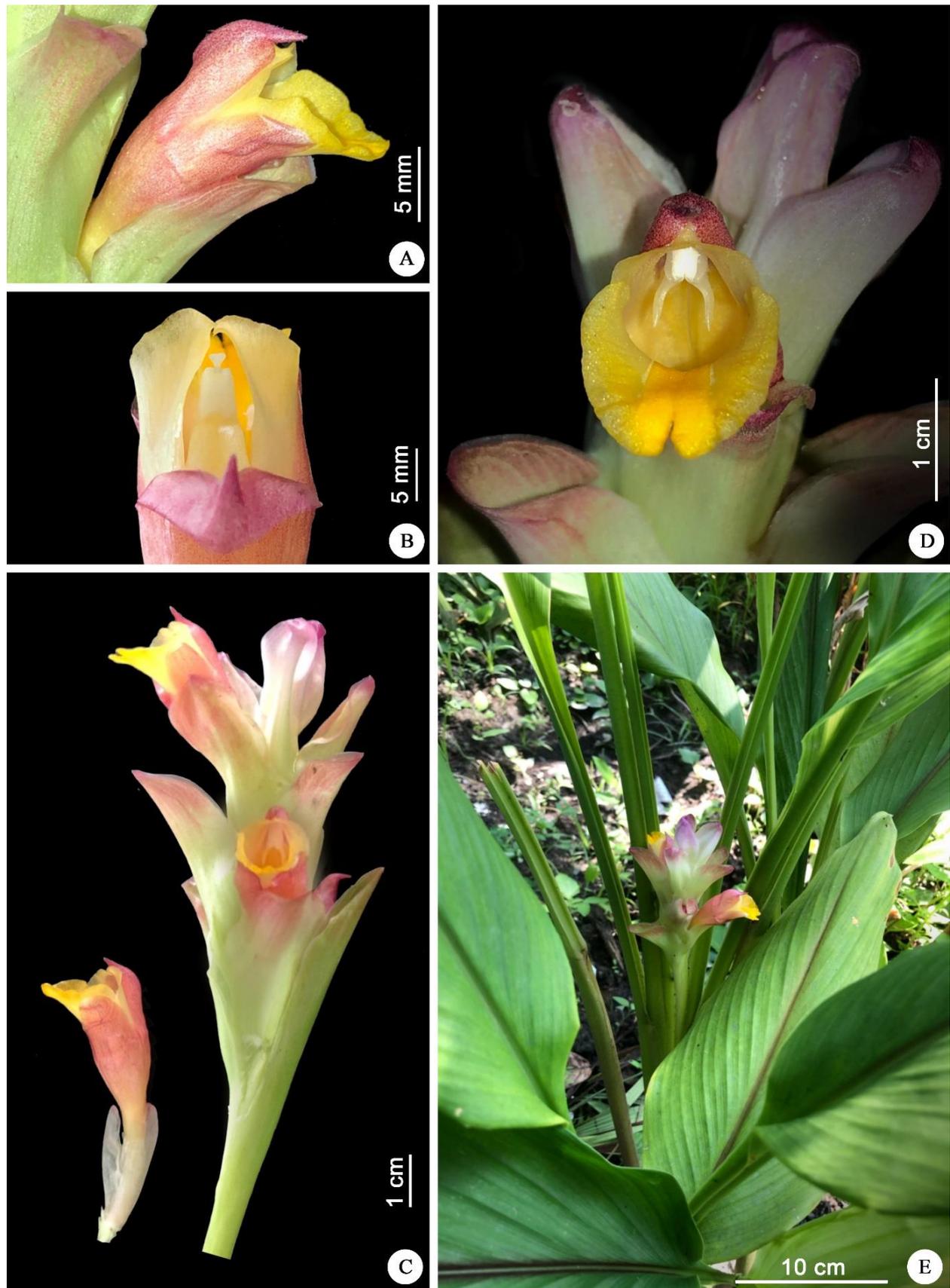


Figure 2. *Curcuma wanenlueanga* Saensouk, Thomudtha & Boonma sp. nov. (A) flower-side view, (B) back view of flower with the back view of stamen, (C) flower with bracteoles and inflorescence with flowers-side view, (D) flower-front view, (E) plants in natural habitat in oblique view to show leaf-adaxially with reddish-purple tinge along the midrib and its inflorescence. Photographed by Thawatphong Boonma

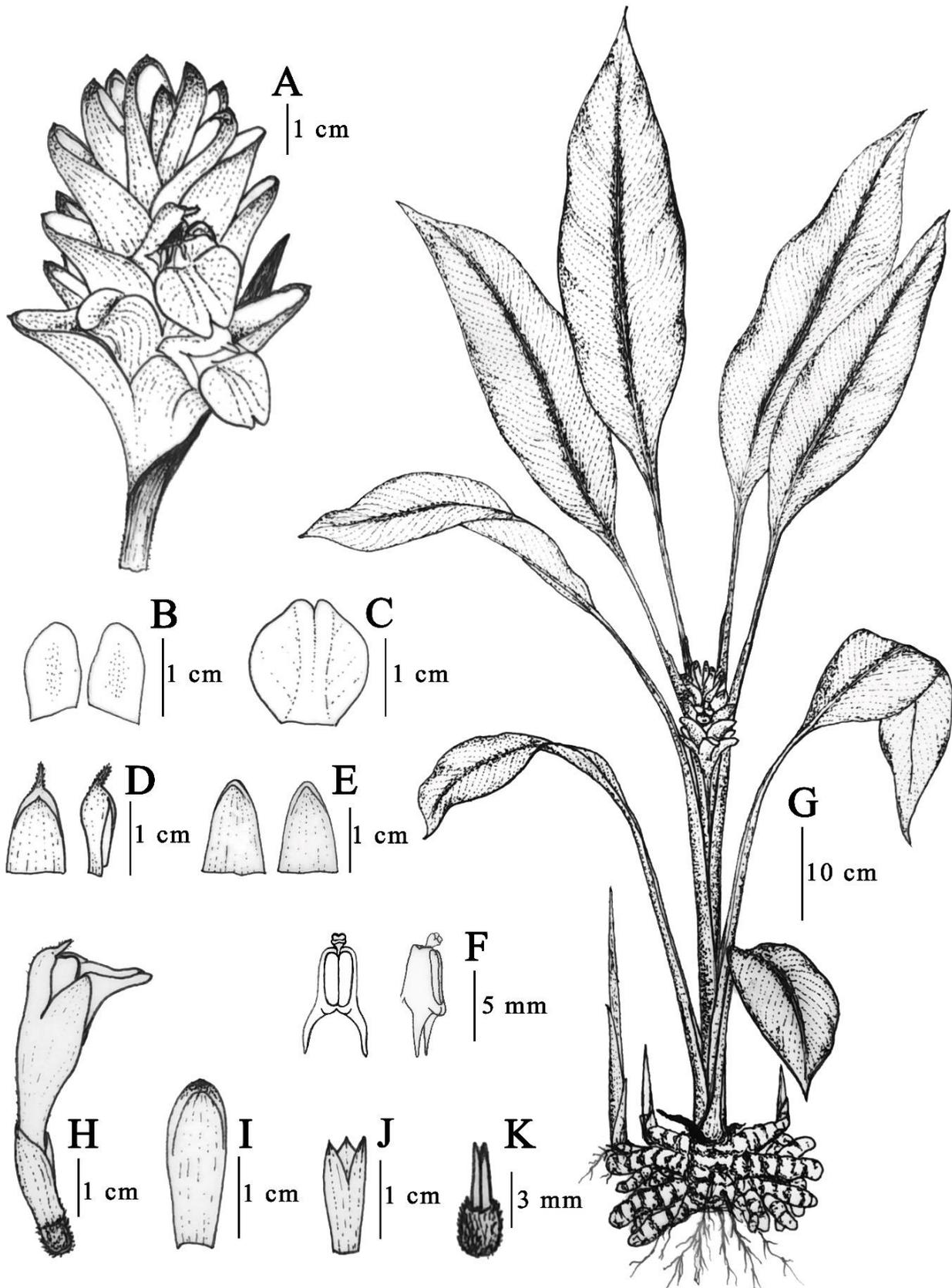


Figure 3. *Curcuma wanenlueanga* Saensouk, Thomudtha & Boonma sp. nov. (A) inflorescence with flowers and sterile bract-side view, (B) lateral staminodes, (C) labellum, (D) dorsal corolla lobe—front and side view, (E) lateral corolla lobes, (F) anther—front and side view, (G) habitus, (H) flower with calyx and ovary, (I) bracteoles, (J) calyx, (K) epigynous glands with ovary. Drawn by Thawatphong Boonma

Table 1. Morphological comparison of *Curcuma wanenlueanga*, *C. longa*, and *C. amada*

Characters	<i>Curcuma wanenlueanga</i>	<i>Curcuma longa</i> (Sabu 2006)	<i>Curcuma amada</i> (Roxburgh 1810; Sabu 2006)
Rhizome	large size, 5.3–8.9 × 3.8–4.6 cm	medium size, 2–3 × 2–3 cm	large size, 4–5.3 × 3–4 cm
Rhizome internally	yellow with darker core	deep orange-yellow	light yellow, white towards the periphery
Rhizome-smell	slightly aromatic	strongly aromatic	smell of green mango
Pseudostem	to 70 cm tall, green with reddish-brown tinge	c. 30 cm tall, green	30–35 cm tall, green
Leaf-sheath	pubescent, green with reddish-brown tinge	glabrous, green	glabrous, green
Leaves-number	7–10	4–6	4–6
Petiole	up to 35 cm long, sparsely pubescent, green with a reddish tinge at base	35–40 cm long, glabrous, green	5–10 cm long, glabrous, green
Lamina-shaped	narrowly lanceolate	oblong-lanceolate	oblong, lanceolate, acuminate
Lamina-size	50–70 × 15–18 cm	45–60 × 15–20 cm	45–60 × 14–15 cm
Lamina-margin	entire, glabrous	wavy, pubescent towards the extreme tip	entire, glabrous
Lamina-adaxially	green with reddish-purple tinge along the midrib	green	green
Inflorescence	terminal	terminal	terminal and lateral
Peduncle	30–38 cm long	15 cm long	20–22 cm long
Spike	8–10 cm long	8–10 cm long	12–18 cm long
Coma-number	4–6	8–10	5–8
Coma-size	2.5–3.2 × 1.5–2 cm	7 × 3.5 cm	c. 6 × 2.5 cm
Coma-apex	hooded	not hooded	not hooded
Coma-color	pink at distal part and gradually fade to pale green at base	white	light violet
Fertile bract	12–15 per inflorescence	25–30 per inflorescence	15–18 per inflorescence
Bract-size	3–4.5 × 2–2.6 cm	4.5–5.5 × 3–5 cm	c. 4 × 3.5 cm
Bract-color	pale green with reddish tinge at distal part, veins pale green	pale green	green
Bract-connate	lower 1/2	lower 1/2	lower 2/3
Flowers	1 per bract	1–2 per bract	4–5 per bract
Bracteoles	pubescent	glabrous	minutely hairy
Flowers	c. 5 cm long	4.5–5.5 cm long	c. 5 cm long
Calyx	longer than bracts	equal to the bracts	longer than bracts
Floral tube	13–15 mm long	10 mm long	10 mm long
Floral tube-color	3.2–3.5 cm long	2.5 cm long	3 cm long
Dorsal corolla lobe	yellow with pink at distal part	white	pale yellow
Lateral corolla lobe	pink	white	white
Staminodes-size	pink, sparsely hairy	white, glabrous	white, glabrous
Staminodes-color	11–13 × 7–8 mm	1.5 × 0.8 cm	c. 1.5 × 0.9 cm
Anther spurs	yellow	pale yellow	pale yellow
Epigynous glands	c. 4 mm long	3 mm long	1–2 mm long
Ovary	3–5 mm long	5 mm long	6 mm long
Stigma	3 mm long, pubescent	5 mm long, pubescent	3 mm long, densely hairy
	slightly exerted above the anther lobes	closely appressed within the anther lobes	closely appressed within the anther lobes

Key to 26 species of *Curcuma* subgenus *Curcuma* in Thailand

1. Rhizome branches not produced
 2. Inflorescence lateral and terminal *C. angustifolia*
 2. Inflorescence terminal
 3. Sheaths glabrous; leaf abaxially glabrous *C. plicata*
 3. Sheaths pubescent; leaf abaxially hairy or glabrescent at least at the apex *C. attenuata*
1. Rhizome branches produced or well developed
 4. Inflorescence terminal
 5. Rhizome creeping *C. rubrobracteata*
 5. Rhizome with branches non-creeping
 6. Anther ecalcarate
 7. Flowers yellow or orange-yellow *C. aurantiaca*
 7. Flowers cream-white with yellow in the center of labellum *C. roscoeana*

6. Anther calcarate
8. Bracts glabrous
9. Ovary glabrous *C. antinaia*
9. Ovary pubescent *C. sattayasaiorum*
8. Bracts pubescent
10. Coma bracts greenish-white *C. viridiflora*
10. Coma bracts pink or white with pink at tip
11. Peduncle red *C. phrayawan*
11. Peduncle green
12. Ovary glabrous *C. petiolata*
12. Ovary pubescent
13. Leaf adaxially green with reddish-purple along the midrib *C. wanenlueanga*
13. Leaf adaxially green with green midrib
14. Rhizome pale yellow with the smell of green mango *C. amada*
14. Rhizome deep orange-yellow, strongly aromatic, without smell of green mango *C. longa*
4. Inflorescence usually lateral
15. Leaves lower surface pubescent
16. Leaf-adaxially green with green midrib
17. Rhizome yellow; lamina broadly lanceolate *C. aromatica*
17. Rhizome pale yellow; lamina oblong *C. elata*
16. Leaf-adaxially green with red or reddish-purple patch along midrib
18. Bracts glabrous *C. zedoarioides*
18. Bracts pubescent
19. Inflorescence cylindrical >10 cm long; bracts green, short-hairy on both surfaces *C. latifolia*
19. Spike almost globular shape <10 cm long; bract bright green to brownish green with palegreen venation, adaxially puberulent, abaxially glabrous *C. globulifera*
15. Leaves lower surface glabrous
20. Petioles and leaf-sheaths reddish-brown *C. rubescens*
20. Petioles and leaf-sheaths green
21. Leaf-adaxially green with red or reddish-purple patch along the midrib
22. Rhizome aeruginous green *C. aeruginosa*
22. Rhizome yellow or orange
23. Corolla lobes nearly white or with very slight pinkish shade; rhizome pale straw to yellowish white *C. picta*
23. Corolla lobes conspicuously pink to reddish; rhizome deep bright orange to yellow-orange *C. zanthorrhiza*
21. Leaf-adaxially green without red patch along midrib
24. Fertile bracts pale pink; rhizome pale ochraceous *C. comosa*
24. Fertile bracts green; rhizome white to pale yellow
25. Bracts glabrous *C. leucorrhiza*
25. Bracts minutely puberulous on both sides *C. manga*

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