



Cryptocarya sheikelmudiyana (Lauraceae), a new species from the Western Ghats in Kerala, India

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(Manuscript received 30 January 2020; Accepted 26 April 2020; Online published 11 May 2020)

ABSTRACT: A new species of *Cryptocarya* (Lauraceae), *Cryptocarya sheikelmudiyana* is described and illustrated. This new taxon characteristically differs from *C. lawsonii* with elliptic apiculate leaves and non-lenticellate, oblong, longitudinally ridged fruits with a constriction just below middle. Detailed descriptions, illustrations, photographs, a distribution map, notes on conservation status, numerical taxonomic analysis of sympatric species and keys are provided.

KEY WORDS: *Cryptocarya sheikelmudiyana*, India, Kerala, Lauraceae, Sheikelmudi.

INTRODUCTION

The genus *Cryptocarya* Brown comprises 300 species (Mabberley, 2017) distributed in warm tropical regions of the world, especially in Asia. Most of the species are found in wet evergreen forests, sometimes in moist deciduous forests, warm broad-leaved forests, inland hill forests or 'Sholas' - montane subtropical evergreen forests (Gangopadhyay and Chakrabarty, 2005). In India, *Cryptocarya* is represented by 15 species of which 10 are endemic (Hooker, 1886; Gamble, 1925; van der Werff, 2001; Gangopadhyay and Chakrabarty, 2005). During the course of botanical explorations along the Western Ghats, the authors came across an interesting *Cryptocarya* from Sheikelmudi in Parambikulam Tiger Reserve. It closely resembles *Cryptocarya stocksii* Meisn. in habit and general morphology and its fruits to *C. lawsonii* Gamble and *C. anamalayana* Gamble. However, it differs from them in a number of vegetative, floral and fruit characters. Critical studies in consultation with types of the related Indian taxa reveal this to be a hitherto undescribed taxon, which is described here. Numerical taxonomy methods were applied here to differentiate the new taxa from the morphologically similar and sympatric species such as *C. lawsonii* Gamble, *C. stocksii* Meisn., *C. wightiana* Thwaites, *C. anamalayana* Gamble, and *C. praetervisiva* Gangop., Chakrab. & A.S. Chauhan.

Being a large, buttressed rainforest tree of the Lauraceae the new taxa assessed against the various IUCN criteria to understand its threatened status.

MATERIALS AND METHODS

The description of this new species is based on living specimens collected by the authors from Sheikelmudi in

the Parambikulam Tiger Reserve along the Western Ghats of India. The taxonomic key provided by Gangopadhyay and Chakrabarty (2005) and other relevant literature dealing with the genus (Hooker, 1886; Gamble, 1925; Kostermans, 1957; van der Werff, 2001; Bachan *et al.*, 2018) were also consulted. Floral characters and fruits were observed using a Leica M80 Stereo microscope attached to a digital camera and field photographs were taken using a Nikon 750 DSLR.

The taxon shows similarity with *C. lawsonii* Gamble and *C. stocksii* Meisn. The details provided by Gamble (1925), Gangopadhyay and Chakrabarty (2005) and in addition with the herbarium specimen of *C. lawsonii* Gamble collected by M.A. Lawson 1884 from Sispara, Nilgiris, designated as type by Gamble in 1925, (K000768412) and syntypes (K000768411, K000768414, K000768415), available at KEW and that of *C. stocksii* Meisn. collected by Stocks in 1864 from Canara (K000768402) used for the critical study and compared for confirming the identity of the new taxon.

A comparative study was carried out with specimens of five morphologically similar and sympatric species (distributed in the evergreen forest of Southern Western Ghats) such as *C. anamalayana* Gamble, *C. stocksii* Meisn. *C. wightiana* Thwaites, *C. lawsonii* Gamble, and *C. praetervisiva* Gangop., Chakrab. & A.S. Chauhan for well differentiation of the new taxa using numerical methods following (Sneath and Sokal, 1973). A total of 71 characters with 305 character states elucidated from the morphological description available with the protologues, in the revision (Gangopadhyay and Chakrabarty, 2005) and as observed from the type specimens were considered for comparison and the cluster analysis provided here (Fig.4). The new taxa evaluated against IUCN criteria (2012) to understand its conservation status based on data of its two available populations.



TAXONOMIC TREATMENT

Cryptocarya sheikelmudiyana A.K.H. Bachan & P.K. Fasila, *sp. nov.* **Figs. 1, 2 & 3**

Cryptocarya sheikelmudiyana resembles *C. lawsonii* Gamble in its leaves, puberulous to tomentose branchlets and large fruits with shallow ridges and *C. stocksii* Meisn. in the oblong fruits. But the new taxon differs from both (<25m *C. stocksii* Meisn. and 15–20 m *C. lawsonii* Gamble), being a large buttressed tree 25–35 m high, with the elliptic to oblong leaves with acute to apiculate apex, veins strictly limited to 7–8 pairs, tepals fulvous tomentose abaxially, non-lenticellate, longitudinally shallowly-ridged oblong fruits with a constriction just below the middle.

TYPE: INDIA. Western Ghats, Kerala, Thrissur, way to Pooppara, Parambikulam Tiger Reserve, flowering twig with mature fruits attached, Sheikelmudi, 10°20'52"N, 76°49'33.4"E, ± 1100 m, 23 September 2018, *K.H. Amitha Bachan & P.K. Fasila, 150502* (Holotype CAL!, Isotypes CALI!, KFRI!)

Large evergreen tree, 25–35 m high; bark greyish brown outside, fleshy, brown inside with creamy white blaze; branchlets terete, greenish-brown when fresh, dark brown when dry, glabrous, puberulous when young, terminal bud hairy, not covered with leaves, lenticels prominent, oval, pale creamy-white. Leaves simple, alternate, exstipulate; petiole 1–1.5 cm long, stout, grooved above, glabrous, greenish when fresh, blackish when dry; lamina elliptic to elliptic-oblong, rarely ovate-oblong, 8–20 × 3–9 cm, sub coriaceous, cuneate, rarely acute, slightly oblique at base, acute to apiculate, rarely acuminate at apex, dark green above, pale greenish-whitish distinctly glaucous beneath, brown above and pale brownish when dry, margins entire, penni nerved; midrib impressed above and prominently raised below, secondary veins 7–8, usually sub opposite to opposite except the central pairs, obscure above and prominent below; veinlets prominent, parallel with scalariform intercostae, arcuate, slightly looped towards the margin. Inflorescence cymose panicles, axillary or terminal on sub terminal branches, 3.6–9.5 cm long, puberulous; peduncle 0.4–2 cm long, brown puberulous. Flowers bisexual, ca. 4 × 2.5 mm, fulvous pubescent, pale creamy-yellow; pedicel 1–2.5 mm long, pubescent; calyx tube pale creamy-yellow, fleshy, coriaceous, 2–2.5 × 1.8 mm; tepals 6 in two whorls of 3, ca. 2 × 1.2 mm, obovate-oblong, obtusely acute at apex, pale creamy yellow, fleshy-coriaceous, fulvous tomentose; fertile stamens 9, in 3 whorls of 3 each, the first two whorls introrse, eglandular, third whorl extrorse, with glands attached to base of the filament; stamens 1.3–1.8 mm long; anthers 0.8–0.9 mm long, ovoid-triangular, filaments 0.4–1 mm long, stout, villous; glands to 0.6 × 0.4 mm, ovoid, stalked, stalk 0.2 mm long, hairy; 4th row staminodes 1 × 0.6 mm, triangular-acuminate, shortly stipitate, villous

along the middle on the abaxial side; gynoecium 2.5 mm long, ovary 1.2 mm long, elliptic oblong, sessile, glabrous, enclosed within the receptacle; ovule solitary; style terete, 1.2 mm long, glabrous; stigma sub capitate. Berry 2–2.4 × ca.1cm, cylindrical-oblong, slightly narrowed and truncate at the apex, broader at base, constricted just below the middle, with 6–11 shallow longitudinal ridges, non-lenticellate, glabrous, light green when young, black when mature, single seeded, fruiting pedicel 0.5–0.6 mm long, terete, glabrous. Seed 1.8 × 0.6 cm, white to light brown when young and reddish brown when mature, glabrous, oblong, narrowly apiculate at apex.

Distribution and Habitat: *Cryptocarya sheikelmudiyana* is distributed in wet-evergreen forests of Southern Western Ghats and is so far known only from two locations in the Anamalai landscape near to Valparai plateau Sheikelmudi of Parambikulam Tiger Reserve and high forest area of the Malakkappara in Kerala. The taxon is a buttressed, top canopy tree seen along the hilltops of wet evergreen forests associated with *Cullenia exarillata* Robyns, *Dysoxylum malabaricum* Bedd. ex Hiern and *Aglaiia malabarica* Sasidh.

Etymology: Named after the type locality, Sheikelmudi, in the north west of Valparai plateau. The name has its origin from the Kadar indigenous community language 'Shekel' means 'sacred' and 'mudi' means mountain top.

Phenology: Flowering and fruiting from Sep. to Apr.

Additional specimens examined: INDIA. Kerala, Thrissur, Parambikulam Tiger Reserve, Sheikelmudi, 76°49'33.4"E, 10°20'52"N, ±1000 m, fruiting twig, January 2019, *K.H. Amitha Bachan & P.K. Fasila 150532* (FRC!, KEW!, TAI!); High Forest, Malakkappara, Malayatoor Forest Division, 76°54'17.5"E, 10°14'50.5"N, ±1000m, Fruting Twig, 22 September 2018, *K.H. Amitha Bachan & P.K. Fasila 137498* (CALI!, KFRI!).

Numerical taxonomy: A total of 71 characters with 305 character states from habit to seeds were compared for the 5 closely related species of the genus *Cryptocarya* using numerical taxonomic methods (Fig. 4). The new taxon showed 52% dissimilarity with its closest allies *C. lawsonii* Gamble and followed by with *C. stocksii* Meisn. The dendrogram shows its affinity more towards *C. lawsonii* Gamble while the *C. wightiana* Thwaites and *C. stocksii* Meisn. remain as sister clade. The *C. anamalayana* Gamble seems to have a different identity from all these four related taxa since it has fulvous pubescent tepals, oblong longitudinally ribbed fruits with a constriction just below the middle and the elliptic to oblong leaves with acute to apiculate apex, veins strictly limited to 7–8 pairs, tepals fulvous tomentose abaxially. The new species *C. sheikelmudiyana* confirmed to be a separate unique identity in the *C. lawsonii* Gamble clade.

Conservation Status: The new taxon is evaluated against IUCN (2012). It is found to occur as two populations, 13 km apart traversed by tea plantations.

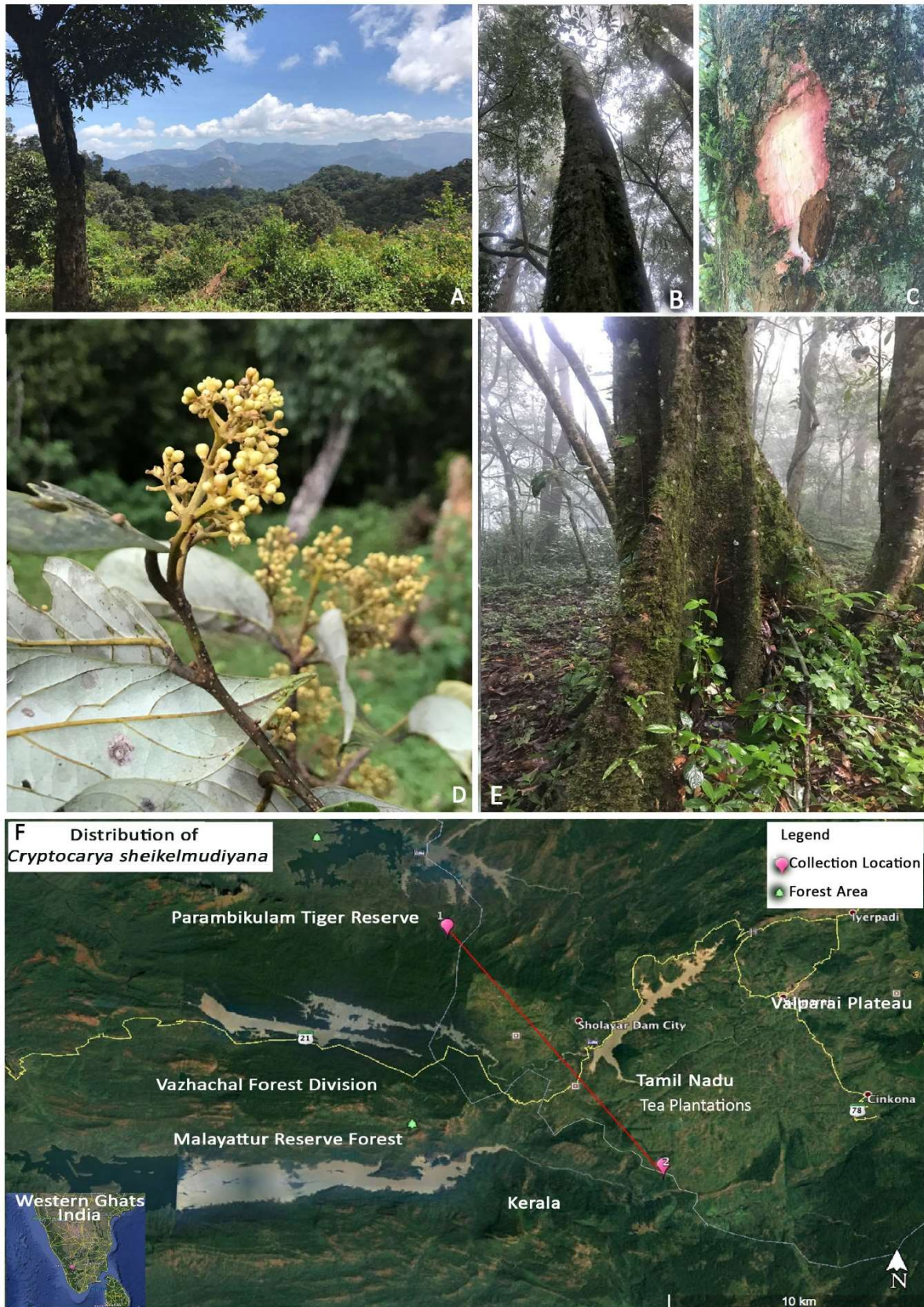


Fig. 1. *Cryptocarya sheikelmudiana* A. Habitat, B. Habit, C. Blaze, D. Flowering Twig, E. Buttress, F. Distribution Map (1. Sheikelmudi; 2. Highforest) from Google Earth Image 2019.

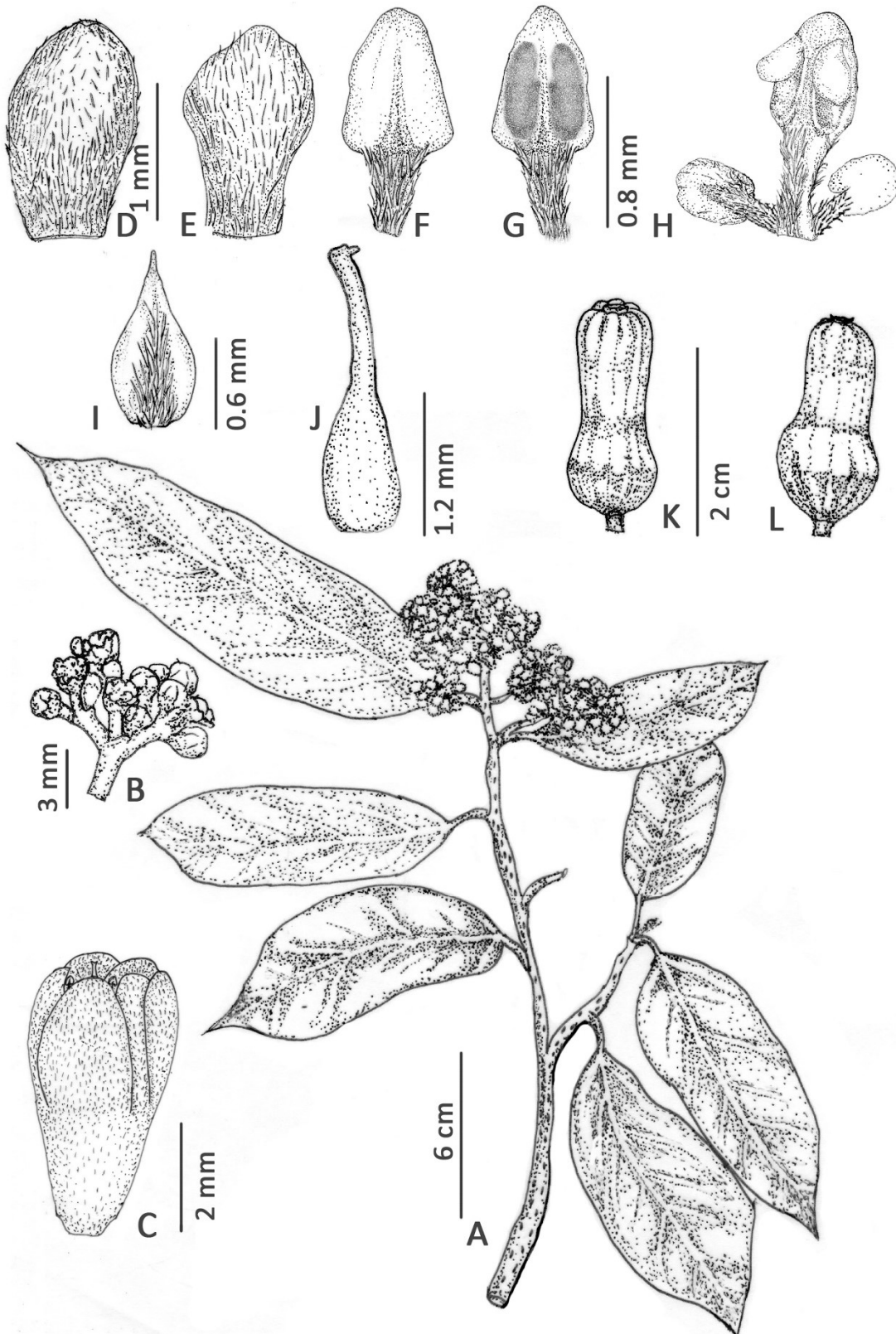


Fig. 2. *Cryptocarya sheikelmudiana*. A. Flowering twig. B. Portion of Inflorescence. C. Single flower. D-E. Tepals, outer and inner. F-H. Stamens, outer, middle and inner row. I. Staminode. J. Gynoecium. K-L. Mature fruits. [Drawn from K.H. Amitha Bachan & P.K. Fasila 150502.]

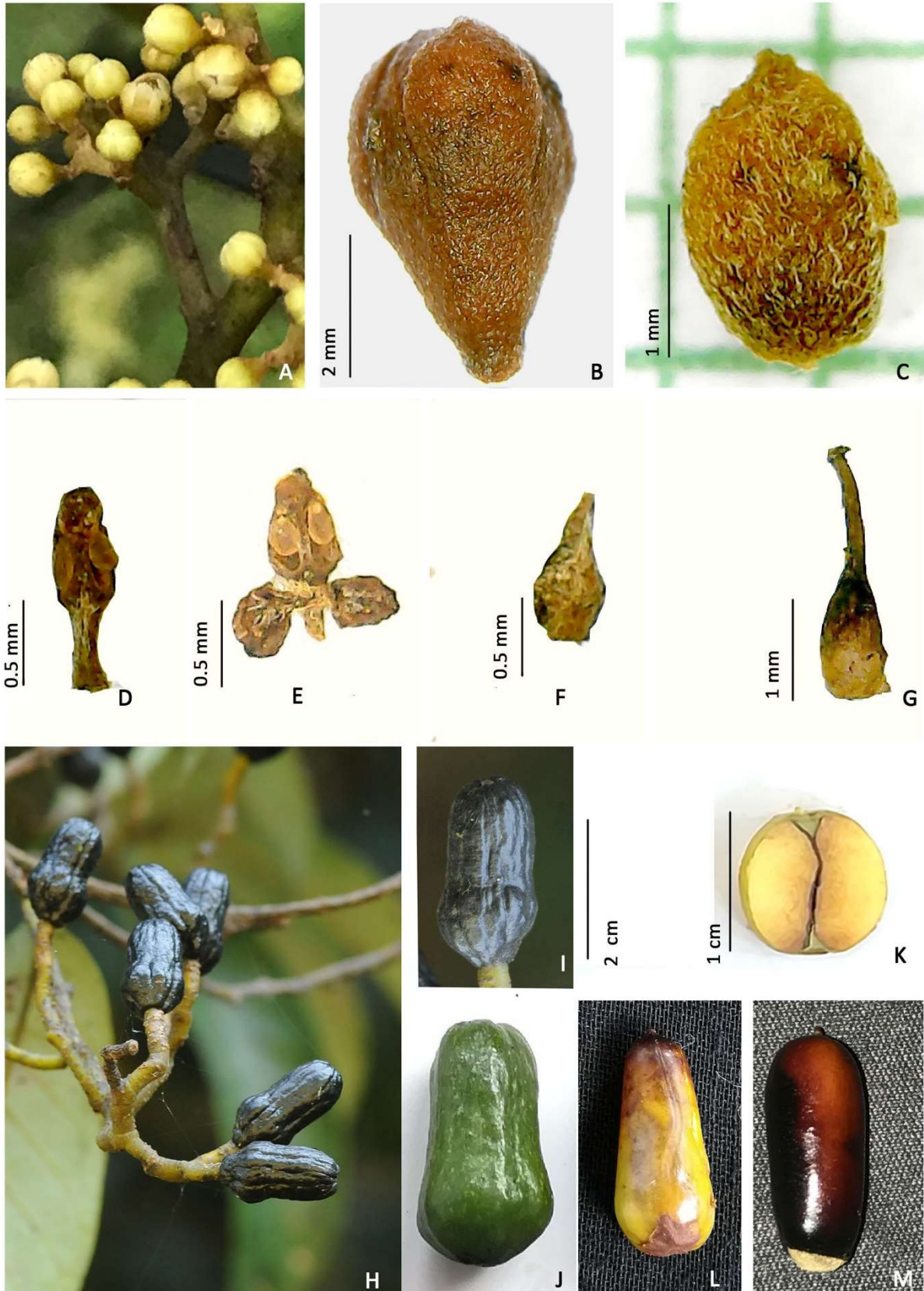


Fig. 3. *Cryptocarya sheikelmudiyana*. **A.** Inflorescence, **B.** Flower, **C.** Tepal (outer view), **D.** Stamen, **E.** Inner Stamen with Glands, **F.** Staminode, **G.** Gynoecium, **H-I.** Fruit (ripe), **J.** Mature Fruit, **K.** CS of Fruit, **L.** Seed (immature), **M.** Seed (mature).



people.

Table 1. Comparison of significant features of *C. sheikelmudiyana* with its closest allies

Characters	<i>C. lawsonii</i>	<i>C. sheikelmudiyana</i>	<i>C. stocksii</i>
tree height	15–20 m	25–35 m tall tree	7–25 m
branchlets	fulvous ochraceous brown adpressed tomentose	puberulous	rufous or rusty velutinous - tomentose
inflorescence branches	peduncle yellow to brown adpressed tomentose	brown puberulous	brown ochraceous tomentose
leaves lamina	oblong to oblong - lanceolate or ovate oblong	elliptic, rarely elliptic oblong	ovate or orbicular
apex	obtuse slightly acute to acuminate	acute to apiculate	obtuse or emarginate at apex
lateral nerves	5–12 pairs	7–8 pairs	5–8 pairs
nerves	not prominent above	not prominent above	prominent above
tepals pubescence	scattered puberulous out side	fulvous tomentose abaxially	scattered puberulous out side
anther shape	ovoid to ellipsoid	ovoid-triangular	ovoid triangular to oblong
stigma	simple	sub capitate	sub capitate
fruit	ovoid, 3.8 cm long, 2 cm broad, furrowed sometimes and often lenticellate	oblong, and 2–2.4 cm long, 0.6–1cm broad longitudinally shallowly sometimes deeply ridged with a constriction just below the middle, non lenticellate	oblong, 2.8cm long, 0.8–1 cm broad, smooth, non lenticellate
fruit color when dry	reddish brown	black	black or blackish-brown
seed shape	ovoid	oblong - apiculate	ovoid oblong

Table 2. *C. sheikelmudiyana*- IUCN status assessment

IUCN Criterion	Explanation	IUCN Status		
		Critically Endangered	Endangered	Vulnerable
A1-A4	Population reduction - can't be estimated since a new species 13 individuals present. Abundance 0.03 per ha	≥ 90%	≥ 70%	≥ 50%
B1. Extent of occurrence (EOO)	Extent of occurrence restricted to 50 km ²	< 100 km ²	<5000 km ²	<20000 km ²
B2. Area of occupancy (AOO)	Restricted to 5–10 km ²	< 10 km ²	<500 km ²	<2000 km ²
a. Severely fragmented of number of locations	Located from 2 locations – 13 km apart, =1 fragmented with tea plantations	=1	≥5	≥10
C. small population size and decline	Only 13 individuals	<250	<2500	<10000
C2 (a)1. Number of mature individuals in each subpopulation	12 individuals in one location and one in another location	≥50	≥250	≥1000
D. Very small or restricted population - Number of mature individuals	13 individual trees	<50	<250	<1000

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Supplementary materials are available from Journal Website.