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Taxonomic notes on some species of Genus *Bryum* Hedw. in Rawatbhata Subdivision of District Chittorgarh

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Abstract
The genus Bryum Hedw., an acrocarpous moss of family Bryaceae is considered to be one of the largest genus of mosses. A critical study on the genus Bryum Hedw., revealed the occurrence of 4 species from Padajhar, Dariba and Bhainsrodgarh region of Rawatbhata subdivision of Chittorgarh District. The four species collected are
Bryum cellulare Hook., Bryum paradoxum Schwaegr., Bryum capillare Hedw., and Bryum caespiticium Hedw. Identification key to all the known species of the genus alongwith the notes on their taxonomy and distribution have been provided.
Keywords: *Bryum, moss, Padajhar, Dariba, Bhainsrodgarh, Rawatbhata, Chittorgarh.*

I. Introduction

The Bryaceae constitutes one of the largest families of mosses after Pottiaceae (Vohra and Aziz, 1997) with 13 genera and approximately 850 species (Shaw, 1985). Lal (2005) reported 11 genera under this family from India and out of which 10 genera: *Anomobryum* Schimp., *Brachymenium* Schwaegr., *Bryum* Hedw., *Epipterygium* Lindb., *Leptobryum* (B.S.G.) Wils., *Mielichhoferia* Nees & Hornsch., *Mniobryum* Limpr., *Plagiobryum* Lindb., *Pohlia* Hedw. and *Rhodobryum* (Schimp.) Hamp. are widely distributed in eastern Himalaya. The family includes those acrocarpous mosses which have erect and usually sparsely branched stems, capsules bearing sterile neck region and a diplolepideous peristome. The genus *Bryum* Hedw. of this family is most important and occurrs in variety of habitats in tropical and subtropical regions of the world, yet it is poorly understood taxonomically due to its great species diversity and morphological plasticity within the species. The genus being polymorphic with about 700

species worldwide (Gangulee, 1974–1977) is placed under subfamily Bryoideae with other genera *Acidodontium, Anomobryum, Brachymenium, Plagiobryum, Roellia* and *Rhodobryum* (Spence, 1987). Among the bryogeographical regions of India, eastern Himalaya is considered as one of the centre of origin and diversification of the bryophytes (Dixon, 1937). The region has considerably rich bryological diversity, which is due to the variable climatic conditions, habitat, geography and altitudinal variations.

Gangulee (1974–1977) made valuable contributions on the mosses of eastern India and adjacent regions and described twenty two species of *Bryum* from different parts of the country. He mentioned that Sikkim with 12 taxa was high in diversity, after which was Darjeeling with 9 taxa. Only 5 taxa were present in Khasia hills, Meghalaya while both Arunachal Pradesh and Assam were represented by 2 taxa each. Lal (2005) in his *Checklist of Indian Mosses* reported 21 taxa of the genus from eastern Himalaya, whereas Dandotiya *et al*. (2011) provided a checklist of the bryophytes of India which included 45 taxa of *Bryum* from India. They listed 26 taxa from eastern Himalaya including 15 taxa in Sikkim, 9 in Darjeeling, 7 in Khasia hills, 16 in Manipur, 4 in Assam, 2 in Arunachal Pradesh. Barukial (2011) reported 4 species of the genus from the Assam state. Bansal and Nath (2011) reported *B. argenteum* for the first time from Nagaland. Later, Govindapyari *et al.* (2012) listed the acrocarpous mosses from Imphal district, Manipur, and reported 13 taxa of *Bryum.* Bansal and Nath (2012 a,b) reported *B. bessonii* for the first time from eastern Himalaya and described *B.coronatum* as an addition to the bryoflora of Meghalaya. The present work provides the four species of genus *Bryum* in Padajhar, Dariba and Bhainsrodgarh region of Rawatbhata subdivision of Chittorgarh District.

II. Materials and Methods

Present work is based on the field collection of fresh plants of bryophytes from the study area. Most of the places were visited several times during different seasons of the year, especially following rains. Surveys were carried out in all possible habitats and microhabitats, like dense forests, degraded forests, marshy pockets, wells, step wells, dams, canals, buildings, fluvial streams, non-fluvial streams, caves, crevices, etc. most of the places of study area were visited and various habitat types in the study area have been observed. Most of these

habitat types were visited several times during different seasons of the year, especially following rains when bryophytes flourish well due to high humidity and optimum temperature. Plants from various habitats and localities were collected by scraping out from the substrate with the help of a sharp-edged knife. The field data were recorded in the field book, such as the date of collection, locality, altitude, habitat etc. All identified and labelled specimens have been deposited in the Bryology Laboratory, Dept. of Botany, Maharana Pratap Post Graduate College, Chittorgarh. A description of each species was prepared.

Taxonomic Treatment

Key to the species

1.	Leaves spirally twisted when dry, dense in upper region forming comal tuft; costa ends in arista up to 0.35 mm.	***B. capillare***
2.	Leaf margin usually revolute, Costa ends in short (.15 mm.) arista; margin more or less revolute all along, entire except mild denticulation at top	***B. paradoxum***
3.	Plant reddish green; leaf not hyaline on top	***B. cellulare***
4.	Leaves light–silky green; margins broadly reflexed to strongly revolute all along the length; costa long–excurrent, ending in a 0.30–0.48 mm long arista	***B. caespiticium***

1. *Bryum cellulare* Hook. Schwaegr., Spec. Musc. Suppl. 3 :1 : 214a.1827.

Plants small, reddish green, densely tufted. Stem erect, about 3-6 mm. long. branched by 2 to 3 subfloral innovations, densely and uniformly foliose. Leaf erecopatent, ovate-lanceolate, ± 1.8mm. long and 0.5 mm. wide at middle, concave with an acute apex; margin flat, entire, with a very narrow border. Younger leaves smaller and costa reddish. Leaf cells lax, thin-walled, sub-rectangular at base (±95 × 19 μ), becoming rhomboid to hexagonal at apex (± 83 × 15 μ); marginal row of very long linear cells. Seta apical, erect (flexuose when dry), brownish, ± 1.8 cm. long. Capsule horizontal, clavate-cylindraical, brownish and operculum conical. Dioecious, antheridia ± 380 μ long with long paraphyses.

Field note: Plants grow on soil, rocks and shady places.

Locality: Bhainsrodgarh.

Distribution: Western Himalayas, Gujarat, Rajasthan, Sumatra, Java, Bali, Philippines, Japan, Europe and Australia.

2. *Bryum paradoxum* Schwaegr., Spec. Musc. Suppl. 3(1) : 224 a, 1827.

Plants green, slender tufted, radiculose below. Stem 2.7 cm. high, erect, branched by subfloral innovations. Leaves crowded at upper but smaller and distinct below, (moist) erectopatent or spreading, (dry) closely appressed, oblong lanceolate, linear, acuminate, 2-2.4 mm. long and 0.6 mm. broad; entire, mild toothed at tip; costa strong, excurrent in a short arista. Upper and middle cells rhomboid to hexagonal, thin-walled, border cells narrower, cells from base rectangular, apical cells 7-16 x 4.77 μm. long, 3-5 x 4.77 μm. wide, middle cells 13-16 x 4.77 μm. wide and basal cells 5-7 x 4.77 μm. long and 5-7 x 4.77 μm. wide. Plants sterile.

Field notes: Plants are found to grow on soil.

Locality: Dariba and Padajhar.

Distribution: East Nepal, Sikkim, Darjeeling, Bhutan, Khasia hills, Western Himalayas, Rajasthan, Gujarat, China, Taiwan, Korea and Japan.

3. *Bryum capillare* L.ex. Hedw., in Sp. Musc. 182, 1801.

Plants soft, densely tufted, green and reddish below. Stem 4 mm. to 1 cm. long with many subfloral innovations. Leaves crowded at stem apex, acuminate and ovate. Upper and middle cells rhomboid hexagonal, thin walled, upper cells 12–23 x 4.77 μm wide, 30–50 x 4.77 μm long, middle cells 11–23 x 4.77 μm wide, 50–60 x 4.77 μm long, basal cells 70–80 x 4.77 μm wide, 50–60 x 4.77 μm long, rectangular, coloured cells at leaf attachment. Seta apical, erect but arcuate at tip, up to 1.2 cm. long, red. Capsule horizontal, pyriform to cylindrical, with a tapering apophysis and a wide mouth, upto 4 mm. long, brown with a red mouth. Peristome deep inserted, normal, outer teeth reddish at base, paler at tips; endostome free from outer, hyaline with segments as high as outer teeth and regular appendiculate cilia. Spore variable in size 9–15 μm in diameter.

Field notes: Plants are found to grow on soil.

Locality: Padajhar and Bhainsrodgarh.

Distribution: Western Himalayas, Kashmir, South India, Rajasthan, Gujarat, Thailand, North Vietnam, China, Australia and New Zealand.

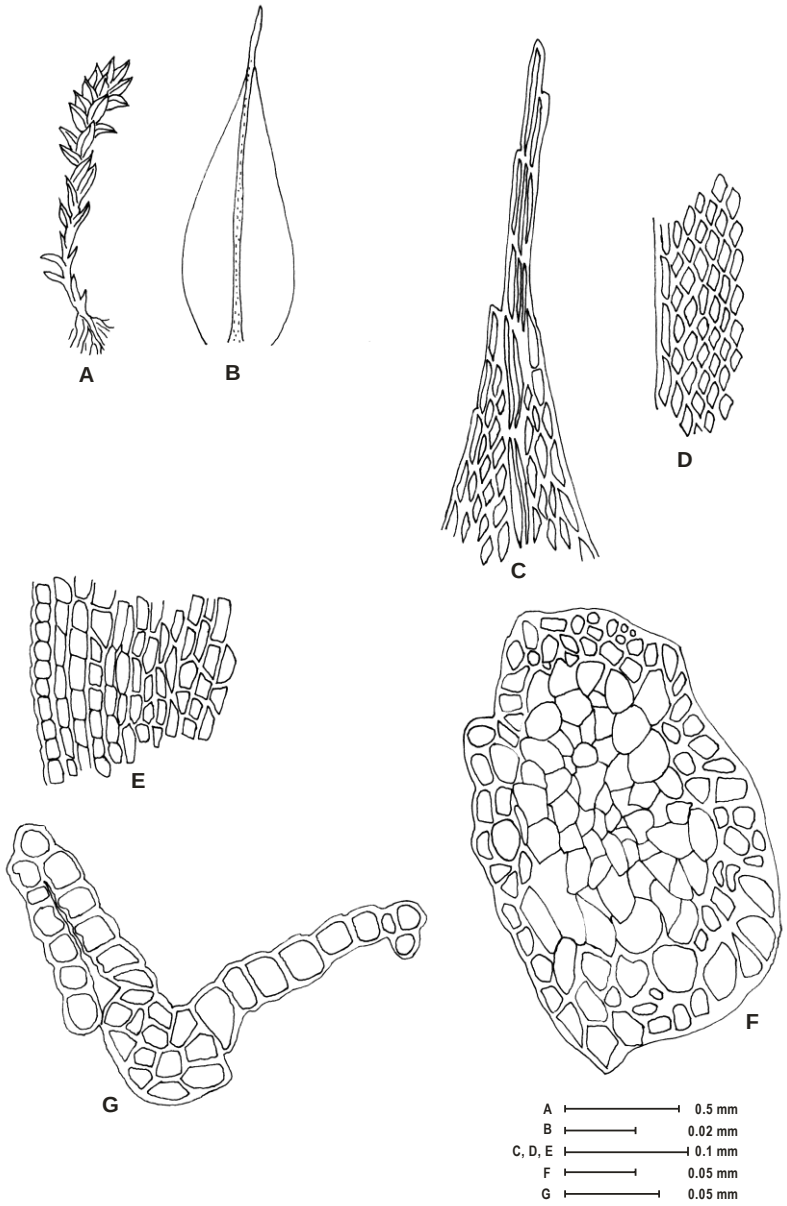
4. *Bryum caespiticium* L.ex. Hedw., in Sp. Musc. 180, (1801).

Plants densely caespitose, silky green. Stems about 7 mm long with several subfloral innovations which usually do not show comal tufts. Leaves small, comal tufts clear only on main shoot, erect to erectopatent, not twisted when dry, oblong to ovate-lanceolate, acuminate, up to 2.1 mm long and 0.6 mm broad; margin revolute all along length, almost entire. Lower leaves smaller. Costa strong, excurrrent and extends beyond leaf tip into an awn. Leaf cells thin walled; rhomboidal, 57 X 20 µm at apex; about two rows in the margin are narrower and longer forming a border but this is not always distinct specially at the apex; basal cells sub-rectangular, up to 55 µm long and 20 µm broad.

Field notes: Plants are found to grow on soil.

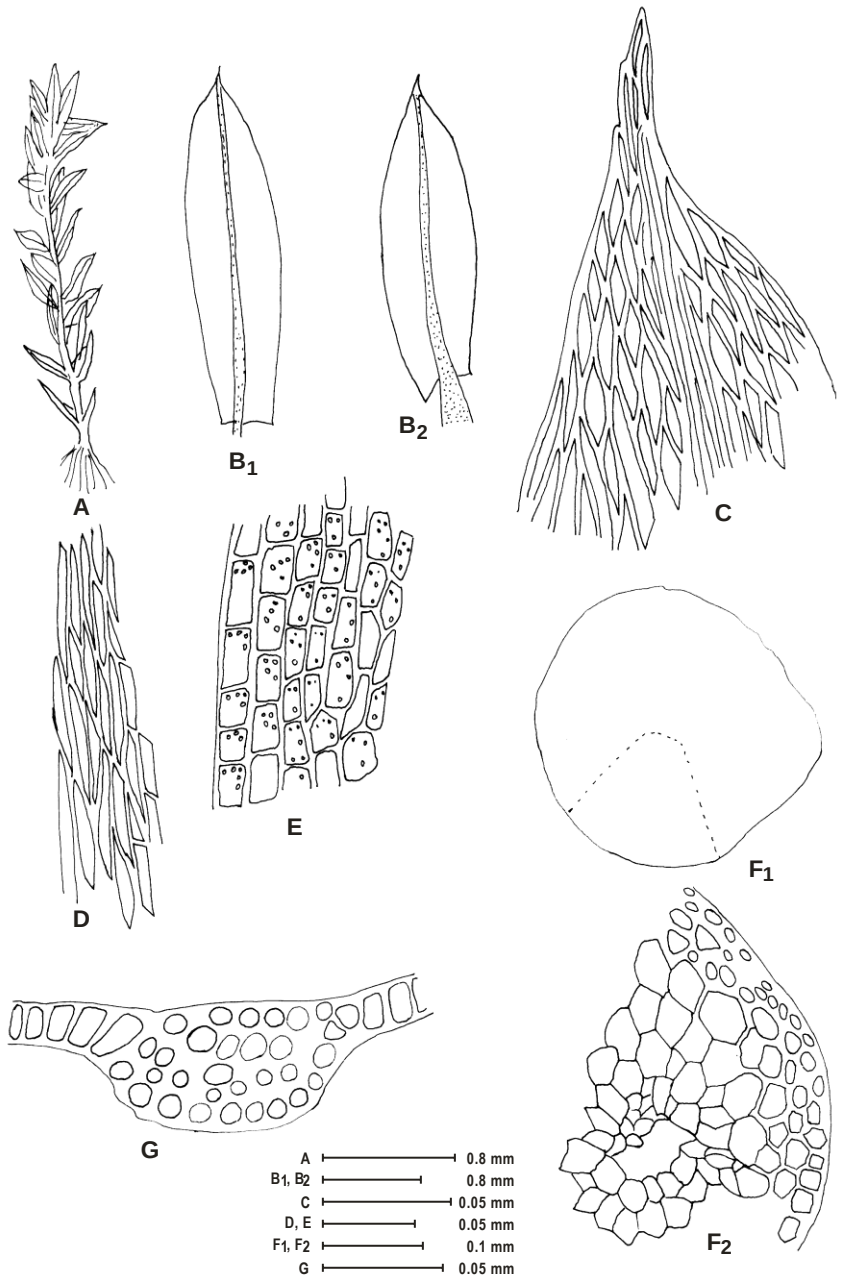
Locality: Dariba.

Distribution: Western Himalayas, East Nepal, Bhutan, Khasia hills, Korea, Japan, China, Taiwan, Australia and New Zealand.



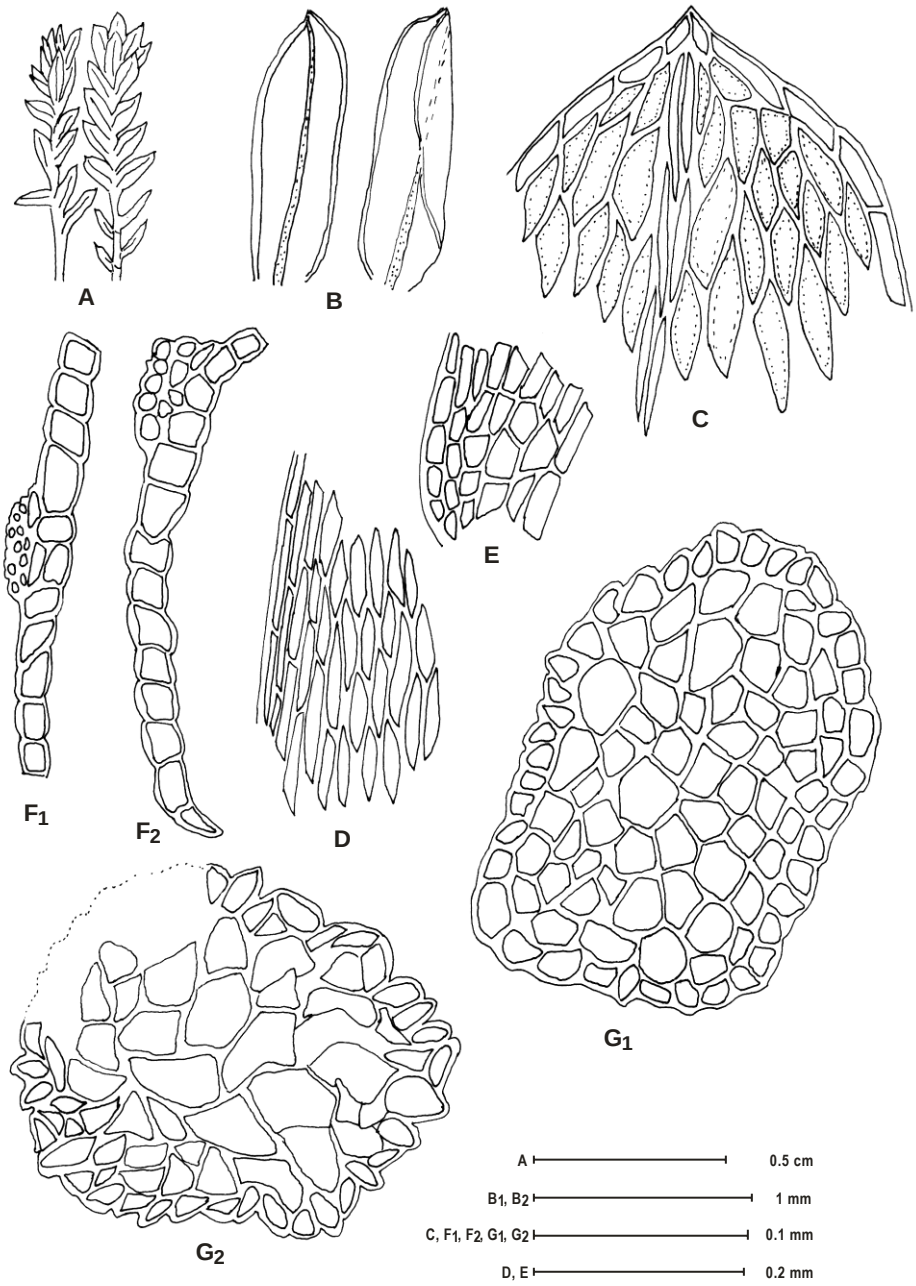
***Bryum capillare* L. ex. Hedw.**

A. Plant; B. Leaf; C. Cells from upper part of leaf; D. Cells from middle part of leaf; E. Cells from basal part of leaf; F. C.S. of stem; G. C.S. of leaf.



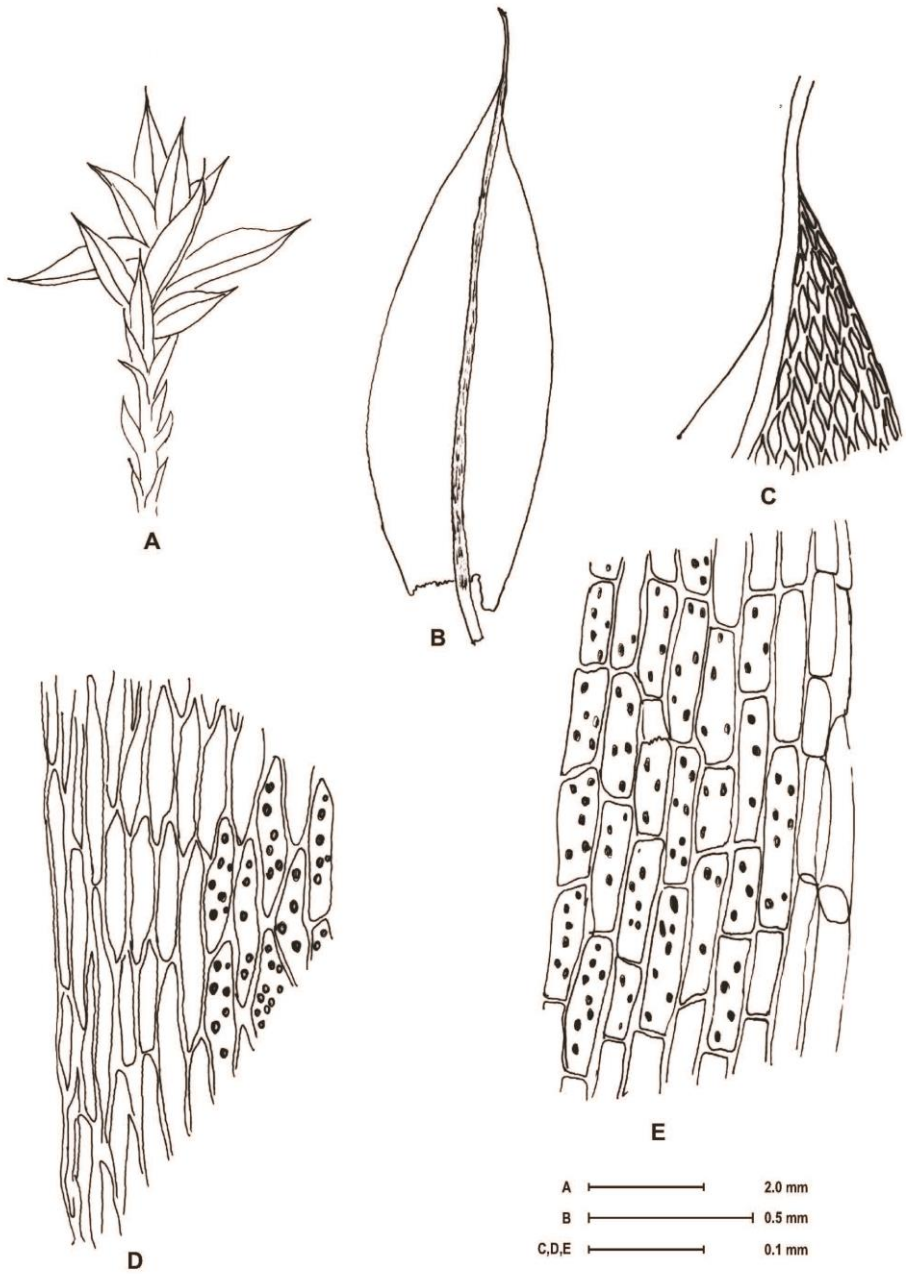
***Bryum paradoxum* Schwaegr.**

A. Plant; B_1-B_2. Leaves; C. Cells from upper part of leaf; D. Cells from middle part of leaf; E. Cells from basal part of leaf; F_1-F_2. C.S. of stem; G. C.S. of leaf.



***Bryum cellulare* Hook.**

A. Plants; B. Leaves; C. Cells from upper part of leaf; D. Cells from middle part of leaf; E. Cells from basal part of leaf; F_1 -F_2 C.S. of leaf; G_1 -G_2 . C.S. of stem.



***Bryum caespiticum* L.ex.Hedw.**
A. Plant; B. Leaf; C. Cells from upper part of leaf; D. Cells from middle part of leaf; E. cells from basal part of leaf.

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