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Extended Distribution of *Achyranthes coynei* Santapau (Amaranthaceae) in Karnataka, India

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ABSTRACT

The Achyranthus coynei, an endemic (South India) herbaceous plant of the family Amaranthaceae, is known only in Karnataka from the Belagavi district. The present study in the central and southern parts of Karnataka revealed an extended distribution to southward. The plant closely resembled a widely occurring species, Achyranthus aspera var. aspera, and in this communication, a comparative account of its micro-morphology with respect to seed and pollen is given for easy identification of the species.

Keywords: *Chaffy flowers, Dense spike, Pollen morphometry, Santapau, Utricle morphometry.*

INTRODUCTION

The family Amaranthaceae Juss. represents approximately 2,500 species across 179 genera worldwide. In India, 46 genera and over 150 species have been reported, and in Karnataka, about 22 genera and 48 taxa, including intraspecific taxa (7), have been reported so far. The genus *Achyranthes* L. records 33 accepted species from South East Mexico to Venezuela, S. Florida to the Caribbean, Tropical & Subtropical Old World (5). In Karnataka, the genus is represented by three species and two varieties (*Achyranthes aspera* var. *aspera* L., *A. aspera* var. *porphyristachya* (Wall. ex Moq.) Hook., *A. aspera* var. *rubrofusca* (Wight) Hook., *A. bidentata* Blume, *A. coynei* Santapau).

Achyranthes coynei was described by Santapau (8) from Khandala, Maharashtra. Subsequently, the species was recorded from different districts of Maharashtra, viz., Raigad, Sindhudurg, Thane, and Amaravati (10; 3), until it was reported from Karnataka (4). It is considered endemic to Maharashtra. So far, the species is restricted to Maharashtra and Karnataka (7; 6). As per Pai and all categorized this species as Endangered; however, Punkear & Lakshminarsimhan considered it Least Concern. In recent explorations in the central parts of Karnataka, the species has been collected outside the district reported so far, and this report extends its distribution southwards in Karnataka. Specimens have been collected, processed, and prepared using the standard procedure (1) and deposited in the national herbarium, Herbarium UASB, of the University of Agricultural Sciences, Bangalore. Detailed comparative accounts of seed and pollen morphometry for *Achyranthes coynei* and *A. aspera* var. *aspera* have been provided to facilitate distinguishing the species.

MATERIALS AND METHODS

***Study area*:** The present study was conducted in the central and southern parts of Karnataka, with districts covering Chikkamangaluru, Davangere, Dharwad, Gadag, Hassan, and Haveri. Vegetation in these districts is of semi-evergreen, moist deciduous and dry deciduous types (Figure 01).

***Micro-morphology*:** Mature fruits of both species, *A. coynei* and *A. aspera var. aspera,* were collected, and the seeds were carefully separated. The seeds were washed with 98% alcohol and placed directly on a stub (2). The anthers of both species, *A. coynei* and *A. aspera* var. *aspera*, were collected, and the pollen was carefully collected in a vial and dipped in 70% alcohol to remove unwanted gelatinous and fatty substances. A 98% alcohol wash has been used to remove excess water content (11). The samples were dried to the critical point for SEM studies. Microphotographs were taken using a JEOL JSM-IT500LA Scanning Electron Microscope (USIC-SAIF-DST, Karnatak University, Dharwad) with a mini-gold sputter, sputtering gold for 30 s at ~70 mTorr. Microphotographs were taken at different power settings, with 500 µm, 50 µm, and 10 µm (9).

RESULTS

***Taxonomic treatment*:** A taxonomic key to distinguish closely related species, along with a detailed description of the species and micro-morphological details of the seed and pollen grains, has been provided, with a photo plate for easy identification in the field.

1a Dense pink spike, flowers 5 mm, opens erect or straight *A. coynei*

1b Less dense, greenish-pink, flowers 3 mm, opens bent *A. aspera* var. *aspera*

Achyranthes coynei Santapau, Kew Bull. 1948: 488. 1949; Mishra & Singh, End. Threat. Fl. Pl. MH. 196, 2001; Sandeep et al., J. Threat. Taxa. 3(6): 1875, 2011; Sanjappa & Sringeswara, Fl. Karnataka. 2: 57. 2019; Ravikumar et al., Seed Plants of Karnataka. 115. 2021. Figure 03, 04

Perennial sub-erect under shrub to 1.5 m high. Stem terete, woody; branches quadrangular, younger ones pubescent, green or with purple patches, older ones glabrous or glabrescent, brown to purple; nodes swollen. Leaves are deciduous, dimorphic, with lower ones being larger, 15–22 9.6–10 cm, whereas upper ones gradually decreases in size, elliptic or elliptic-lanceolate, acute or acuminate, subglabrous above, pubescent beneath, slightly wavy; petiole 1–3 cm long, channeled, pink above, and green beneath. Flowers in spikes, dense, 21–40 cm long, rachis densely pubescent and whitish. Bract persistent, linear and membranous with distinct midrib, smaller than the longest tepal, up to 5 mm long with rosy tinge at the base; bracteoles two with thin papery wing like structure at the base. Tepals 5 in two whorls, 8 1 mm, glabrous, ribbed, margin scarious. Stamens 5 with filaments fused at base; staminodes fimbriate, half the length of the filaments, alternatively placed with pink. Ovary truncate; style and stigma pink; style 4 mm long, filiform; stigma capitellate. Fruit a capsule ca. 5 mm, enclosed within persistent hardened tepals; seed 1, cylindrical, smooth and brown.

***Phenology*:** Flowering: December; Fruiting: January.

***Specimen examined*:** India, Karnataka, Chikkamagluru District, Ajampura, 06/12/2025, Shreyas Betageri 06 (UASB5902); Davangere District, Channgeri road, 06/12/2025, Shreyas Betageri 05 (UASB5901); Dharwad District, Dhaneshwari nagar, JSS college campus, 10/12/2025, Shreyas Betageri 08 (UASB5904); Gadag District, Jalashankara Gudda, Nagavi, 08/12/2025, Shreyas Betageri & Prashant Karadakatti 03 (UASB5899); Hassan District, Belur road, 06/12/2025, Shreyas Betageri 07 (UASB5903); Haveri District, Halgeri, 06/12/2025, Shreyas Betageri 04 (UASB5900) (Figure 02).

***Distribution*:** India [Gujarat (Kachchh district), Maharashtra (Raigad, Sindhudurg, Thane and Amaravati), and Karnataka (Earlier distribution: Belgaum; Present distribution: Chikkamagluru, Davangere, Dharwad, Gadag, Hassan, Haveri)], Endemic.

***Conservation status*:** According to the current survey across six districts, the population is abundant along road sides, but it is not continuous; it is fragmented. The threats to plants include roadside fires, cleaning, and road widening. Since it is an important medicinal plant and endemic to Southern India, it needs to be conserved, even though its population is relatively healthy.

Pollen morphology:

Pollen of *A. coynei* shows a unit as a monad, small, about 17.03 ± 0.33 × 16.2 ± 0.93 µm; the pollen parameter in A. aspera var. aspera is about 13.61 ± 0.54 × 13.80 ± 0.44 µm. The *A. coynei* pollen class is porate, isopolar. The Pollen and equatorial ratios showed the class as isodiametric; shape exhibits spheroidal; sparsely granulate, non-punctate; outline in polar view is circular; aperture number 8 or more; aperture type: porus; aperture condition: porate, pantoporate; aperture membrane ornamented, pantoaperturate. The pollen surface is psilate-scabrate. Pollen morphometry of both species shows variation in size, with a Verrucate shape (Figure 5).

Seed morphometry:

A. aspera var. *aspera* shows a grey-blackish color with an oblong-obtuse seed shape. The seed is 2.2 ± 0.33 × 1.2 ± 0.55 mm. Testa cells show reticulate streaks with a black dot. The testa cell is about 183.1 ± 1.23 × 43.67 ± 2.54 µm (Figure 6).

A. coynei shows a grey-blackish color with an oblong-obtuse seed shape. The length of the seed is 2.3 ± 0.81 × 1.8 ± 0.54 mm. Testa cells show reticulate streaks. The testa cell is about 163 ± 2.24 × 37.8 ± 5.44 µm (Figure 6).

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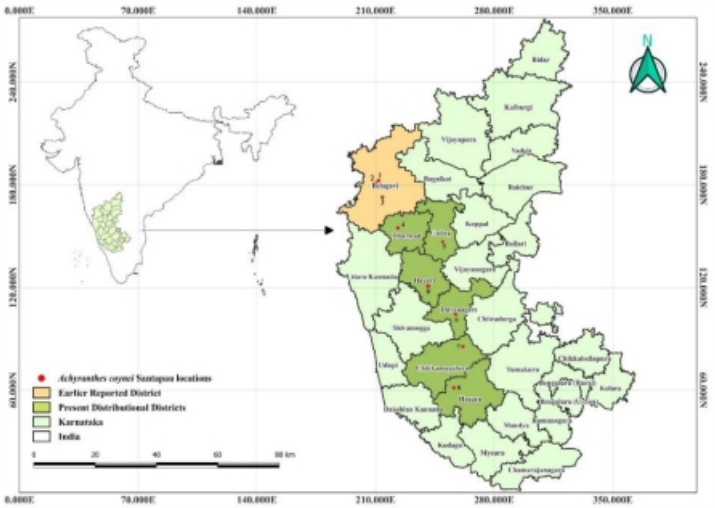

Figure 1: *Map showing earlier distributed district (Belgaum) and present distributional districts (Chikkamagaluru, Davangere, Dharwad, Gadag, Hassan, Haveri) of A. coynei Santapau (QGIS 4.0)*

Figure 2: *A. coynei Santapau. Habitat photographs and Herbarium deposits at UASB from different locations of Karnataka other than Belgaum:* ***AG.*** *Dharwad;* ***BH.*** *Gadag;* ***CI.*** *Haveri;* ***DJ.*** *Davangere;* ***EK.*** *Chikkamguluru;* ***FL.*** *Hassan.*

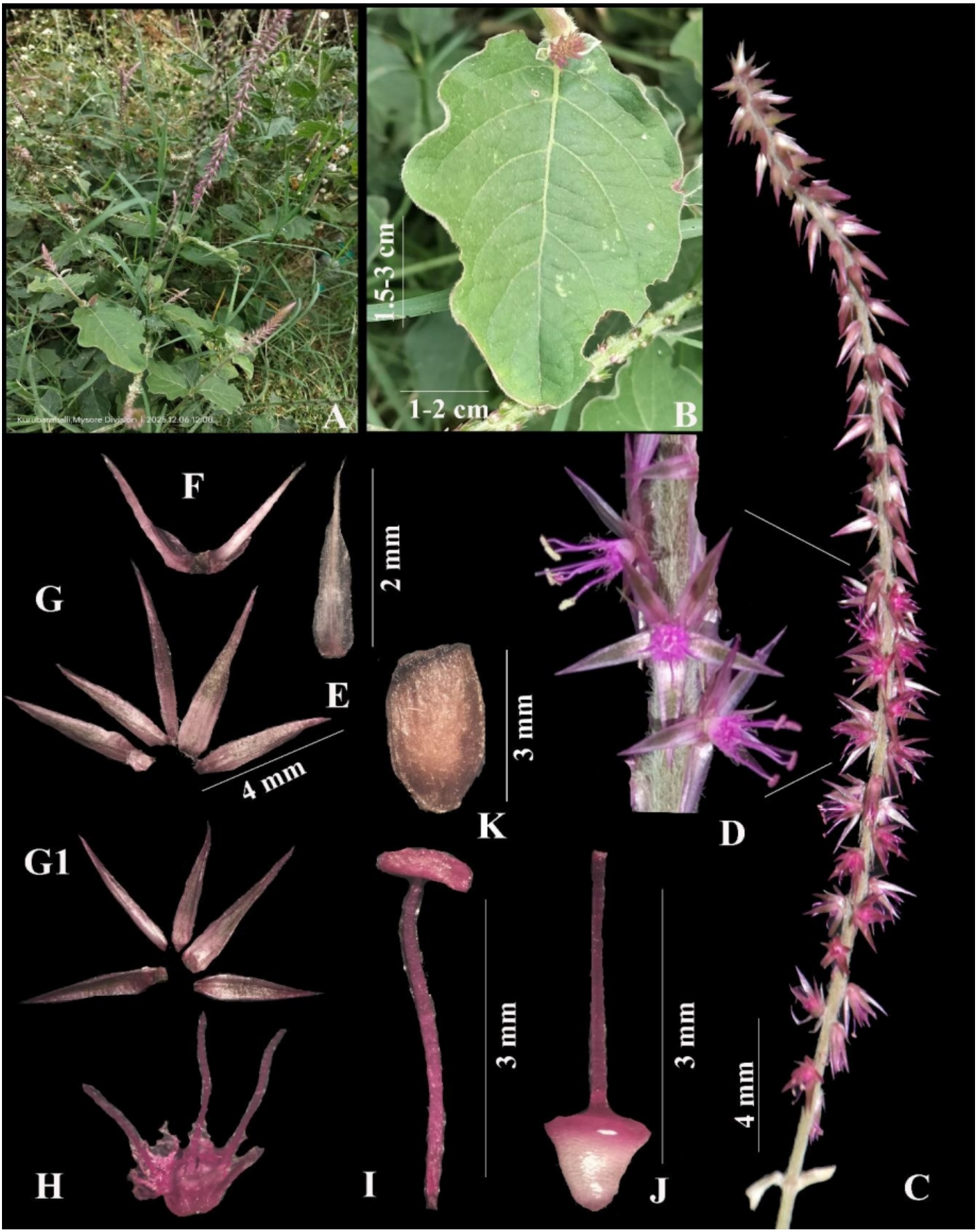

Figure 3: ***A.*** *coynei;* ***B.*** *Dorsal view of leaf;* ***C.*** *Inflorescence (Spike);* ***D.*** *Side view and front view of flower;* ***E.*** *Bract;* ***F.*** *Bracteoles;* ***G. & G1.*** *Dorsal and ventral view of perianth;* ***H.*** *Stamineal ring separated;* ***I.*** *Anther;* ***J.*** *Ovary with stigma;* ***K.*** *Seed (Photography by Shreyas Betageri).*

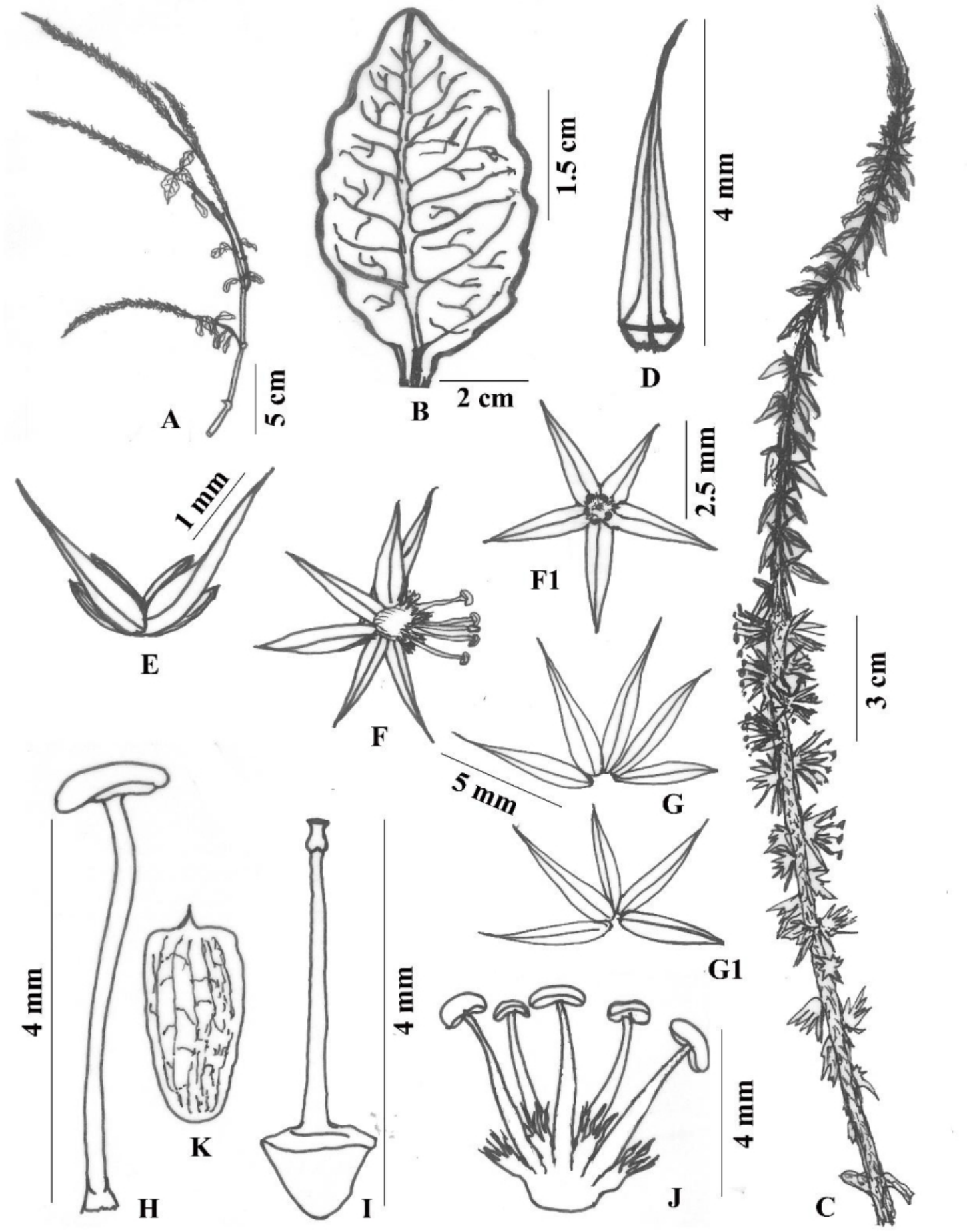

Figure 4: ***Illustration of A. coynei*** *A. Habit; B. Leaf; C. Inflorescence; D. Bract; E. Bracteoles; F. Side view of flower; F1. Front view of flower; G. Dorsal view of perianth; G1. Ventral view of perianth; H. Stamen; I. Gynoecium; J. Staminal ring with staminodes; K. Seed (Illustration by Shreyas Betageri)*

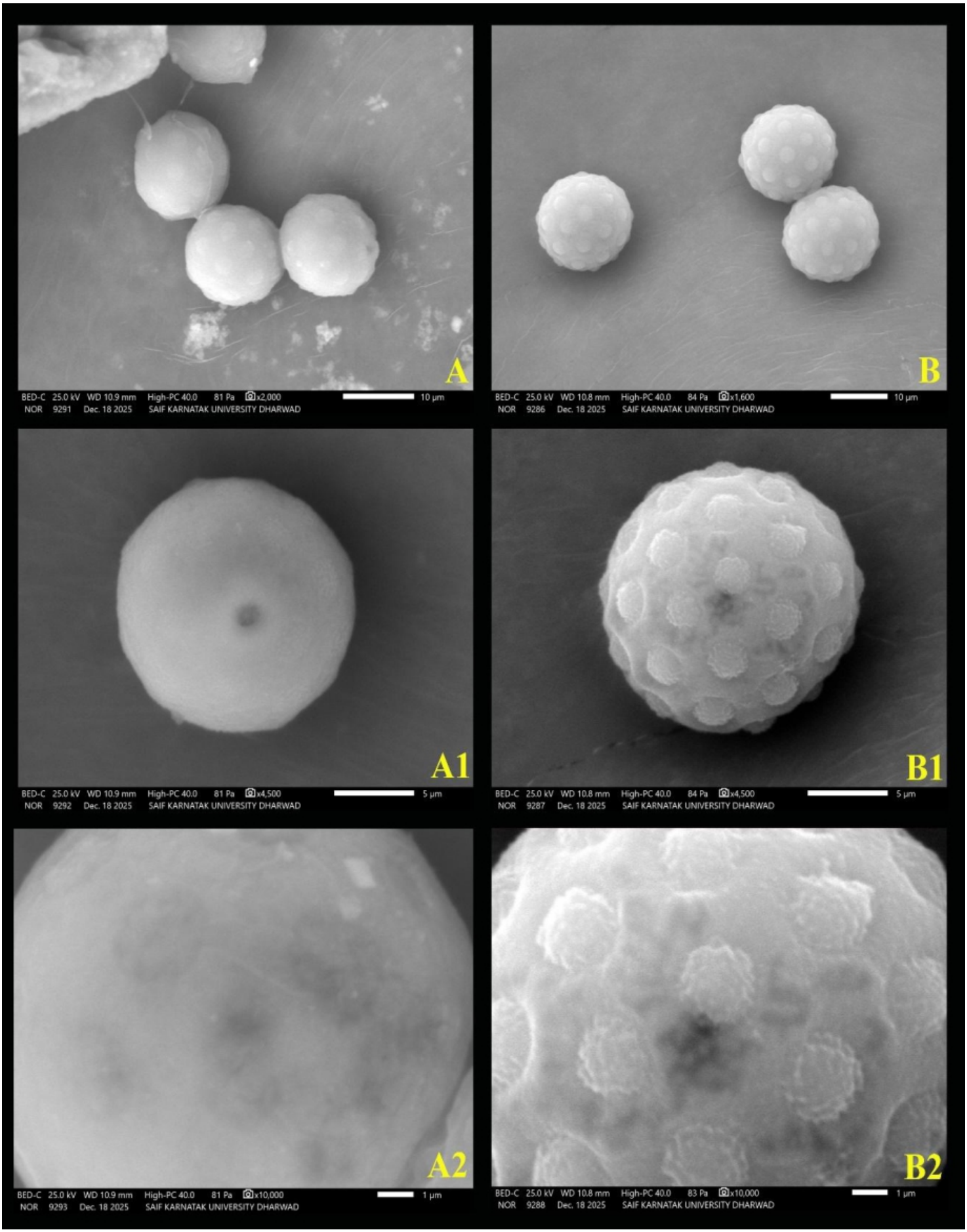

Figure 5: *Pollen morphometry of A. aspera var. aspera* ***A.*** *Pollens;* ***A1.*** *Single pollen enlarged;* ***A2.*** *Surface of pollen;* ***A. coynei B.*** *Pollens;* ***B1.*** *Single pollen enlarged;* ***B2.*** *Surface of pollen.*

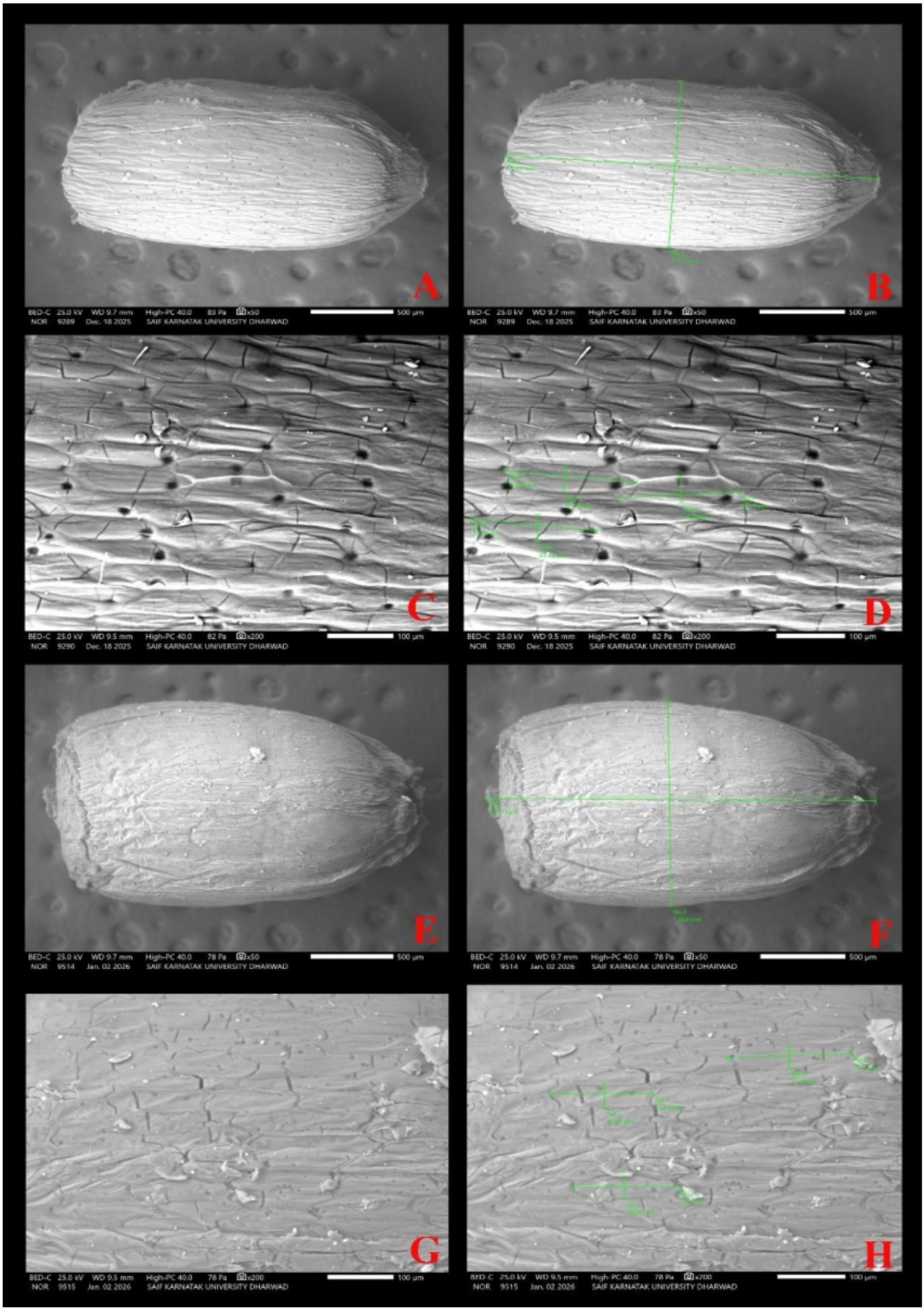

Figure 6: *Seed morphometry of A. aspera var. aspera* ***A. B.*** *Utricle and meauremnts at 50X;* ***C. D.*** *Surface ornamentation with measurements at 200X; A. coynei* ***A. B.*** *Utricle and meauremnts at 50X;* ***C. D.*** *Surface ornamentation with measurements at 200X.*

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