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Two moss species new to Govind Wild Life Sanctuary in Uttarkashi District, Uttarakhand, India

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ABSTRACT

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Govind Wild Life Sanctuary situated in Uttarkashi District, Uttarakhand harbours a rich biodiversity. During investigation on the bryophytes of this region, *Fabronia pusilla* Raddi (Family Fabroniaceae) and *Didymodon michiganensis* (Steere) Saito (Family Pottiaceae) have been identified in this reserve area for the first time. Earlier, *F. pusilla* was listed from Kumaon Hills and *Didymodon michiganensis* from Himachal Pradesh and Meghalaya. *Didymodon michiganensis* is being reported here for the first time from Uttarakhand. About 9 species of genus *Fabronia* and 20 taxa of *Didymodon* are known from India. *F. pusilla* is characterized by bright green, pleurocarpous, branched and very minute plants having ovate lanceolate leaves, abruptly narrowed into a long and fine toothed hair point, margin dentate, costa reaching more than half of the leaf length, capsule erect, ovoid. Endostome is missing. Plants of *D. michiganensis* are erect, simple or branched with numerous gemmae in leaf axils, leaves ovate, abruptly acuminate, margin entire, costa ending just below leaf apex, lamina unistratose and leaf basal cells are arranged in rows. A morphotaxonomic account of above two taxa is provided.

Key-words: *Didymodon michiganensis, Fabronia pusilla,* Govind Wildlife Sanctuary, Uttarakhand, India.

INTRODUCTION

About 95 species of *Fabronia* occur in tropical and warm temperate regions, viz. North and South America, Mexico, Guatemala, Africa, South-West Europe, Caucasus, Israel, Afghanistan, China, Sri Lanka, Indonesia, Philippines and Australia (Vohra 1983). Genus *Fabronia* Raddi is represented in India by 9 species (Chopra 1975, Gangulee 1978, Vohra 1983, Lal 2005, Nath et al. 2007). During the present study, some specimens of *F. pusilla* were encountered from Govind Wild Life Sanctuary, Uttarkashi District, Uttarakhand for the first time. *Fabronia pusilla* is commonly known as silver hair moss and it belongs to family Fabroniaceae. *Didymodon* is a cosmopolitan genus widely diversified in temperate and montane regions on globe. About 122 species of this genus occur world-wide. About 20 taxa of *Didymodon* are known from India (Gangulee 1972, Lal 2005, Aziz & Vohra 2008). Some specimens of *D. michiganensis* were also encountered from Govind Wild Life Sanctuary, Uttarkashi, Uttarakhand for the first time. *D. michiganensis* is known from Bhutan, India, Japan, USA (Michigan) and North Mexico.

MATERIAL AND METHODS

Plant specimens of *F. pusilla* were collected from on way to Kedarkantha, Govind Wildlife Sanctuary, Uttarkashi District, Uttarakhand. Specimen examined: On way to Kedarkantha (alt. ca. 6547 ft, latitude 31°04.331'N and longitude 78°11.413'E, epiphytic on *Pinus* tree), 5.11.2012, leg. Vinay Sahu, 264887D (LWG). Plants of *D. michiganensis* were collected from Sankari, Naitwar, Jakhol Village and Osla Guest House. Specimens examined: Jakhol Village (alt. ca. 6547-7240 ft, latitude 31°06.602'N and longitude 78°12.778'E, on soil covered rock), 6.11.2012, leg Vinay Sahu, 264917D, 264919D, 264933D, 264934F (LWG), Osla Guest House (alt. ca. 8721 ft, on rock), 3.04.2013, leg. Vinay Sahu, 265023C (LWG). The voucher specimens were deposited in Bryophyte Herbarium, National Botanical Research Institute, Lucknow (LWG).

TAXONOMIC DESCRIPTION

Fabronia Raddi in Atti Acc. Sc. Siena 9: 230 (1808).

Plants bright green or yellowish green, pleurocarpous, branched and very minute. Leaves ovate lanceolate, margin serrulate in upper 2/3 portion, apex ending in a long hair point, costa single, covering 1/2 to 2/3 of the leaf length. Leaf cells rhomboidal at apex and quadrate at base angles. Seta short, Capsule erect. Peristome single, spores papillose.

Distribution of various species of the genus *Fabronia* Raddi in India is given in Table 1.

Fabronia pusilla Raddi in Attii Acad. Sc. Siena 9: 231 (1808).

Text-figure 1

Description: Plants bright green, branched, prostrate. Stem in cross section rounded, 100 µm wide, cortical cells smaller, 4-8 µm wide, medullary cells larger 12-16 µm wide, polygonal, thin walled. Leaves ovate lanceolate, abruptly narrowed into a long and fine toothed hair point, 0.64-0.72 mm long and 0.20-0.24 mm wide, margin dentate, marginal teeth 1-2 celled, costa covering more than half of the leaf, sometimes indistinct. Leaf cells at apex 40-80 µm long and 8 µm wide, rhomboidal, at middle 32-40 µm long and 8 µm wide, rhomboidal, at base alar cells clearly differentiated, rectangular to quadrate in shape, 8-16 µm wide. Seta yellowish green, 1.2-1.4 mm long, capsule 0.64 mm long and 0.40 mm wide, erect, ovoid. Endostome missing, exostome 100 µm long and 60 µm broad at base, lanceolate. Spores bright green, rounded, 16-20 µm wide, finely papillose.

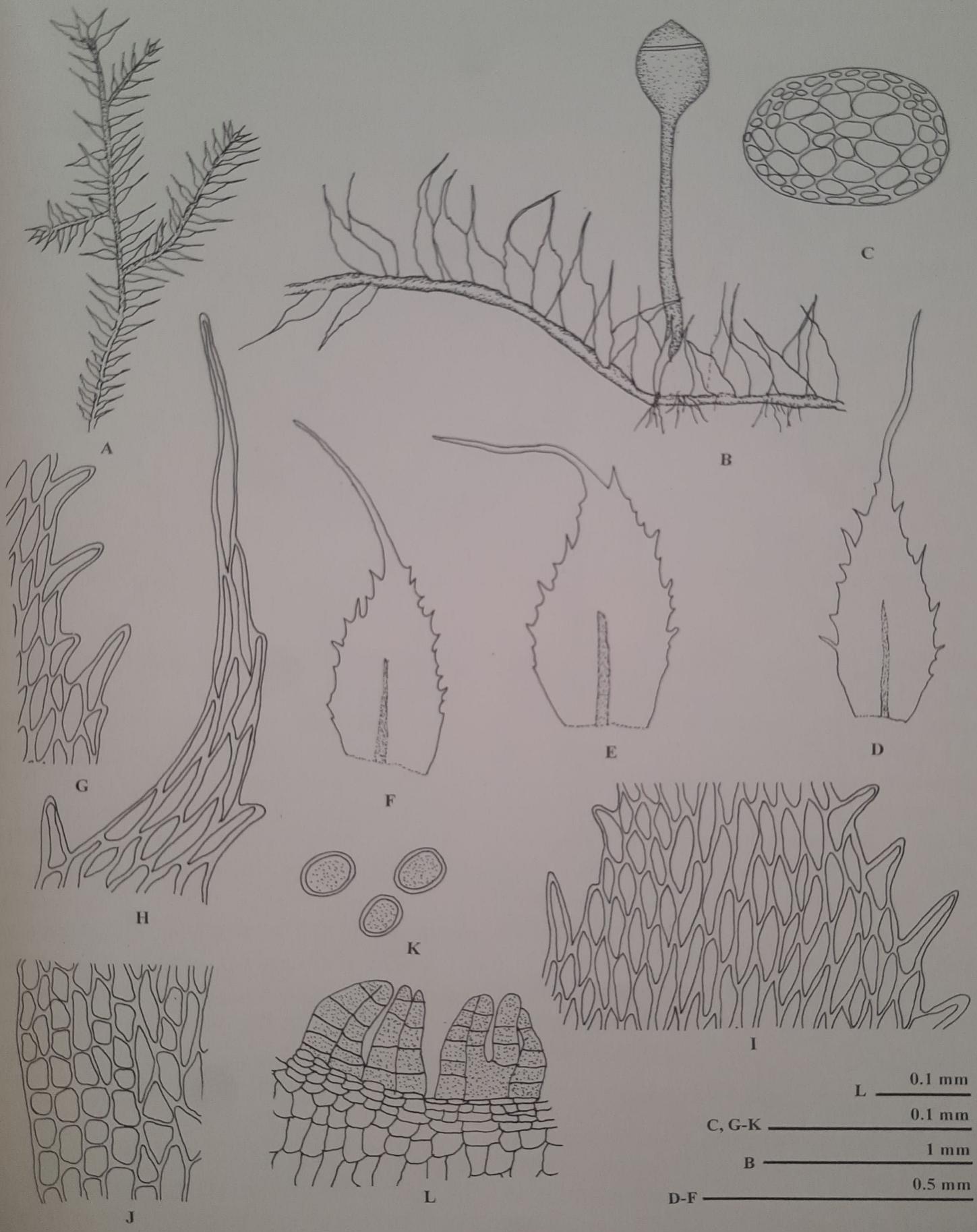
Remarks: In case of *Fabronia pusilla*, marginal teeth are long ciliate and apex aristate-pilose which differentiate this species from other species of the genus. The taxon exhibits a wide range of habitat preference by growing on rocks, soil or bark of trees.

Didymodon Hedw. in Spec. Musc., 104 (1801).

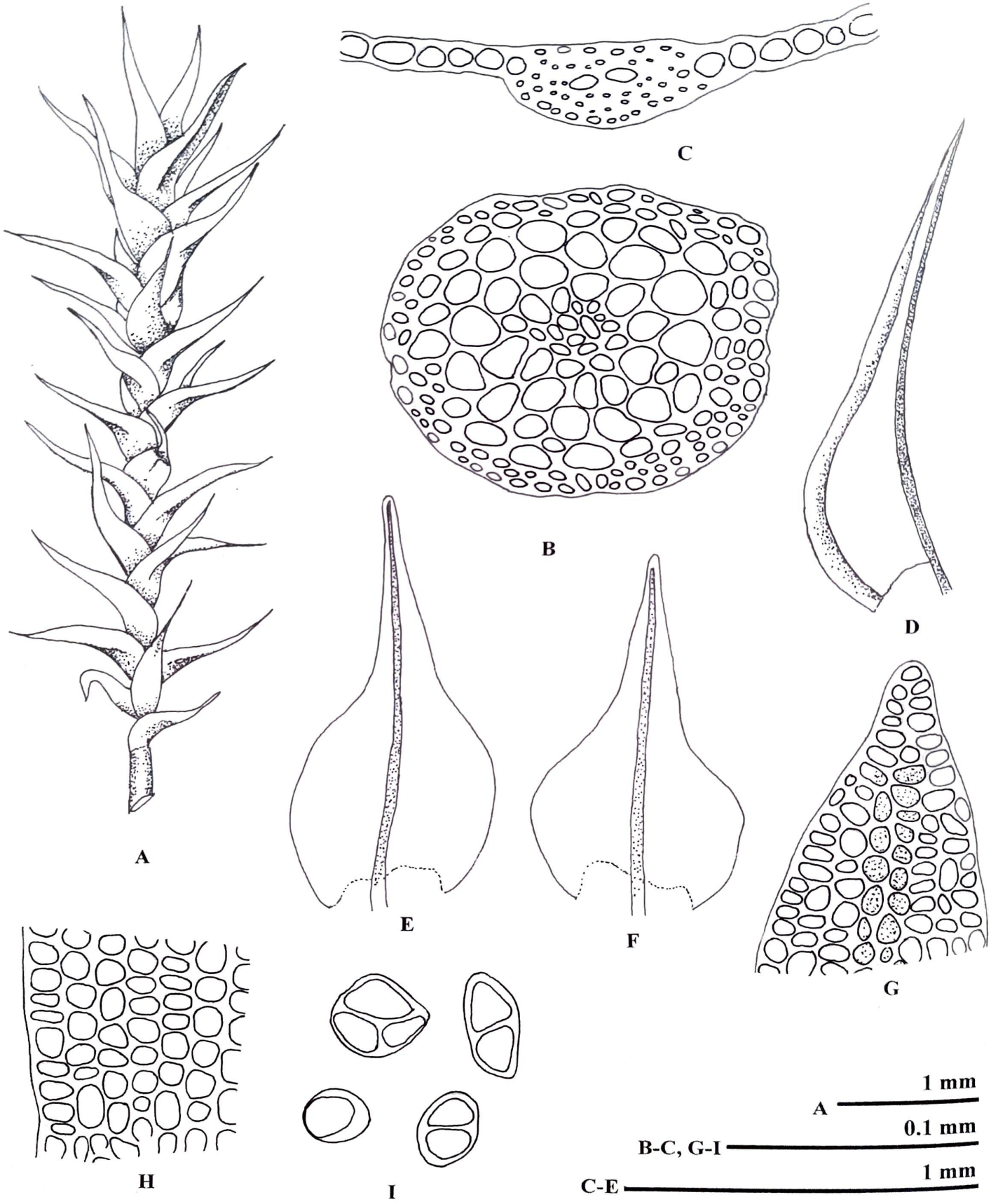
Plants growing in tufts, green to yellowish green, simple or branched. Stems erect, central strand present, rarely absent. Leaves erect and appressed when dry, ovate lanceolate, erectopatent,

Table 1: Distribution of genus *Fabronia* in India. WH – western Himalaya; EH – eastern Himalaya; CI – central India; GP – Gangetic plains, SI – South India, A & N – Andaman and Nicobar Islands; R & P – Rajasthan and Punjab Plains; + Present, - Absent

S.N.	Species name	WH	EH	CI	GP	SI	A & N	R & P	References
1	*F. ciliaris* (Brid.) Brid.	+	-	-	-	-	-	-	Chopra 1975, Vohra 1983, Lal 2005
2	*F. curvirostris* Doz. et Molk.	-	-	-	-	+	-	-	Chopra 1975, Lal 2005
3	*F. goughii* Mitt.	+	-	-	-	+	-	-	Vohra 1983, Chopra 1975, Lal 2005
4	*F. madurensis* Dix. et Vard.	+	-	-	-	+	-	-	Vohra 1983, Chopra 1975, Lal 2005
5	*F. minuta* Mitt.	+	-	+	-	-	-	-	Vohra 1983, Chopra 1975, Lal 2005
6.	*F. pusilla* Raddi	+	-	-	-	-	-	-	Tewari & Pant 1994
7.	*F. schensiana* C. Muell.	-	+	-	-	+	-	-	Ohashi 1974, Manju et al. 2005, Asthana & Yadav 2013
8.	*F. schmidii* C. Muell.	-	-	-	-	+	-	-	Chopra 1975, Lal 2005
9.	*F. secunda* Mont.	+	+	-	-	+	-	-	Chopra 1975, Gangulee 1978, Vohra 1983, Lal 2005, Nath et al. 2007



Text-figure 1. A-L. *Fabronia pusilla* Raddi A. Plant Habit. B. A portion of Plant with sporophyte. C. Cross section of stem. D-F. Leaves. G. marginal cells. H. Apical Leaf cells. I. Median Leaf cells. J. Basal Leaf cells. K. Spores. L. Peristome.



Text-figure 2. A-I. *Didymodon michiganensis* (Steere) K. Saito. A. A portion of Plant. B. Cross section of stem. C. Cross section of leaf. D-F. Leaves; G. Apical Leaf cells. H. Basal Leaf cells. I. Gemmae.

Table 2: Distribution of genus *Didymodon* in India. WH: Western Himalaya; EH: Eastern Himalaya; CI: Central India; GP: Gangetic plains, SI: South India; A & N: Andaman & Nicobar Islands; R & P: Rajasthan and Punjab Plains; + Present, - Absent

S. N.	Species name	WH	EH	CI	GP	SI	A & N	R & P	References
1	*D. aspertifolius* (Mitt.) H. A. Crum, Steere & L. E. Anderson	+	+	-	-	-	-	-	Lal 2005
2	*D. constrictus* (Mitt.) K. Saito	+	+	-	-		-	-	Lal 2005, Aziz & Vohra 2008
3	*D. croso-denticulatus* (Müll. Hal.) K. Saito	+	-	-	-	-	-	-	Aziz & Vohra 2008
4	*D. fallax* (Hedw.) R. H. Zander	+	-	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008
5	*D. ferrugineus* (Schimp. ex Besch.) M. O. Hill.	+	-	-	-	-	-	-	Aziz & Vohra 2008
6	*D. filiforme* (Dixon) M. N. Aziz & Vohra	+	-	-	-	-	-	-	Aziz & Vohra 2008
7	*D. giganteus* (Funck) Jur.	-	+	-	-	-	-	-	Aziz & Vohra 2008
8	*D. hastatus* (Mitt.) R. H. Zander	+	+	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008
9	*D. leskeoides* K. Saito	+	-	-	-	-	-	-	Lal 2005
10	*D. maschalogena* (Renauld & Cardot) Broth.	+	+	-	-	-	-	-	Gangulee 1972, Aziz & Vohra 2008
11	*D. michiganensis* (Steere) K. Saito	+	+	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008
12	*D. mittenii* Gangulee	+	+	-	-	-	-	-	Lal 2005, Gangulee
13	*D. nigrescens* (Mitt.) K. Saito	+	+	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008
14	*D. platyneurus* (Müll. Hal. & Kindb.) M. N. Aziz & Vohra	+	-	-	-	-	-	-	Aziz & Vohra 2008
15	*D. recurvus* (Griff.) Broth.	+	+	-	-	+	-	-	Gangulee 1972
16	*D. rigidulus* Hedw.	+	+	+	-	-	-	-	Lal 2005, Aziz & Vohra 2008
17	*D. rigidulus* var. *gracilis* (Schleich. ex Hook. & Grev.) R. H. Zander	+	-	-	-	-	-	-	Lal 2005
18	*D. stewarii* (E. B. Bartram) R. H. Zander	+	-	-	-	-	-	-	Lal 2005
19	*D. tophaceus* (Brid.) Lisa	+	-	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008
20	*D. vinealis* (Brid.) R. H. Zander	+	+	-	-	-	-	-	Lal 2005, Aziz & Vohra 2008

imbricate, apex acute, margin entire rarely toothed in upper portion, recurved. Costa prominent, percurrent or short excurrent. Leaf cells at apex quadrate to rounded, papillose, incrassate. Leaf basal cells subrectangular to rectangular, pellucid or brown, in some species reddish brown. Gemmae present in leaf axils, rounded or spherical in shape. Capsule erect, cylindrical, peristome teeth filiform, papillose.

Distribution of various species of the genus *Didymodon* Hedw. in India is given in Table 2.

Didymodon michiganensis (Steere) Saito in J. Hattori Bot. Lab., 39: 517 (1975).

Barbula michiganensis Steere in Grout, Moss Fl. N. Am. 1: 180 (1938).

Text-figure 2

Description: Plants erect, green, 6-9 mm long, branched. Stem in cross section 160 µm long and 120 µm wide. Cortical cells 2-3 layered, 4-8 µm wide, thick walled, small, medullary cells 16-28 µm long and 12-20 µm wide, thin walled, polygonal. Central strand present. Leaves catenuate when dry, erectopatent ovate lanceolate, 1-1.2 mm long and 0.32-0.48 mm wide, costa prominent ending just below the leaf apex, 48-60 µm wide. Leaf cells at apex papillose, short quadrate to rounded 8 µm wide. Leaf cells at base 16-32 µm long and 8-12 µm wide, rectangular, arranged in vertical rows. Gemmae present at the leaf axils reddish brown, rounded, 20-28 µm wide, 2 to many celled. Sporophyte not found.

Remarks: *Didymodon michiganensis* differs from other species in having gemmae, bistratose lamina, catenuate leaves on drying and basal cells arranged in vertical rows.

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