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ASSESSMENT OF DIVERSITY AND DISTRIBUTION OF DOMINANT ACROCARPOUS MOSS FAMILIES IN PACHMARHI BIOSPHERE RESERVE (MADHYA PRADESH)

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ABSTRACT

Pachmarhi Biosphere Reserve (PBR), situated in Madhya Pradesh, India is well known for its biodiversity. Moss flora of the region is immensely significant considering the fact that mosses are abundantly found here. Most abundant families include Bryaceae (9), Pottiaceae (8), Dicranaceae (7) and Fissidentaceae (6) totaling 30 taxa. Interestingly, all the four moss families are acrocarpous indicating the dominance of erect mosses in the region. Further, *Fissidens* Hedw., *Bryum* Hedw., *Campylopus* Bridel. and *Hyophila* (Hook.) Jaeg. are the most abundant genera of these families. While Pottiaceae is dominant in terms of frequency of occurrence of its genera in different localities of PBR, Bryaceae shows maximum representation with 9 members. The mosses account for both epiphytic and terrestrial members and contribute substantially to the ecology and diversity of PBR.

Keywords: Bryophytes, acrocarpous Mosses, PBR.

Introduction

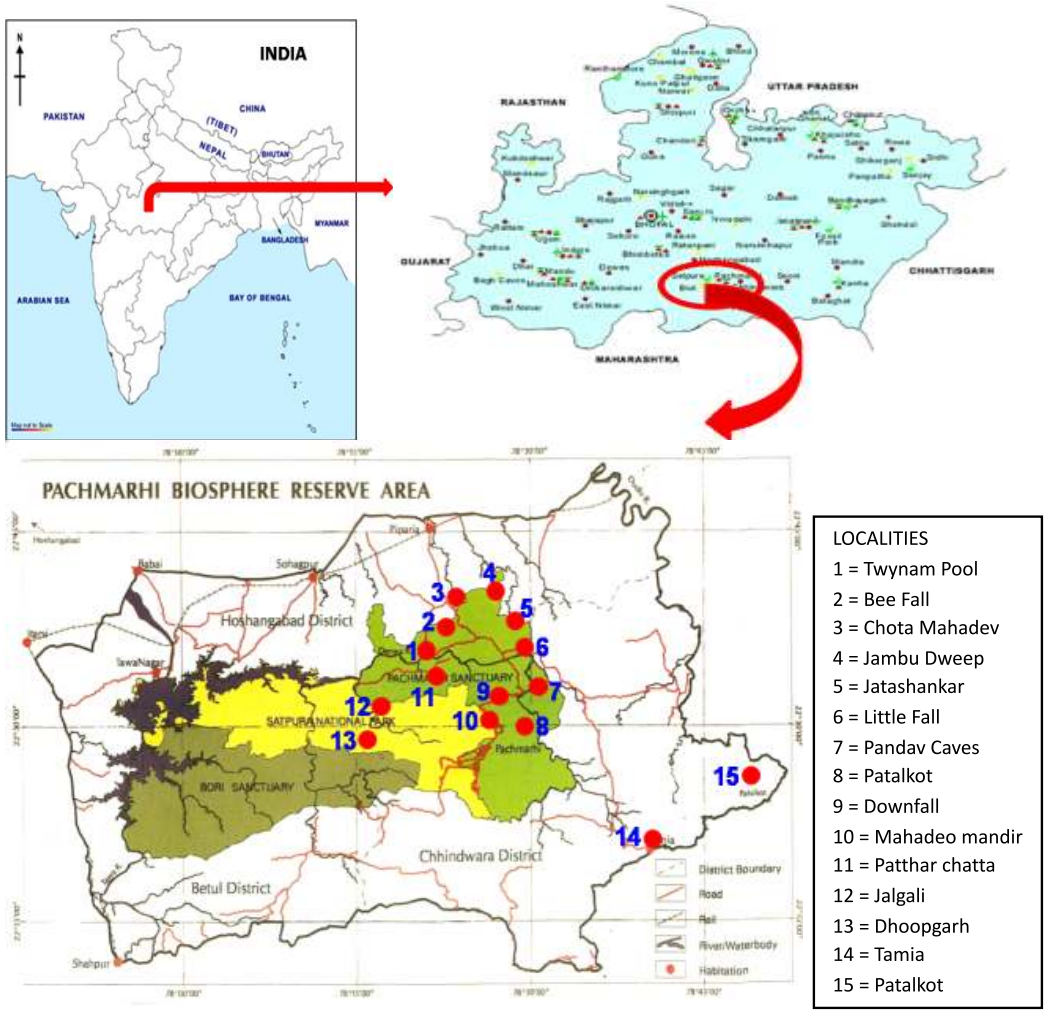
India harbours some important biodiversity rich regions as evident from the presence of numerous protected areas covering nearly 4.95% of the total surface area of Indian land. Among these protected areas, 16 Biosphere Reserves, 492 wildlife Sanctuaries and 92 National Parks are the major ones. Madhya Pradesh is an important state of the central Indian bio-geographical zone harbours 2 Biosphere Reserves and 9 National Parks. Pachmarhi Biosphere Reserve (PBR) is a biodiversity rich hotspot of M.P., occupying an area of 4987.38 km^2, covering three civil districts namely Hoshangabad, Betul and Chhindwara. Interestingly, the Biosphere Reserve has also been recognized as one of the 27 Tiger Reserves of India. The varied topography of the region includes plateaus, hills and valleys, lying within the altitudinal range of 400-1060 meters. PBR includes three conservation units *viz*. Pachmarhi Sanctuary, Satpura National Park and Bori Sanctuary. Among these, Pachmarhi Sanctuary is a tourist spot frequented by people, while Satpura National Park and Bori Sanctuary are the regions rarely disturbed by human activities.

In general, the central Indian bryo-geographic region possesses some important biodiversity rich areas, Achanakmar - Amarkantak Biosphere Reserve, Bhimbedka World Heritage site, areas of Gujarat, Kanha National Park, Mt. Abu, Pachmarhi Biosphere Reserve (PBR) and parts of Chota Nagpur plateau being the major ones. These areas are rich in vegetation including the bryophytes and pteridophytes. Bryophyte flora of central India is quite significant and ecologically important. Some noteworthy contributions towards mosses of central India are those of Chaudhary and Deora (2001); Singh and Kaul (2002); Chaudhary *et al.* (2006); Chaudhary and Sharma (2002, 2007); Nath *et al.* (2005, 2007, 2008) and Nath and Gupta (2007, 2008, 2009, 2009a). The literature clearly indicates that the mosses of the Pachmarhi Biosphere Reserve have not been explored to a satisfactory extent. Moss flora of the region is immensely significant considering the fact that mosses are abundantly found here. Among the moss families: Bryaceae, Pottiaceae, Dicranaceae and Fissidentaceae are the most abundant ones being represented by 30 taxa in total. Among these, Bryaceae is represented by 9, Pottiaceae by 8, Dicranaceae by 7 and Fissidentaceae by 6 taxa. Interestingly, all the four moss families are acrocarpous indicating the dominance of erect mosses in the region. Assessment was made regarding the trends of distribution followed by the various taxa among the localities of collection. Also, the dominance of some taxa of these individual families has also been taken into account.

Material and Methods

The specimens were collected during the years 1992, 1993 and 2006 respectively from 15 localities of PBR covering an altitudinal range of 400 to 1065 m. The specimens were collected from terrestrial habitats such as rocks, soil covered rocks, wet rocks, etc. and from tree bark as well and have been deposited in the Bryophyte Herbarium, NBRI, Lucknow (LWG), India. The area covered under PBR and the major sites of plant collection has been shown in the map. The material was studied in

Pachmarhi Biosphere Reserve has become the rich biodiversity centre with the presence of 30 taxa of moss flora including Bryaceae (9), Pottiaceae (8), Dicranaceae (7) and Fissidentaceae 6 species.



Map 1: Map showing major localities of plant collection

detail and the taxonomic observations were recorded to perform the identification. Identified specimens were assessed for the distributional patterns and observations prepared.

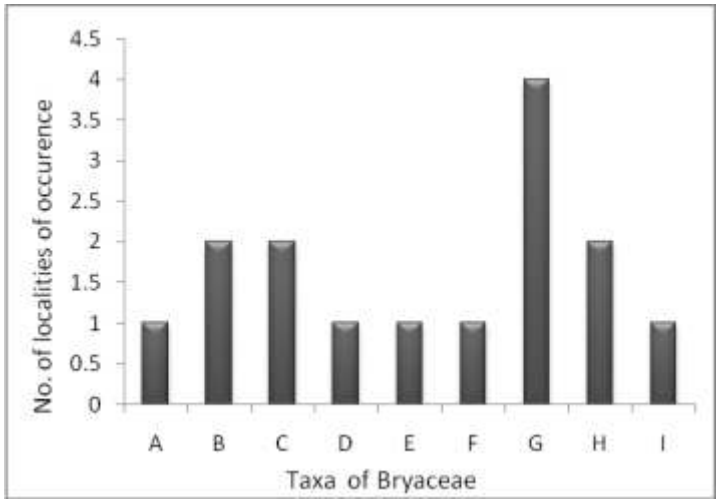
Results

I. Bryaceae

Family Bryaceae is represented by 4 genera and 9 species viz. *Anomobryum auratum* Mitt. (Jaeg.), *Brachymenium acuminatum* Harv., *B. ptychothecium* (Besch.) Ochi, *Bryum argenteum* Hedw., *B. caespiticium* L. ex Hedw., *B. capillare* L. ex Hedw., *B. coronatum* Schwaegr. and *B. paradoxum* var. *reflexifolium* (Ochi) Ochi and *Pohlia flexuosa* Hedw. Fig. 1 shows the distribution of each taxa against the number of localities it was encountered. The taxa of Bryaceae are characterized by erect habit, small to robust plants which may be proliferating by subfloral innovations; leaves are variable in form (small ovate to long spathulate); leaf cells rhomboid to rectangular; costa may be percurrent, excurrent or extended into arista. Peristome is bryoid type; showing similarity throughout the family; however, the capsule form varies from erect to pendulous. *Bryum capillare* is the most dominant and widely distributed taxa among the 9 taxa at PBR, followed by *Bryum coronatum*. Fig. 2 exhibits the relative representation of the genera of Bryaceae at PBR. All the members of family present at PBR show terrestrial habitat.

II. Dicranaceae

Family Dicranaceae is represented by 4 genera and 7 species viz. *Campylopus ericoides* (Griff.) Jaeg., *C. goughii (Mitt.) Jaeg., C. savannarum* (Müll. Hal.) Mitt. *C. schimperi* Milde, *Cynodontium gracilescence* (Web. *et* Mohr), *Dicranella leptoneura* Dix. and *Leucoloma amoene-virens* Mitt. at PBR. The taxa have been collected from 7 localities of PBR. Fig. 3 shows the distribution of each taxa against the number of localities it was encountered. The members are characterized by erect habit, medium to large plants with mostly dense leaf arrangement, leaves are long, broader below, tapering into characterstic subulate or canaliculated apex in



Abbreviations:
A = *Pohlia flexuosa*
B = *Anomobryum auratum*
C = *Brachymenium acuminatum*
D = *Brachymenium ptychothecium*
E = *Bryum argenteum*
F = *Bryum caespiticium*
G = *Bryum capillare*
H = *Bryum coronatum*
I = *Bryum paradoxum* var. *reflexifolium*

Fig. 1 : Distribution of the taxa of bryaceae against the number of localities of Pachmarhi biosphere reserve

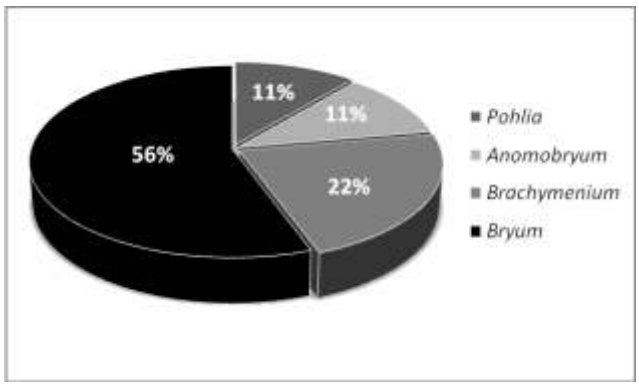
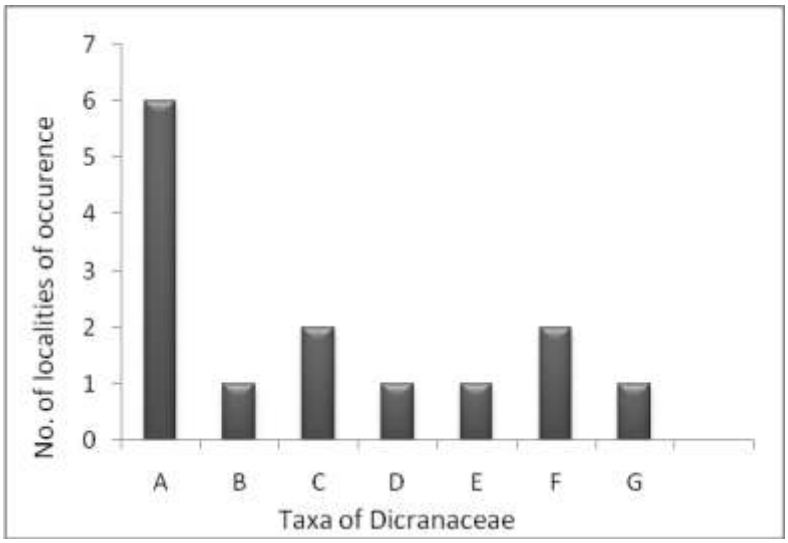


Fig. 2 : The percentage relative distribution of various genera of bryaceae among the localities of their distribution

majority of taxa. Leaf cells larger and rectangular below, smaller and rhomboidal above; Costa robust, broad and excurrent mostly. Peristome is dicranoid type with few variations and exceptions; capsule erect or inclined, cylindrical usually. *Campylopus* Bridel. is the most dominant genus with representation of 4 species, *C. ericoides* being the most widely encountered species. Fig. 4 exhibits the relative representation of the genera of Dicranaceae at PBR. Members of this family occur at terrestrial as well as epiphytic habitats with 2 taxa, *Campylopus schimperi* and *Cynodontium gracilescence* being terrestrial, 4 taxa, *Campylopus goughii, C. savannarum, Leucoloma amoene-virens* and *Dicranella leptoneura* being epiphytic while 1 taxon, *Campylopus ericoides* occupies both the habitats.

III. Fissidentaceae

Fissidentaceae is represented by single genus *Fissidens* Hedw. and 6 species viz. *F. asperisetus* var. *andamanensis* Gangulee, *F. ceylonensis* Doz. *et* Molk., *F. crispulus var. crispulus* Brid., *F. involutus* Wils. *ex* Mitt., *F. pulchellus* Mitt. and *F. taxifolius* Hedw. at PBR. Fig. 5 shows the distribution of each taxon against the number of localities it was encountered. The genus is very



Abbreviations:
A = *Campylopus ericoides*
B = *Campylopus goughii*
C = *Campylopus savannarum*
D = *Campylopus schimperi*
E = *Cynodontium gracilescence*
F = *Dicranella leptoneura*
G = *Leucoloma amoene-virens*

Fig. 3 : Distribution of the taxa of dicranaceae against the number of localities of Pachmarhi biosphere reserve

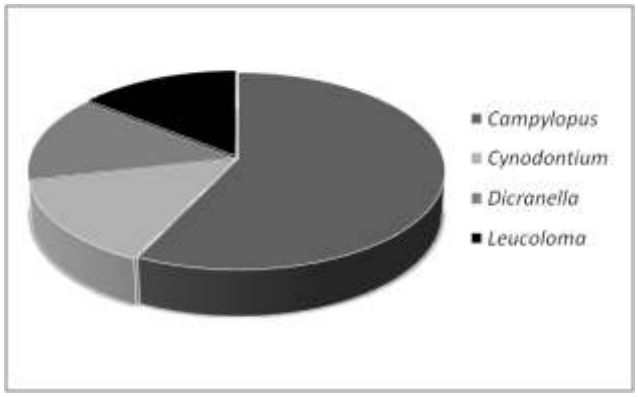
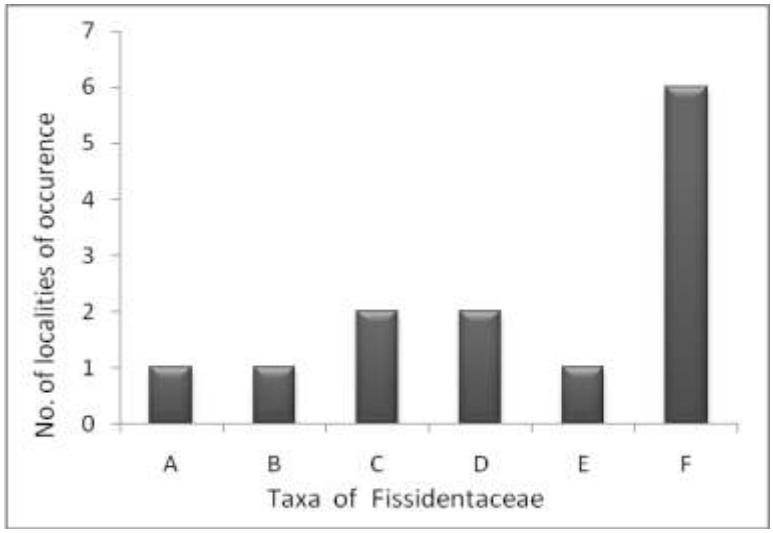


Fig. 4 : The percentage relative distribution of various genera of dicranaceae among the localities of their distribution

dominant among erect mosses in India. It is distributed among 8 localities of PBR. *Fissidens* is characterized by erect habit, small to medium plants with characteristic leaf arrangement in opposite manner; leaves ovate - spathulate, having sheathing lamina and small rhomboidal cells. *F. taxifolius* is the most dominant in distribution among the taxa at PBR. All the members show terrestrial habit except for *F. taxifolius* which is present in both terrestrial and epiphytic forms.

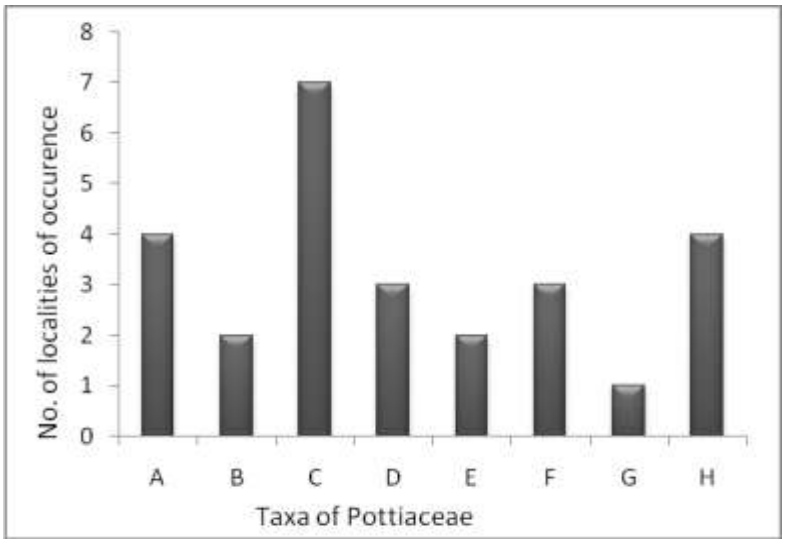
IV. Pottiaceae

Pottiaceae is represented by 6 genera and 8 species namely viz. *Anoectangium stracheyanum* Mitt., *Barbula javanica* Doz. et Molk., *Hyophila involuta* (Hook.) Jaeg., *Hyophila nymaniana* (Fleisch.) Menzel, *Hyophila spathulata* (Harv.) Jaeg, *Oxystegus teneuirostre* (Hook. *et* Tayl.) A.J.E. Smith, *Semibarbula ranuii* Gangulee *and Weissia edentula* (Mitt.) Besch. at PBR. Fig. 6 shows the distribution of each taxon against the number of localities it was encountered. The taxa are distributed among 13 localities. The taxa of Pottiaceae are characterized by erect habit, small to moderate size, spathulate leaves, papillose or mamillose; small isodiametric cells getting bigger at base. The peristome



Abbreviations:
A = *Fissidens asperisetus* var. *andamanensis*
B = *Fissidens ceylonensis*
C = *Fissidens pulchellus*
D = *Fissidens involutus*
E = *Fissidens crispulus* var. *crispulus*
F = *Fissidens taxifolius*

Fig. 5 : Distribution of the taxa of fissidentaceae against the number of localities of Pachmarhi biosphere reserve



Abbreviations:
A = *Anoectangium stracheyanum*
B = *Barbula javanica*
C = *Hypohila involuta*
D = *Hyophila nymaniana*
E = *Hyophila spathulata*
F = *Oxystegus tenuirostre*
G = *Semibarbula ranuii*
H = *Weissia edentula*

Fig. 6 : Distribution of the taxa of pottiaceae against the number of localities of Pachmarhi biosphere reserve

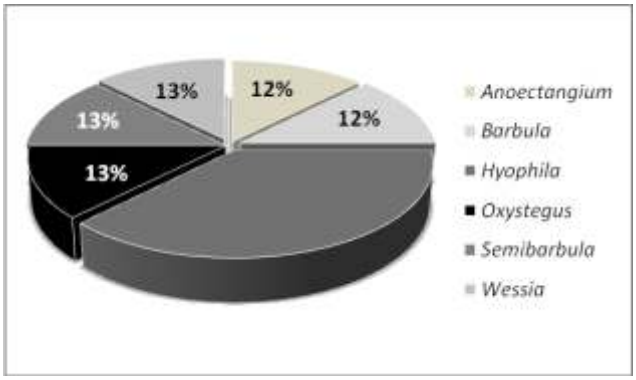


Fig. 7 : The percentage relative distribution of various genera of pottiaceae among the localities of their distribution

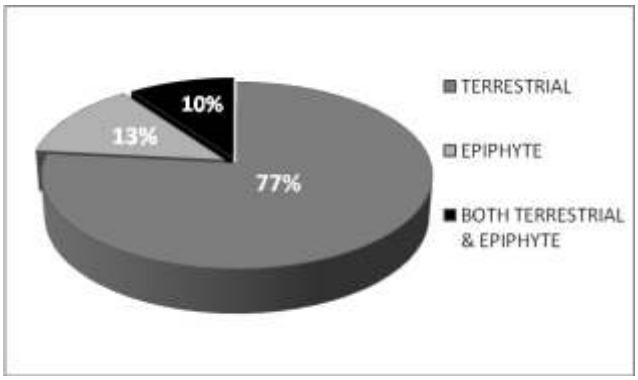


Fig. 8 : Percentage of taxa showing distribution at various habitats

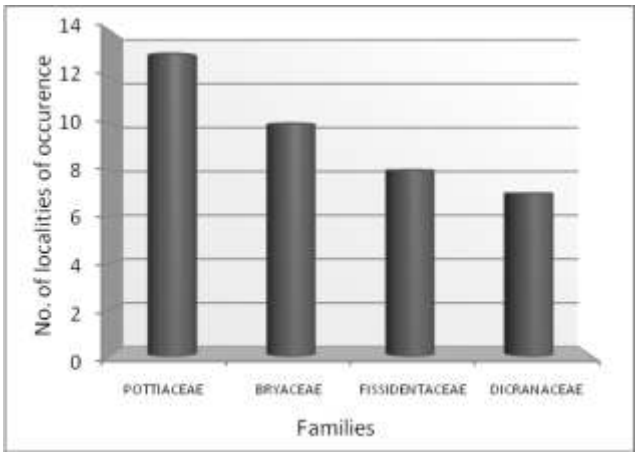


Fig. 9 : Relative distribution of the four families at the major localities of Pachmarhi biosphere reserve

varies from being absent to spirally twisted helical form. Genera *Hyophila* Brid. and *Anoectangium* Schwaeg. are dominant among the members of the family. Fig. 7 exhibits the relative representation of the genera of Pottiaceae at PBR. Terrestrial members of this family are mainly encountered at PBR, *Hyophila spathulata* being the only epiphytic species among the taxa.

Discussion

During field survey on the bryophytes nearly 34 localities of PBR has revealed the presence of 4 dominant

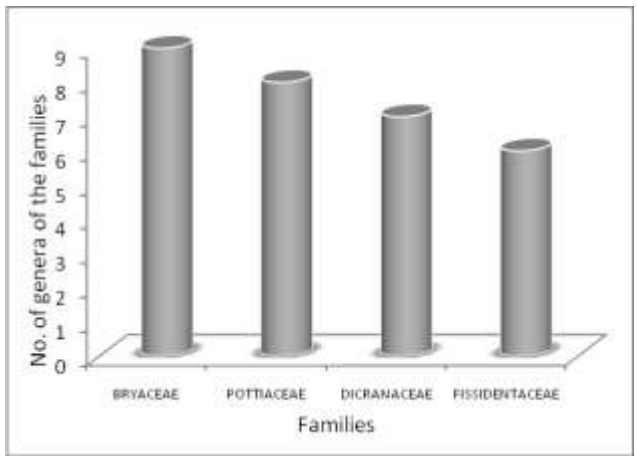


Fig. 10 : Relative dominance of the four families in terms of number of genera present at Pachmarhi biosphere reserve

families of acrocarpous mosses. These families viz. Bryaceae, Pottiaceae, Dicranaceae and Fissidentaceae are together represented by 30 taxa being harboured in 15 major localities of PBR, as against 16 taxa attributed together to these families previously from the same region (Singh and Kaul, 2002). Studies on families Bryaceae, Pottiaceae and Fissidentaceae separately have been performed earlier by Nath and Gupta (2009a) and Nath *et al.* (2011, 2011a) which also circumvent the status of these families. Fig. 8 shows the relative distribution of the four families at the major localities of PBR. The mosses show presence in both terrestrial and epiphytic habitats. However, nearly 23 taxa show terrestrial habitat, while only 4 taxa show epiphytic habitat and 3 taxa are found as both terrestrial and epiphytic. Fig. 9 shows the percentage of taxa showing disribution at various habitats. Among the families, Pottiaceae shows most frequent occurrence with its 8 taxa inhabiting nearly 13 localities hence, it is the most abundant family among these four families followed by Bryaceae. Bryaceae is the most dominant family in terms of representation with 9 taxa being encountered so far. Fig. 10 gives the relative dominance of the four families in terms of number of genera present at PBR. Further, *Fissidens* Hedw., *Bryum* Hedw., *Campylopus* Bridel. and *Hyophila* (Hook.) Jaeg. are the most abundant genera of these families. Workers have listed Bryaceae and Pottiaceae as dominant families of the region with 5 taxa of each being mentioned among the mosses of the region (Singh and Kaul, 2002). Further, in this context the distribution and dominance patterns along with the diversity analysis taken up in the present study suggest that acrocarpous mosses form an important element of the bryophyte diversity at this central Indian hotspot and contribute considerably to the ecology and plant diversity of PBR.

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पचमढ़ी जीव-मण्डल रीजर्व (म.प्र.) में प्रधान एक्रोकार्पस मॉस कुलों की विविधता एवं वितरण का मूल्यांकन

विरेन्द्र नाथ, ए.के. अस्थाना और रीसा गुप्ता

सारांश

मध्य प्रदेश, भारत में स्थित पचमढ़ी जीव-मण्डल रीजर्व अपनी जैवविविधता के लिए जाना जाता है। इस तथ्य पर विचार करते हुए कि यहां माँस प्रचुर मात्रा में मिलता है, क्षेत्र की मॉस (शैवाल/काई) वनस्पति अत्यधिक महत्वपूर्ण है। ज्यादा प्रचुर कुलों में शामिल हैं - ब्रेएसीया (9), पोटिएसीया (8), डाइफ्रेनेसीया (7) और फिसिडेन्टेसीया (6), जो कुल मिलाकर 30 टैक्सा हैं। सभी चार मॉस कुल एक्रोकार्पस हैं, जो क्षेत्र में उर्ध्व मॉसों की प्रधानता को दर्शाते हैं। इसके अलावा, *फिसिडेन्स डीडयू., ब्रीयम हीडयू., कैम्पीलोपस ब्राइडल* और *होफिला* (हुक) जैग इन कुलों के सबसे प्रचुर वंश हैं। जबकि पचमढ़ी जीव-मण्डल रीजर्व के विभिन्न स्थानों में अपने वंश की प्राप्ति की बारम्बारता के संदर्भ में पोटिएसीया प्रधान है, ब्रेएसीया ने 9 सदस्यों के साथ अधिकतम प्रतिनिधित्व दर्शाया। मॉस अधिपादपीय और स्थलीय सदस्य दोनों के लिए सहयोग करते हैं और पचगढ़ी जीव-मण्डल रीजर्व की परिस्थितिकी एवं विविधता में पर्याप्त रूप में सहयोग करते हैं।

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