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Bryum cellulare Hook. (Bryophyta; Bryaceae) – A New Distributional Record from West Bengal Bryoflora, India

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ABSTRACT

Bryum cellulare Hook. is reported for the first time from Purulia district of West Bengal. Previously, it was known only from Gujarat, Odisha, Maharashtra, and Rajasthan. A brief illustrated taxonomic account and ultrastructure of peristome teeth with spores is provided for easy identification.

Keywords: New record, *Bryum,* Peristome, SEM, Spore, West Bengal

1. INTRODUCTION

Genus *Bryum* Hedw. is one of the largest genera of mosses represented by 1000 species worldwide (Gangulee 1974-1978; Shaw 1985 and Spence 2005) and 36 species in India (Bansal & Nath 2013a, 2013b, 2018). The maximum number of species (25 sp.) under the genus *Bryum* are distributed in Eastern Himalaya, followed by Western Himalaya with 18 species, Central India with 17 species, Western Ghats with 16 species, eastern Ghats and Decan Plateau with six species, Punjab and West Rajasthan with five species, Gangetic plains with four species and only one species in Andaman Nicobar Islands (Figure 1).

While studying the bryoflora of South West Bengal, the author came across a few interesting specimens of *Bryum* that were collected from Ajodhya hills of Purulia district in 2022. Subsequent study of these specimens and scrutiny of pertinent literature (Dabhade 1998; Chaudhary and Deora, 2001; Chaudhary et al., 2006; Singh and Ghosh, 2007; Chaudhary et al., 2008; Alam 2013; Frahm et al., 2013; Alam et al., 2014; Bansal and Nath, 2014; Alam et al., 2015; Mishra et al., 2016; Rawat et al., 2015) revealed it as *B. cellulare* species earlier known from Western Himalaya, Western Ghats, Eastern Ghats, and Decan plateau in India.

2. MATERIAL AND METHODS

The collected specimens were initially kept in blotting paper packets with a part of the same preserved in 70% alcohol with a trace glycerol. The external morphology was studied with a stereo zoom dissecting microscope model Stemi-508. The anatomical details were studied with the help of a stereo phase contrast microscope model Primostar. SEM photomicrographs were taken under a Marlin scanning

electron microscope (ZEISS FESEM SUPRA-40). The studied plants is deposited in the Cryptogamic sections of the Vidyasagar University Herbarium, Medinipur, West Bengal, India.

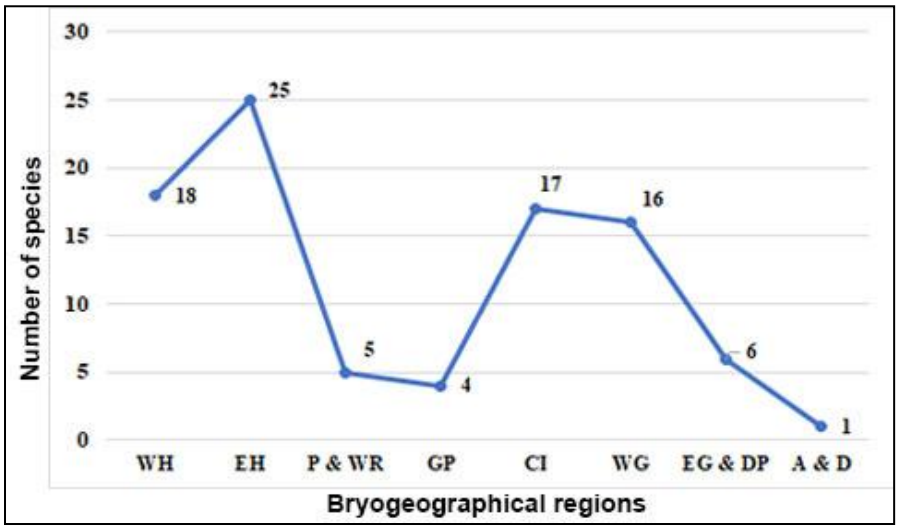

Figure 1. Distribution of genus *Bryum* Hedw. in different bryogeographical regions of India. WH = Western Himalaya; EH = Eastern Himalaya; P & WR = Punjab and West Rajasthan; GP = Gangetic Plains; CI = Central India; WG = Western Ghats; EG & DP = Eastern Ghats and decan

3. RESULTS

Taxonomic Treatment

Bryum cellulare Hook. in Schwäegr. in Sp. Musc. Suppl. 3(1): 214. 1827 (**Figures 2, 3**)

Plants are small, reddish green, densely tufted. Stem erect about 3–6 mm. long, branched by 2 to 3 sub-floral innovations densely and uniformly foliose, in T.S. with an indistinct central strand of large thin-walled cells bounded by the inner and 2-layered thick outer cortex and 1-layered epidermis. Leaf erectopatent, ovate lanceolate 1.2–1.8 mm long and 0.4–0.5 mm wide at the middle, concave with an acute apex; margin flat, entire with a very narrow border, in T.S. showing unistratose lamina and in midrib steridal cells below 2–3 guide cells. Younger leaves are smaller. Costa reddish, percurrent or ending a little below apex. Leaf cells lax, thin-walled, sub-rectangular at base with 5–10 × 5 µm length with 4–6 × 5 µm width becoming rhomboid to hexagonal at apex with 6–10 × 5 µm length and 4 × 4.5 µm wide: marginal row of very long linear cells with 11–16 × 5 µm length and 1–2 × 4.5 µm wide. Middle cells along with costa 11–15 × 5 µm long and 2–4 × 4.5 µm wide. Seta slender, apical, red, erect (flexuose when dry), brownish, 1.6–2 cm long, and cross-section of seta semi-rounded to hexagonal parenchymatous cells. Mature capsule red-brownish and immature capsule light green in color, nodding to horizontal, clavate-cylindrical, 3–3.5 mm long and 1mm wide at top with a short tapering neck and a broad mouth; stomata scattered in the apophysis region, actinocytic stomata, arranged horizontally, two guard cells are present, and 9–10 epidermal cells are arranged in a circular pattern around the guard cells. Operculum is small, and covex-conical. Peristome deeply inserted at the urn mouth, normal, outer teeth brownish yellow, 320–350 µm long and 55–65 µm wide, gradually acuminate; endostome free, broadly from the outer peristome, narrow segments from a very low basal membrane and without any cilia, densely papillose. Spores globose, brownish green, finely papillose, 9–12 µm in diameter.

Peristome teeth and spores under SEM:

Peristome diplolepidous; exostome teeth lanceolate-broadly lanceolate; boarder of exostome teeth 8–12 µm wide, median line zig-zag shaped in lower part, more nearly straight above, ventral trabeculae of segments having smooth surface, 25–30; exostomial teeth forming brush like projection showing papillose ornamentation on the dorsal surface; endostome free, surface conspicuously granulose, basal membrane more than ½ of height exostome, segments broadly perforated below, narrowly split above, cilia papillose. Spore spherical-ovoid, yellow brown in colour, 8–11µm in diameter, proximal surface curved semi-rounded cup-like gemmate ornamentation with round and blunt papillate, each papillae 0.2–0.3 µm high; distal surface densely papillae with a tendency to coalesce with each other.

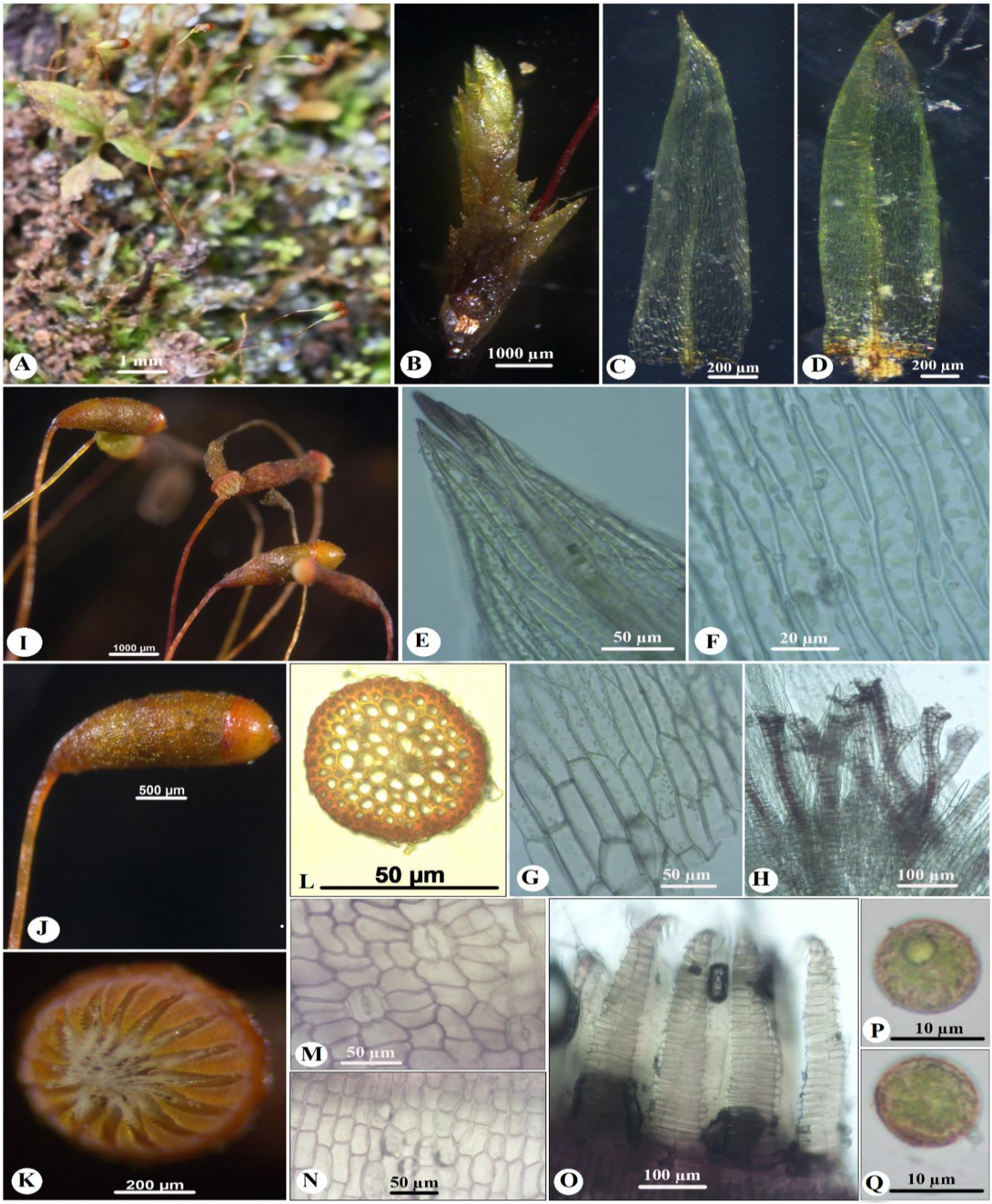

Figure 2. ***Bryum cellulare*** **Hook.**, **A.** Habit; **B.** Whole leaf body; **C, D.** Leaves; **E.** Apical laminal cells; **F.** Median laminal cells; **G.** Basal laminal cells; **H.** Archegonium; **I.** Mature capsule with seta; **J.** Enlarged view of capsule; **K.** Peristome teeth; **L.** Cross section of seta; **M.** Stomata; **N.** Capsule wall; **O.** Outer peristome teeth; **P-Q.** Spores.

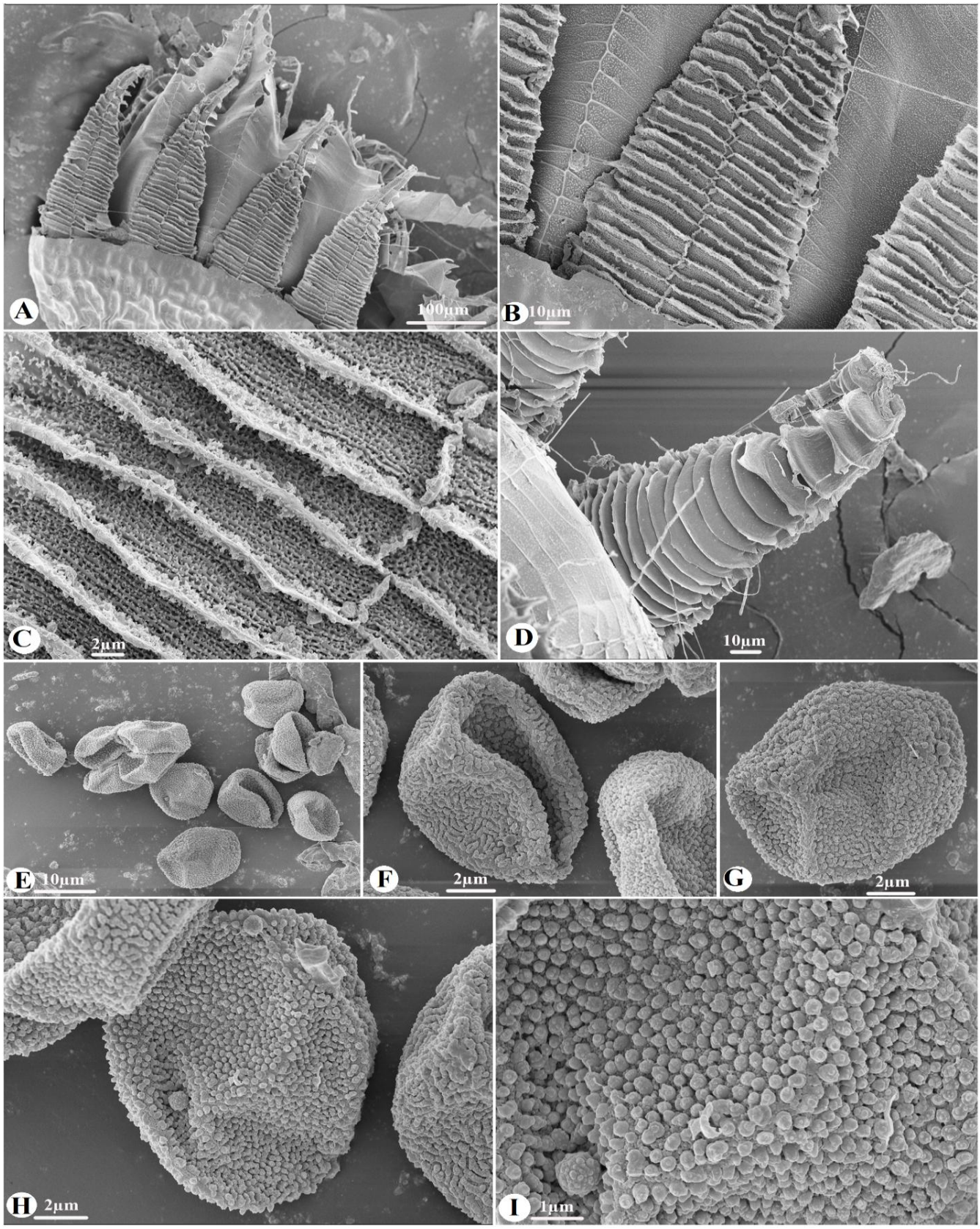

Figure 3. ***Bryum cellulare*** **Hook.**, **A.** Exostome and endostome under SEM, **B.** Dorsal surface of exostome, **C.** A portion of the same enlarged, **D.** Endostome showing smooth surface, **E.** Spores, **F.** Spore in proximal view, **G-H.** Spore in distal view, **I.** A portion of the same enlarged.

Habitat and ecology:
Terrestrial, growing in moist soil covered with rocks in Sal (*Shorea robusta*) forest in association with *Bartramia* species.

Specimens examined:
India, West Bengal, Purulia district, Ajodhya hills, Hill top, 23º12'48.18''N, 92º22'42''E, c. 532m, 11.11.2022, Islam & Saadi 01001, 01002 (Vidyasagar University Herbarium).

Distribution:
Arunachal Pradesh, Western Himalaya, Gujarat, Odisha, Maharashtra, Rajasthan, West Bengal (present study), Myanmar, Nepal, Sumatra, Java, Bali, Philippines, Taiwan, China, Japan, Europe, North & Central Africa, Australia.
Plateau; A & N = Andaman Nicobar Island.

4. DISCUSSION

B. cellulare is characterized by leaves ovate-lanceolate (Fig. 1. C, D), margin flat, entire (Fig. 1. E), peristome broadly lanceolate, exostome showing brush-like projection with papillose ornamentation (Fig. 1. O; 2. A-C). Spore globose, densely papillate with a tendency to coalesce with each other (Fig. 1. P, Q; 2. E-I). *B. cellulare* is somewhat similar to *B. apiculatum* and *B. dichotomum* in having larger spores, a papillate pattern, and a yellowish-green color. However, it is similar to *B. capillare* in having densely papillate spores, but *B. cellurare* has 1–2 broad granules throughout the spore surface and an exostome showing brush-like projections with papillae ornamentation and a ventral trabeculae smooth surface. Therefore, the present communication reports newly extended distributional records from West Bengal, India.

5. CONCLUSION

The Ajodhya Hills in Purulia, part of the central bryo-geographical region, harbor rich biodiversity not only in angiosperms but also in bryophytes. This study documents a new occurrence of *Bryum cellulare* from Purulia, West Bengal, India, and presents its morphological and ultrastructural features along with notes on its conservation.

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Conflict of Interest
The authors declare that they have no conflicts of interest, competing financial interest or personal relationship that could have influenced the work reported in this paper.

Informed consent
Not applicable.

Ethical approval & declaration
In this article, as per the plant regulations followed in the Vidyasagar University, Midnapore, West Bengal, India; the author observed the occurrence and distribution of *Bryum cellulare* (Bryophyta; Bryaceae) from Purulia district, West Bengal. The ethical guidelines for plants & plant materials are followed in the study for species collection & identification.

Data and materials availability
All data associated with this study are present in the paper.

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