



Taxonomic revision of the genus *Cautleya* (Zingiberaceae) in India with a description of a new variety

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(Manuscript received 2 September 2020; Accepted 22 February 2021; Online published 2 March 2021)

ABSTRACT: The genus *Cautleya* (Royle ex Benth.) Hook.f. in India is revised. The present study recognizes four taxa in the genus, including a new variety, *Cautleya gracilis* var. *hispida* Aishwarya & M.Sabu. The new variety is recognized mainly based on the relative length of corolla tube with calyx of the taxa under study. The corolla tube of the new variety is as long as its calyx, unlike those of the other taxa of the species *C. gracilis*. Keys to the taxa are also provided along with their detailed description and colour photographs.

KEY WORDS: *Cautleya gracilis* var. *hispida*, *Cautleya spicata*, new variety, West Bengal, morphology, type, key.

INTRODUCTION

Cautleya, which belongs to the family Zingiberaceae, is a small genus of Himalayan herbs with thick root fibres (Kumar, 1994). As per the latest revision by Auvray and Newman (2010), the genus is represented by three taxa all over the world. All these taxa are present in India. Now, with a new variety described during the present study, the number of taxa is increased to four.

Royle (1839) intended to form the species *Roscoea lutea* Royle to a distinct genus and thus selected the name *Cautleya* to honour his friend Captain Cautley F.G.S. But he retained it under the genus *Roscoea* as per the advice of his botanical friends. Later Bentham (Bentham and Hooker 1883) took up this name for his section *Roscoea* sect. *Cautleya* Royle ex Benth. and included *R. gracilis* Sm. and *R. spicata* Sm. under it. Hooker (1888) regarded the spelling of *Cautleya* as an error for '*Cautleya*', and thus corrected the spelling which was followed ever since. But it could be noted that in the *Genera Plantarum* (Bentham and Hooker, 1883) itself the spelling '*Cautleya*' was used, not in the text, but in the index. According to Auvray and Newman (2010) "Royle had consciously latinised Cautley's name to '*Cautleus*', dropping the letter 'y' which doesn't occur in Latin". Also, they added, "support may be found in the International Code of Botanical Nomenclature (McNeill et al., 2006) for retaining the original spelling". But they followed the spelling '*Cautleya*' which has been used since 1883 (as per paragraph 10 of preamble to the ICBN).

Hooker (1888) assigned the status of the genus to Bentham's section for *C. lutea* (Royle) Hook.f. Also, he synonymised *R. gracilis* Sm. under *C. lutea*. Subsequently, Baker (1890) treated the genus *Cautleya* for the *Flora of British India* and recognized five species under it, namely *C. lutea*, *C. cathcartii* Baker, *C. spicata*

(Sm.) Baker, *C. robusta* Baker and *C. petiolata* Baker.

Schumann (1904) recognized six taxa in the genus, including two of his newly described varieties, *C. lutea* var. *gracilior* K.Schum and *C. lutea* var. *robusta* K.Schum. Dandy (1932) confirmed Hooker's (1888) view that *R. gracilis* and *R. lutea* Royle are one and the same species and treated them under the genus *Cautleya*. As *R. gracilis* was published earlier than *R. lutea*, as per the rule of priority, *C. gracilis* is the accepted name for the species and *R. lutea* (hence *C. lutea*) is synonymised under it. Burt and Smith (1972) selected *C. gracilis* (Sm.) Dandy as the type species. Subsequent authors followed Schumann (1904) and recognized five species with one having two varieties (e.g., Sanjappa, 1989).

Smith (1994) was the one who first opined that *C. cathcartii* might be a robust form of *C. gracilis*, and *C. robusta* might be synonymous with *C. spicata*. Kumar (1994) merged the two varieties of Schumann within the main species, *C. gracilis*.

Recently, a detailed revision of the genus was carried out by Auvray and Newman (2010). They retained Schumann's both varieties. They also synonymised *C. cathcartii* under *C. gracilis* var. *robusta*, and *C. robusta* and *C. petiolata* under *C. spicata*. So altogether their study recognized two species, with *C. gracilis* having two varieties.

The present study includes the taxonomic revision of the genus *Cautleya* in India. The study was conducted as part of the revision of Zingiberaceae in India. The review of literature of the genus *Cautleya* shows that one of the few diagnostic characters that distinguished its taxa from one another was the number of flowers per inflorescence. Being an unreliable character for delimiting taxa, a revision was highly demanding for the genus. On this context this genus was selected for the study. As part of that a new variety was also collected which is described here.



Fig. 1. Habitat of *Cautleya* species and varieties. A. *Cautleya gracilis* var. *gracilis*. B. *C. gracilis* var. *robusta*. C. *C. gracilis* var. *hispida*. D. *C. spicata*. (Photos by K. Aishwarya).

MATERIALS AND METHODS

Relevant literature and information related to the taxa under study were thoroughly reviewed. The specimens studied include both live as well as those submitted in herbaria viz. ASSAM, BSHC, CAL, CALI, DD, BM, LINN, LIV, E and K. The live specimens those were collected as part the present study were preserved for herbarium after studying their morphology. Their rhizomes were planted at Calicut University Botanical Garden (CUBG) as part of germplasm conservation. The IUCN status of the taxa under study have been evaluated against IUCN Red List Categories and Criteria Version 14 (IUCN, 2019) and are assigned tentatively based on the field visits and herbaria reference. The taxa considered as Least Concern (LC) are those which have not been qualified to be included under the categories, Critically Endangered, Endangered, Vulnerable or Near Threatened. They are fairly common in their natural habitat.

TAXONOMIC TREATMENT

Cautleya (Royle ex Benth.) Hook.f., Bot. Mag. 114: t.6991. 1888; Petersen, Nat. Pfl.-Fam. Teil 2: 18. 1889

(as '*Cautlea*'); J.N.Mitra, Fl. Pl. E. India 1: 241. 1958; B.L. Burt & R.M. Sm., Notes Roy. Bot. Gard. Edinburgh 31: 184. 1972; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994.

Roscoea sect. *Cautleya* Royle ex Benth., Gen. Pl. 3: 641. 1883 (as '*Cautlea*'). **Type:** *Cautleya gracilis* (Sm.) Dandy, J. Bot. 70: 328. 1932.

Rhizomatous herb with perennial root stock and distinct pseudostem. Rhizome running or clump-forming, aromatic. Roots fibrous and tuberous. Leafy shoot 20–100 cm tall. Leaves sessile or petiolate; ligule oblong, lobes equal, membranous, hyaline; lamina oblong-lanceolate or lanceolate, base equal, apex acuminate, margins straight. Inflorescence terminal, lax or dense, exserted, 1–100-flowered. Floral bracts 1–100 per spike, each subtends a single flower, oblong, membranous. Bracteole absent. Flowers arranged in acropetal succession. Calyx tubular, membranous, clefted on one side. Corolla tube white, glabrous; lobes three, yellow, apices pouched, margins entire; dorsal lobe boat-shaped, apex mucronate; lateral lobes lanceolate, apices acute. Labellum obcordate, yellow, glabrous, apex undulate. Lateral staminodes two, obovate, yellow, glabrous.



Stamen L-shaped, glabrous; filament white; spurs two, horn-shaped, yellow with orange apices; anther oblong, yellow, dehisces along the entire length; crest either small or absent, yellow. Ovary oblong, tricarpeal, trilobular with ovules on axile placentum; style filiform, glabrous; stigma funnel-shaped, white, mouth even, ciliate. Epigynous glands two, linear, white. Fruit capsule (septifragal), globose or oblong, red, glabrous or pubescent, calyx persistent. Seeds angular or elliptic, black, pubescent, arillate.

Flowering and Fruiting: May–December

Distribution: India (North, Northeast and East), Bhutan, China, Myanmar, Nepal, Thailand and Vietnam.

Ecology: Epiphytic at higher altitudes; grows in association with moss on tree trunk, moist slopes and rock crevices; abundantly seen along pine forest.

Etymology: The generic name was given by Royle (1839) to honour his friend Captain Cautley F.G.S.

Taxonomic Notes: *Cautleya* is a genus which closely resembles *Roscoea* Sm. The most important features that they share are the similar morphological traits like the presence of tubular sheaths which extends up to the point where the ligule and leaf blade divide from them, ebracteolate flowers, versatile anther basally with long connective and spurs, conspicuously bilobed labellum, and overlapping distribution area (Cowley, 2007). According to Cowley (2007), the present distribution of both the species are centred in Assam.

Royle (1839) could clearly distinguish between the two genera, and the subsequent authors confirmed the status of new genus (Kumar, 1994). The main differentiating characters between the two genera include: *Cautleya* has yellow flowered inflorescence, whereas in *Roscoea* the flowers are either purple or white, and the ovary is shorter and the fruit is early-dehiscent in *Cautleya* compared to the elongate ovary and tardily-dehiscent fruit of *Roscoea* (Auvray and Newman, 2010). Moreover, Ngamriabsakul *et al.* (2000) confirmed that *Cautleya* is monophyletic and sister to *Roscoea* by using ITS-based and morphology-based phylogenetic analysis.

The present study recognizes two species, *i.e.*, *C. gracilis* and *C. spicata*; *C. gracilis* with three varieties, including our newly described variety, *C. gracilis* var. *hispidata*. The description of this variety as a new one is mainly based on the relative length of corolla tube with calyx.

Taxonomic key to the taxa of *Cautleya*.

- 1a. Leaves petiolate; arils in fruit prominent, completely covering the seeds *C. spicata*
- 1b. Leaves sessile; arils in fruit reduced, present only at the point of connection with the placentum 2
- 2a. Rhizome running; inflorescence lax, 1–5-flowered; floral bracts extending only up to half the length of calyx or shorter (during anthesis) *C. gracilis* var. *gracilis*
- 2b. Rhizome clump-forming; inflorescence dense, ≥ 10 -flowered; floral bracts extending beyond half the length of calyx (during anthesis) 3

3a. Floral bract and calyx glabrous; corolla tube 2.6–2.7 cm long, longer than the calyx; lateral staminodes without a red streak; stamen 1.2–1.3 cm long *C. gracilis* var. *robusta*

3b. Floral bract and calyx pubescent; corolla tube 1.4–1.8 cm long, as long as the calyx; lateral staminodes with a red streak at the base along the median; stamen 2.1–2.2 cm long .. *C. gracilis* var. *hispidata*

***Cautleya gracilis* (Sm.) Dandy, J. Bot. 70: 328. 1932; B.L.Burt & R.M.Sm., Notes Roy. Bot. Gard. Edinburgh 31: 218. 1972; J.C.Daniel *et al.*, J. Bombay Nat. Hist. Soc. 71: 278. 1974; Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994; Auvray & M.F.Newman, Edinb. J. Bot. 67(3): 452. 2010. *Roscoea gracilis* Sm., Trans. Linn. Soc. London 13: 460. 1822; Horan., Prodr. Monogr. Scitam. 21. 1862; Benth. & Hook.f., Gen. Pl. 3: 641. 1883. **Type:** Nepal, 1818, Gardner Smith's collection 9.7.1 (Lectotype: LINN!).**

Roscoea elatior Sm., Trans. Linn. Soc. London 13: 460. 1822; Wall., Numer. List 6531 A & B. 1832. Horan., Prodr. Monogr. Scitam. 21. 1862. **Type:** Nepal, 1819, Gardner Smith's collection 9.9 (Lectotype: LINN!).

Roscoea lutea Royle, Ill. Bot. Himal. Mts. 1: 361. 1839; Ill. Bot. Himal. Mts. 2: t.89, f.2. 1839; Wight, Icon. Pl. Ind. Orient. 6: t.2013. 1853; Horan., Prodr. Monogr. Scitam. 21. 1862. *Cautleya lutea* (Royle) Hook.f., Bot. Mag. 114: t.6991. 1888; Baker in Hook.f., Fl. Brit. India 6: 208. 1890; K.Schum., Pflanzenz. 4 (46): 124. 1904; J.N.Mitra, Fl. Pl. E. India 1: 249. 1958. **Type:** India. Mussoorie, *s.die*, Royle 13191x(1) (Lectotype: LIV).

Cautleya lutea var. *gracilior* K.Schum., Pflanzenz. 4 (46): 124. 1904. *Cautleya gracilis* var. *gracilior* (K.Schum.) Sanjappa, in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989. **Type:** India. Uttarakhand, Kumaon, 1826, Wallich 6531B (Lectotype: K; Isolectotype: BM!, E!).

***Cautleya gracilis* var. *gracilis* (Sm.) Dandy**

Figs.1A & 2

Rhizome running, cylindrical or elliptic, 3.0–13.0 × 0.4–1.0 cm, white to pale brown outside, creamish inside, aromatic. Tuberous roots narrowly oblong-lanceolate, 3–15 cm long, fleshy, white, pink or pale brown outside, white inside. Leafy shoot 20–57 cm tall; internodes 3–6 cm long; 4–9-leaved. Leaves 7–26 cm long, sessile; ligule 0.3–0.5 cm long, bilobed, pale green or red, glabrous, apices of the lobes rounded to obtuse; lamina oblong-lanceolate, 7–26 × 2.0–4.4 cm, green and glabrous on the upper surface, light green or purple and glabrous on the lower surface,. Inflorescence terminal, lax, 4.5–14.0 cm long, exserted, 1–5-flowered; inflorescence axis 4.0–11.8 cm long. Floral bracts 1–5 per spike, arranged 1–4 cm apart, 1.0–1.9 × 0.2–0.3 cm, extending only up to half the length of calyx or shorter (during anthesis), green or red, glabrous, apices obtuse to acute. Flowers 3.8–5.0 cm long, one or two flowers per spike open a day. Calyx 1.4–1.6 × 0.3–0.4 cm, red or green with red tinge, glabrous, clefted on one side *c.* 0.4 cm deep, apex bilobed (sometimes tridentate). Corolla tube 1.6–2.4 cm long, longer than the bract and calyx; dorsal lobe 1.7–2.2 × *c.* 0.2 cm; lateral lobes 1.8–2.1 × 0.4–0.6 cm. Labellum 2.4–2.5 × 1.4–2.0 cm, bifid up to 1.8–2.1 cm depth, lobes overlapping, obtuse

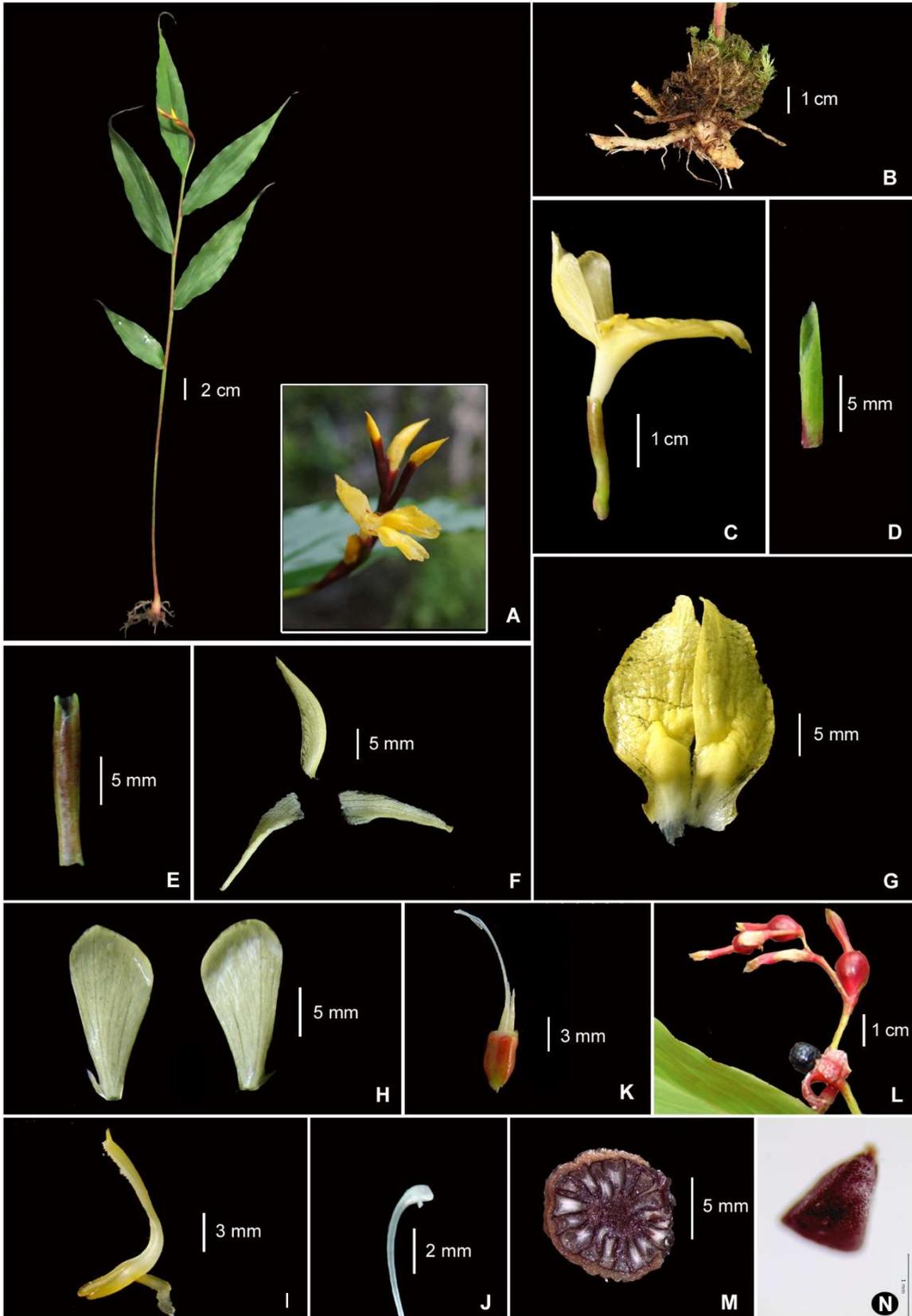


Fig. 2. *Cautleya gracilis* var. *gracilis*. **A.** Habit (inset: inflorescence). **B.** Rhizome. **C.** Flower. **D.** Bract. **E.** Calyx. **F.** Corolla lobes. **G.** Labellum. **H.** Lateral staminodes. **I.** Stamen. **J.** Stigma. **K.** Ovary with epigynous glands. **L.** Fruits. **M.** C.S. of fruit. **N.** Seed. (Photos by K. Aishwarya).



to acute. Lateral staminodes obovate with a lateral process of *c.* 0.2 cm, 1.7–2.5 × 0.6–0.8 cm, yellow, sometimes with a red streak at the base along the median. Stamen 1.1–1.4 cm long; filament *c.* 0.3 × *c.* 0.2 cm; spurs *c.* 0.5 cm long; connective *c.* 0.4 cm long, white or yellow; anther 0.6–0.8 × *c.* 0.2 cm; crest *c.* 0.1 cm long. Ovary 0.4–0.5 cm long, green or white with red tinge or red, glabrous; style 4.0–4.2 cm long. Epigynous glands 0.4–0.7 cm long. Fruit capsule, globose, 0.7–1.3 cm long (excluding calyx), glabrous. Seeds 30–100, angular, 0.10–0.15 × *c.* 0.15 cm; arils reduced, present only at the point of connection with the placenta.

Flowering and Fruiting: May–November

Distribution: India (Arunachal Pradesh, Assam, Himachal Pradesh, Meghalaya, Nagaland, Sikkim, West Bengal, Uttarakhand and Uttar Pradesh), Bhutan, China, Myanmar, Nepal, Thailand and Vietnam.

Ecology: Epiphyte; grows in association with moss on tree trunk, moist slopes and rock crevices; abundantly seen along pine forest.

Taxonomic Notes: Schumann (1904) described two varieties within the species *C. lutea* (= *C. gracilis*). Kumar (1994) merged those varieties stating that they came across many intermediate forms. Later, Auvray and Newman (2010) while revising the genus, recognized these two varieties (*i.e.*, *C. gracilis* var. *gracilis* and *C. gracilis* var. *robusta*) within the main species. In the present study, we also retain these two varieties and in addition, describe a new variety in the species *C. gracilis*.

IUCN Status: Least Concern (LC). It is widely distributed in almost all states of North and Northeast India and adjoining countries, hence it does not come under any threat categories (IUCN, 2019)

Specimens examined: INDIA, Arunachal Pradesh: Kameng F.D., Tawang to Zang, 2833.4 m, 31 May 1957, Rao 7972 (ASSAM); Assam: Cachar, Bhuvan Hills, October 1978, *s.c.* 73001 (ASSAM); Himachal Pradesh: Simla, 29 July 1831, *s.c. s.n.* (E, E00211179, E00211180); Meghalaya: Shillong Peak, 1240 m, 18 August 2004, Sanoj 95649 (CALI); *ibid.*, N25°19'21.7" E91°30'48.3", 1893 m, 21 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139746 (CALI); *ibid.*, N25°11'48.4" E91°26'23.6", 1825 m, 21 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139747 (CALI); Latryngew, on the way to Mowmai, N25°11'48.4" E91°26'23.1", 1684 m, 21 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139751 (CALI); *ibid.*, Aishwarya, Ahmedul Kabeer & Manudev 139752 (CALI); Mawphlang sacred groove, N25°16'10.2" E91°27'7.6", 1846 m, 25 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139777 (CALI); Nagaland: Naga Hills, June 1935, Bor 21211 (ASSAM); Sikkim: Hanuman Tok, 10 July 2014, Aishwarya & Ahmedul Kabeer 139701 (CALI); On the way from Ganeshtok to Gangtok, Near Enje School, N27°20'11.8" E088°37'47.5", 1860 m, 11 July 2014, Aishwarya & Ahmedul Kabeer 139714 (CALI); West Bengal: 1 Km from Jore Bunglaw, on the way to Kalimpong from Darjeeling, N27°00'00.9" E088°16'47.5", 2047 m, 16 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139729 (CALI); Rangiroom, Senchal WLS, near Forest Beat Office, N27°00'27.7" E088°17'49.3", 2055 m, 16 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139730 (CALI); Uttarakhand: Kumaon, Way to Balantifarm (Munsiari), 01 September 1969, Pant & Naithani 39537 (DD); Uttar Pradesh: Tehri District, Khatliang, 14 August 1978, Goel 64492 (DD); MYANMAR, Upper Burma, June 1985, George Forrest 26953 (E, E00061760). NEPAL, 1821, Wallich 6531A (K).

Cautleya gracilis* var. *robusta (K.Schum.) Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; Auvray & M.F.Newman, Edinb. J. Bot. 67 (3): 454. 2010. *Cautleya lutea* var. *robusta* K.Schum. in Engler, Pflanzenz. 4 (46): 125. 1904. **Type:** India. Sikkim, *s.die*, Hooker *s.n.* (Neotype: K, acc. no. K001057272!).

Cautleya cathartii Baker in Hook.f., Fl. Brit. India 6: 208. 1890; J.N.Mitra, Fl. Pl. E. India 1: 249. 1958; Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994. **Type:** India. Sikkim, *s.die*, Hooker *s.n.* (Lectotype: K, acc. no. K001057271!).

Figs. 1B & 3

Rhizome clump-forming, globular, *c.* 1.3 × *c.* 1.5 cm, pale brown to brown outside, white inside, slightly aromatic. Tuberos roots 2–7 cm long, fleshy, white, pink or pale brown outside, white inside. Leafy shoot 35–48 cm tall; internodes 3.4–5.5 cm long; 5–6-leaved. Leaves 15–22 cm long, sessile; ligule 0.3–0.4 cm long, unlobed, red, sparsely pubescent, apex acute; lamina oblong-lanceolate, narrow, 15–22 × 2.0–3.5 cm, green and glabrous on the upper surface, light green with purple tinge and sparsely pubescent on the lower surface. Inflorescence terminal, dense, 8.5–20.0 cm long, exserted, 10–25-flowered; inflorescence axis 6.5–18.5 cm long. Floral bracts 10–25 per spike, arranged 0.5–1.3 cm apart, 1.6–1.7 × 0.3–0.4 cm, extending beyond half the length of calyx (during anthesis), green, glabrous, apices obtuse to acute. Flowers 4.5–4.9 cm long, many flowers per spike open a day. Calyx 1.4–1.8 × *c.* 0.3 cm, red, glabrous, clefted on one side *c.* 0.5 cm deep, apex unlobed, bidentate. Corolla tube 2.6–2.7 cm long, longer than the bract and calyx; dorsal lobe *c.* 2.2 × *c.* 0.2 cm; lateral lobes *c.* 2.3 × *c.* 0.4 cm. Labellum *c.* 2.5 × *c.* 1.4 cm, bifid up to *c.* 2.2 cm depth, lobes overlapping, apex undulate, obtuse to acute. Lateral staminodes obovate with a lateral process of *c.* 0.4 cm, *c.* 1.8 × *c.* 0.6 cm yellow, without a red streak. Stamen 1.2–1.3 cm long; filament *c.* 0.2 × *c.* 0.2 cm; spurs *c.* 0.5 cm long; connective *c.* 0.7 cm long, white or yellow; anther 0.6–0.7 × *c.* 0.2 cm; crest *c.* 0.1 cm long. Ovary *c.* 0.6 cm long, green or white with red tinge or red, pubescent; style 4.4–4.5 cm long. Epigynous glands 0.4–0.5 cm long. Fruit capsule, globose, *c.* 1.3 cm long (excluding calyx), pubescent. Seeds 50–70, angular, 0.10–0.15 × *c.* 0.15 cm; arils reduced, present only at the point of connection with the placenta.

Flowering and Fruiting: May–August

Distribution: India (Sikkim, Uttarakhand and West Bengal), Bhutan, China and Nepal.

Ecology: Epiphyte; grows in association with moss on tree trunk, moist slopes and rock crevices; abundantly seen along pine forest.

Taxonomic Notes: *Cautleya gracilis* var. *robusta* was established by Schumann (1904). The taxonomic status of this variety has always been doubtful. Auvray and Newman (2010) suggested that if it is recognized as a species, the only name available is *C. cathartii*. They noted that this variety cannot be raised to species rank,

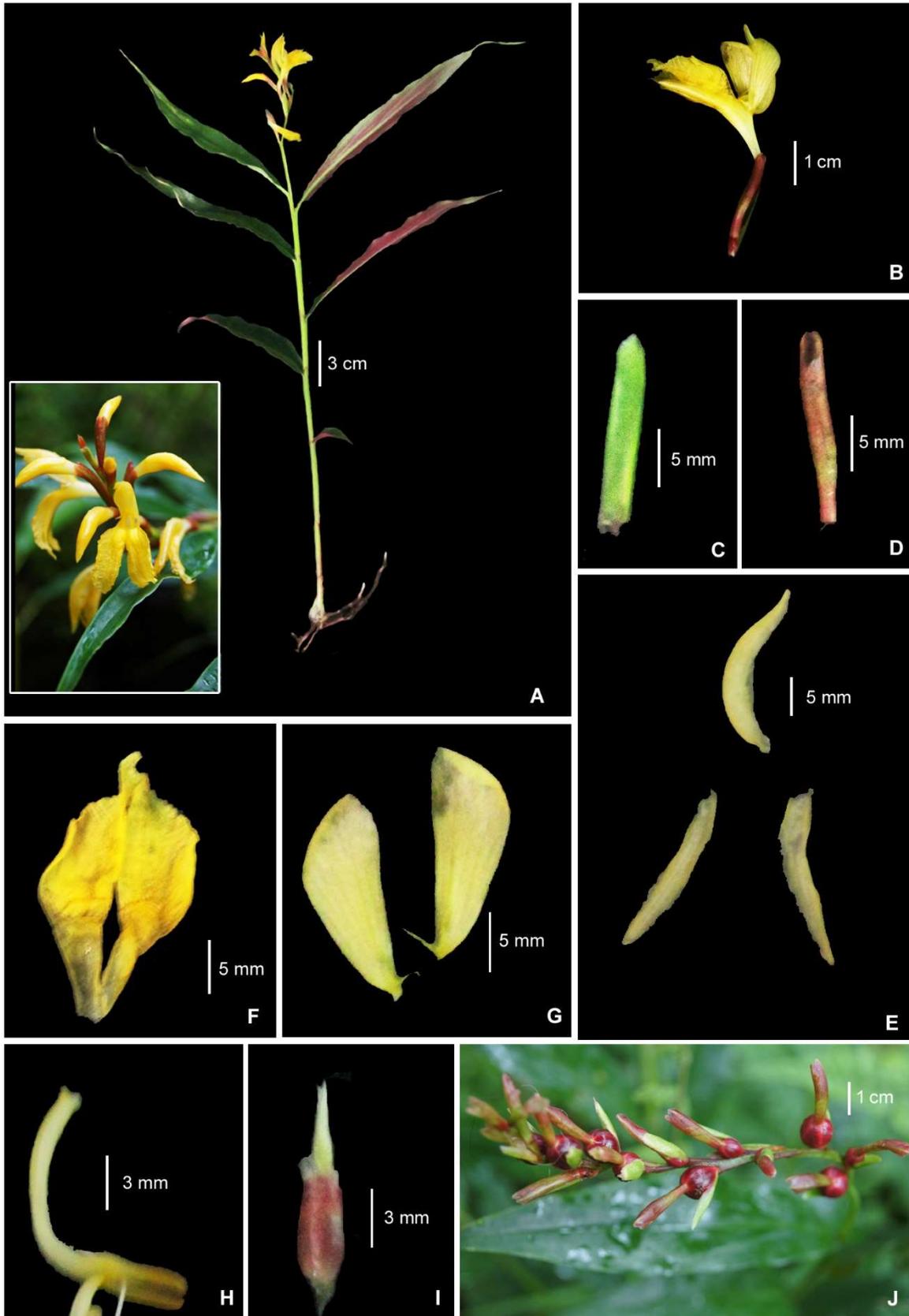


Fig. 3. *Cautleya gracilis* var. *robusta*. **A.** Habit (inset: inflorescence). **B.** Flower. **C.** Bract. **D.** Calyx. **E.** Corolla lobes. **F.** Labellum. **G.** Lateral staminodes. **H.** Stamen. **I.** Ovary with epigynous glands. **J.** Fruits. (Photos by K Aishwarya).



as *C. robusta* (synonym of *C. spicata*) already exists.

In the present treatment, we retain it at the variety rank, as done by the earlier authors (e.g., Schumann, 1904; Auvray and Newman, 2010).

IUCN Status: Least Concern (LC) (IUCN, 2019)

Specimens Examined: INDIA. Nagaland: Tuensang, Sipansang Village, 27 May 2016, *Hareesh 149338* (CALI); Sikkim: Khechupheri Lake, 10 May 2007, *Thomas & Nissar 95529* (CALI); Kewzing, on the way to Rebong from Yuksom, N27°02'30.9" E088°16'05.8", 2060 m, 13 July 2014, *Aishwarya & Ahmedul Kabeer 139721* (CALI); Uttarakhand: Kumaon, 1826, *Wallich 6531B*, leg. *Blinkworth* (K, K001124116); West Bengal: Rongbe, 5000 ft, 19 May 1913, *Cave s.n.* (E); Mamreng, 5000 ft, 13 August 1913, *Cave s.n.* (E, E00061748); Darjeeling, above Sonada, 7000 ft, 08 June 1913, *Cave s.n.* (E); Darjeeling, Lloyd Botanic Garden, 14 July 2014, *Aishwarya, Ahmedul Kabeer & Manudev 139725* (CALI); Darjeeling, Tiger Hills, N26°02'70.6" E088°17'12.6", 15 July 2014, *Aishwarya, Ahmedul Kabeer & Manudev 139726* (CALI). NEPAL. Bagmati: Rasuwa District, Chillime Kharka, 13000 ft, July 1949, *Polunin 1339* (E, E00061752); Eastern Nepal, Mewa Khola, 5000 ft, 15 May 1974, *Stainton*.

Cautleya gracilis* var. *hispida Aishwarya & M. Sabu, **var. nov.** **Figs. 1C & 4**

Type: India. West Bengal, Kalimpong, Algarh road to 1 km towards Lava, 17 July 2014, *Aishwarya, Ahmedul Kabeer & Manudev 139743* (Holotype: CALI!)

Diagnosis: *C. gracilis* var. *hispida* is closely related to *C. gracilis* var. *robusta* but differs from the latter by leafy shoot more robust (60–100 cm long) and velvety, floral bract and calyx pubescent, corolla tube as long as the calyx and longer corolla lobes, labellum, lateral staminodes and stamen.

Rhizome clump-forming, globular, *c.* 1.4 × *c.* 1.3 cm, white to pale brown outside, creamish inside, aromatic. Tuberous roots 2.8–22 cm long, fleshy, white, pink or pale brown outside, white inside. Leafy shoot 60–100 cm tall; internodes 6.5–9.0 cm long; 6–10-leaved. Leaves 16–30 cm long, sessile; ligule 0.4–0.5 cm long, bilobed, pale green, velvety, apices of the lobes rounded to obtuse; lamina lanceolate, 16–30 × 3.5–6.2 cm, green and glabrous on the upper surface, light green and velvety on the lower surface. Inflorescence terminal, very dense, 9.5–20.0 cm long, exserted, 15–100-flowered; inflorescence axis 8–18 cm long. Floral bracts 15–70 per spike, arranged 0.4–0.5 cm apart, 1.5–2.0 × 0.4–0.5 cm, extending beyond half the length of calyx (during anthesis), pubescent, apices acute. Flowers 4.5–5.0 cm long, many flowers per spike open a day. Calyx 1.5–1.8 × *c.* 0.4 cm, pubescent, clefted on one side *c.* 0.7 cm deep, apex bilobed. Corolla tube 1.4–1.8 cm long, almost as long as the bract and calyx; dorsal lobe 2.8–3.2 × *c.* 0.2 cm; lateral lobes 2.8–3.0 × 0.4–0.6 cm. Labellum 2.8–3.0 × 1.3–1.4 cm, bifid up to *c.* 1.9 cm depth, lobes overlapping, apex undulate, obtuse. Lateral staminodes obovate with a lateral process of *c.* 0.5 cm, 2.2–2.3 × *c.* 0.7 cm, yellow with a red streak at the base along the median and the lateral process. Stamen 2.1–2.2 cm long; filament *c.* 0.4 × *c.* 0.2 cm; spurs *c.* 0.6 cm long; connective *c.* 0.8 cm long, white or yellow; anther 0.7–0.8

× *c.* 0.2 cm; crest *c.* 0.1 cm long. Ovary *c.* 0.4 cm long, green, pubescent; style *c.* 4.0 cm long. Epigynous glands *c.* 0.7 cm long. Fruit capsule, globose, 0.8–1.2 cm long (excluding calyx), green with red tinge, pubescent. Seeds *c.* 100, angular, *c.* 0.10–0.15 × *c.* 0.1 cm; arils reduced, present only at the point of connection with the placentum.

Flowering and Fruiting: May–July

Distribution: India (Manipur and West Bengal).

Etymology: The varietal epithet denotes hairy nature of the habit.

Ecology: Epiphyte; grows in association with moss on moist slopes and rock crevices; abundantly seen along pine forest.

Taxonomic Notes: Our study could identify an additional variety in the genus. While Kumar (1994) stated that they could find many intermediate forms and merged Schumann's varieties, their statement seems ambiguous. The earlier authors failed to notice the most distinctive, but consistent character, *i.e.*, the relative length of corolla tube with calyx (the new variety has corolla tube as long as the calyx, whereas the other two varieties of the species have corolla tubes longer than their calyces). They were mainly focused on the number of flowers per inflorescence and the robustness of shoot (within the species *C. gracilis*). So, there is every chance that Kumar (1994) also might have focused on these characters. Based on extensive herbaria as well as field studies, we recognize three varieties in the species *C. gracilis*, including this new variety.

Specimens Examined: INDIA. Manipur: Senapati, 02 June 2005, *Mao 109016* (ASSAM); West Bengal: Kalimpong, Algarh road to 1 km towards Lava, 17 July 2014, *Aishwarya, Ahmedul Kabeer & Manudev 139742* (CALI!); Darjeeling, 06 June 1960, *Panigrahi 20464* (ASSAM); Singalila Range, Manibanjang, 70000 ft, 20 May 1965, *Vos & Cobergt P.1.307220* (E, E00061732).

Cautleya spicata (Sm.) Baker in Hook.f., Fl. Brit. India 6: 209. 1890; J.N.Mitra, Fl. Pl. E. India 1: 249. 1958; Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994; Auvray & M.F.Newman, Edinburgh J. Bot. 67 (3): 452. 2010. *Roscoea spicata* Sm., Trans. Linn. Soc. London 13: 461. 1822; Benth. & Hook.f., Gen. Pl. 3: 641. 1883. **Type:** Nepal, 1819, *Gardner Smith's* collection 9.5 (Lectotype: LINN!).

Cautleya petiolata Baker in Hook.f., Fl. Brit. India 6: 209. 1890; Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994. **Type:** India, Uttarakhand, Garhwal, *Royle*, icon, RBG Kew Library Archive (Holotype: K!).

Cautleya robusta Baker in Hook.f., Fl. Brit. India 6: 209. 1890; J.N.Mitra, Fl. Pl. E. India 1: 249. 1958; Sanjappa in Karthik. *et al.*, Fl. Ind. Enum. Monocot. 291. 1989; S.Kumar, J. Indian Bot. Soc. 73: 195. 1994. **Type:** India. West Bengal, Darjeeling, Kurseong, 11 October 1884, *Clarke 36527* (Lectotype: K, acc. no. K000308448!).

Fig. 1D & 5

Rhizome clump-forming, globular, 2.5–2.7 × 2.0–2.3 cm, white to brown outside, creamish inside, aromatic. Tuberous roots 2–15 cm long, fleshy, white, pink or brown

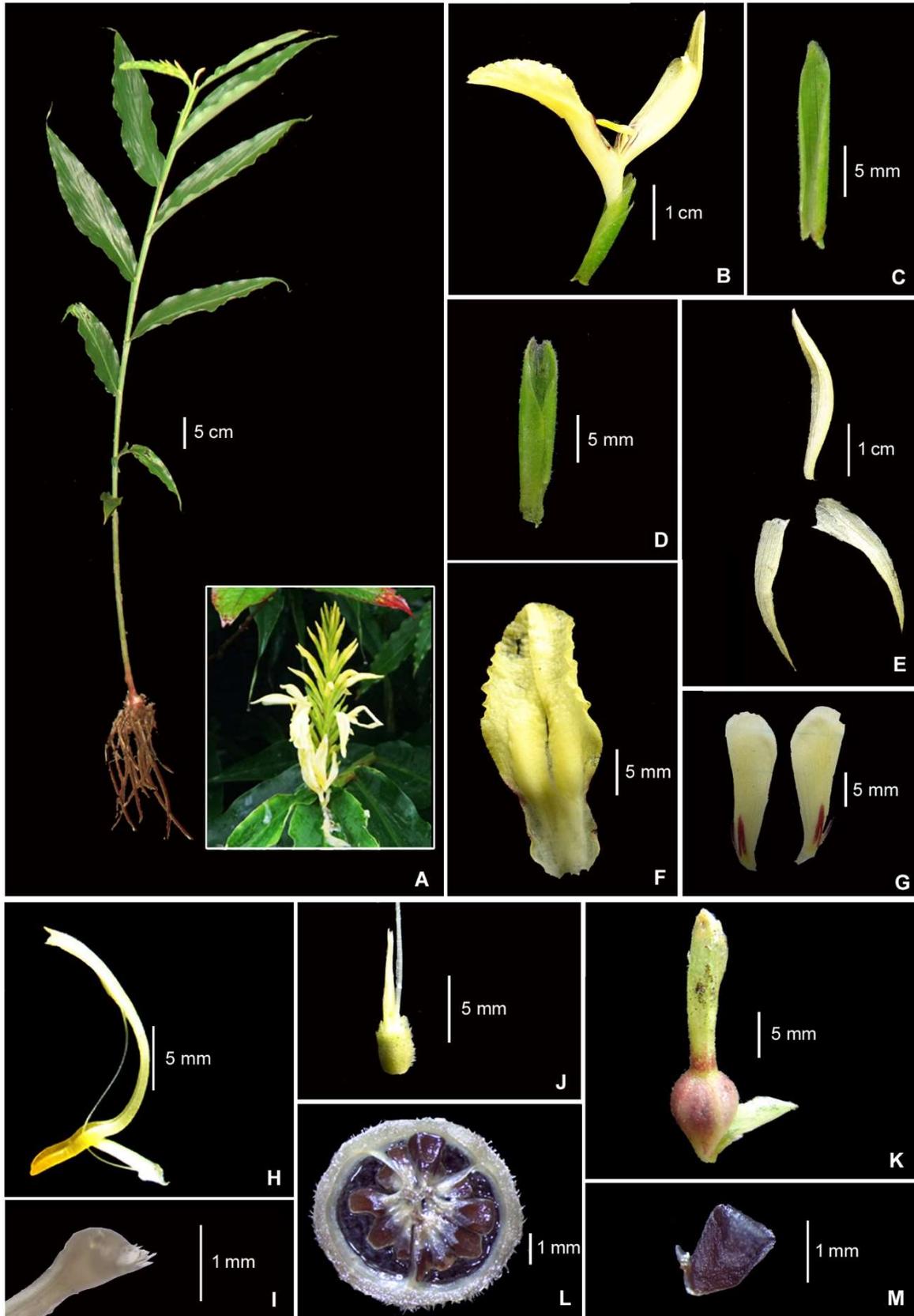


Fig. 4. *Cautleya gracilis* var. *hispida*. A. Habit (inset: inflorescence). B. Flower. C. Bract. D. Calyx. E. Corolla lobes. F. Labellum. G. Lateral staminodes. H. Stamen. I. Stigma. J. Ovary with epigynous glands. K. Fruits. L. C.S. of fruit. M. Seed. (Photos by K. Aishwarya).

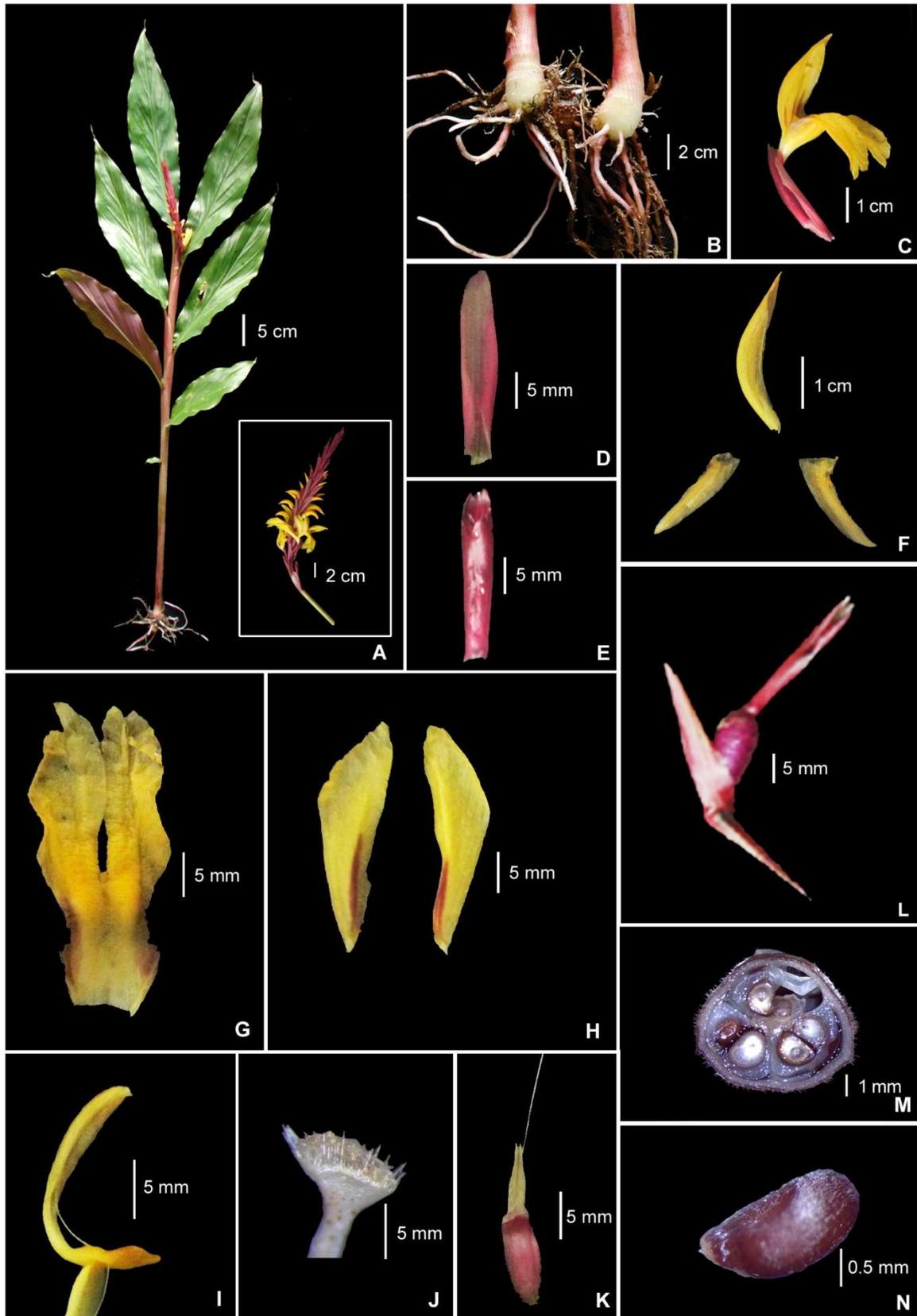


Fig. 5. *Cautleya spicata*. **A.** Habit (inset: inflorescence). **B.** Rhizome. **C.** Flower. **D.** Bract. **E.** Calyx. **F.** Corolla lobes. **G.** Labellum. **H.** Lateral staminodes. **I.** Stamen. **J.** Stigma. **K.** Ovary with epigynous glands. **L.** Fruits. **M.** C.S. of fruit. **N.** Seed. (Photos by K. Aishwarya).



outside, white inside. Leafy shoot 35–100 cm tall; internodes 5.0–6.5 cm long; 6–7-leaved. Leaves 35–41 cm long, petiolate; petiole 1.4–4.0 cm long, pubescent; ligule *c.* 1.0 cm long, bilobed, red, pubescent, apices of the lobes obtuse to rounded or emarginate; lamina lanceolate, 31–36 × 5.4–7.0 cm, green and glabrous on the upper surface, purple or light green with purple tinge and pubescent on the lower surface. Inflorescence terminal, very dense, 17.5–30.0 cm long, exserted, 12–45-flowered; inflorescence axis 16.5–28.0 cm long. Floral bracts 12–45 per spike, arranged *c.* 0.6–1.0 cm apart, 2.7–3.0 × *c.* 0.5 cm, extending beyond half the length of calyx (during anthesis), membranous, red, pubescent, apices obtuse to round. Flowers 5.0–6.0 cm long, many flowers per spike open a day. Calyx 2.0–2.4 × 0.5–0.6 cm, red, pubescent, clefted on one side *c.* 0.6 cm deep, apex bilobed. Corolla tube 1.8–2.2 cm long, almost as long as the bract and calyx; dorsal lobe 3.1–3.4 × *c.* 0.2 cm; lateral lobes 2.2–3.0 × 0.5–0.6 cm. Labellum 3.4–3.5 × 1.3–1.7 cm, bifid up to 2.0–2.2 cm depth, lobes overlapping, yellow (with a red border at the base), apex undulate, obtuse to acute. Lateral staminodes obovate (without any lateral process), 2.8–3.0 × 0.8–1.0 cm, yellow with a red streak at the base along the median. Stamen 2.0–2.1 cm long; filament 0.4–0.5 × *c.* 0.3 cm; spurs *c.* 0.6 cm long; connective *c.* 0.5 cm long, white or yellow; anther 0.9–1.0 × *c.* 0.2 cm; crest absent. Ovary 0.8–0.9 cm long, red, pubescent; style 5.0–5.2 cm long. Epigynous glands *c.* 0.7 cm long. Fruit capsule, oblong, 1.6–1.8 cm long (excluding calyx), red, pubescent. Seeds 40–70, elliptic, 0.1–0.2 × *c.* 0.15 cm; arils prominent, completely covering the seeds.

Flowering and Fruiting: June–December

Distribution: India (Arunachal Pradesh, Himachal Pradesh, Manipur, Meghalaya, Sikkim, Uttarakhand and West Bengal), Bhutan, China, Myanmar and Nepal.

Ecology: Epiphyte; grows in association with moss on moist slopes and rock crevices.

IUCN Status: Least Concern (LC) (IUCN, 2019)

Specimens examined: INDIA. Arunachal Pradesh: Way to Mayodhya, Roing, 12.08.2009, 2508 m, N28°14'07.3" E095°55'12.9" Rajesh & Sanoj 105669 (CALI); Himachal Pradesh: Simla, 1887, Drummond 20951 (E, E00061726); Manipur: Dzuko Valley & Surram Hills, Kujeree forest, 2400 m, 05 September 2003, Mao & Gogoi 112532 (ASSAM); Meghalaya: Shillong, 22 December 1957, Panigrahi 3959 (CAL); Sikkim: On the way from Gangtok to Hanuman Tok, 10 July 2014, Aishwarya & Ahmedul Kabeer 139703 (CALI); Upper Jambari, 2nd mile towards Ganeshtok, N27°20'57.8"E 088°37'28.8", 1880 m, 11 July 2014, Aishwarya & Ahmedul Kabeer 139709 (CALI). Uttarakhand: Chamoli, 1600 m, 03 July 1978, Rao 58428 (DD); West Bengal: Darjeeling, Tiger Hills, N26°02'70.6" E088°17'12.6", 15 July 2014, Aishwarya, Ahmedul Kabeer & Manudev 139727 (CALI). BHUTAN, 30–40 Km north of Phuntsholing, 1500 m, 26 June 1975, Gierson & Long *s.n.* (E, E00061730). NEPAL. *s.die*, Wallich 6530 (E, acc. no. E00211176).

ACKNOWLEDGMENTS

We are thankful to the Department of Science and Technology, Government of India (INSPIRE fellowship No. DST/INSPIRE Fellowship/2012) and Department of Biotechnology, Government of India, for the financial support (BT/PR15275/PBD/16/917/2011). We also thank the Curators and staff of ASSAM, BSHC, CAL, CALI, DD, BM, LINN, LIV, E and K. Thanks are also due to the reviewers for their valuable comments and suggestions. M. Sabu thank CSIR for his CSIR-Emeritus Scientist post at Malabar Botanical Garden and Institute for Plant Sciences, Calicut.

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