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Research Article

Distribution of Moss in the Topography of Kangra District (H.P)

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ABSTRACT
The present study was carried out during March 2008 to September 2010. Regular and periodical visits to different sites were made during this period. Nine species of mosses *i.e., Agrobryidium filamentosum*, *Barbula convolute*, *Bryum argenteum*, *Bryum biocolor*, *Bryum cellular*, *Fimbraria dilatata*, *Funaria hygrometrica*, *Pogonatum microstomum*, *Polytrichum densifolium* are reported and studied here. Moss, such as *Funaria hygrometrica* showed maximum frequency percentage.

Key Words: Density, Abundance, Frequency

INTRODUCTION
Bryophytes especially Mosses which play an important key role in forming communities in environment are very sensitive to pollution and are bio-indicators of environment. They exhibit antibiotic properties (Pant and Tewari 1983) by killing bacteria such as *Vibrio* causing cholera and *Salmonella* causing typhoid. Sexena *et. al.,* (2005) detected chemical constituents like Copper, Nickel and Iron from corticalous mosses from Mahabaleshwar in Western Ghats. Mosses are highly developed group of Bryophytes occupying unique position between lower cryptogams and vascular cryptogams. Systematic account of some member of this group is available in the moss floras of eastern-India, north-west Himalayas and Nilgiri hills. Study of taxonomy of mosses in the Indian sub-continent was first initiated by Hamilton (1802-1803) who explored the moss flora of Nepal, Burma and Assam. The first paper on these mosses was published by Hooker (1849) thereafter a large number of scholars through their continued studies contributed to the moss flora of India.

Studies on ecological (environment) diversity and distributional aspects of such important plant groups have not been made from the area of *Kangra* district of Himachal Pradesh and adjacent region so far. Therefore an attempt was made to determine the diversity of mosses from the area.

MATERIALS AND METHODS
Survey and collection of mosses from different sites differing on their altitude were carried out. The work was carried out from March to September. Temperature and humidity were recorded at the selected sited during collection of materials. The materials collected were subjected to detailed morphological examination under the microscope for its genus & species identification. The mosses density, abundance and frequency were calculated by the method of Skorepa and Vitt (1976) and Showman (1985, 1986) respectively. Soil pH and moisture were measured by soil pH meter and portable moisture meter respectively. Collected mosses from the respective sites were preserved for future documentation.

RESULTS AND DISCUSSION
Study area was Kangra District of Himachal Pradesh. It is a hill station which has cool and dry climate. Kangra lies in between latitude 30^0 15' to 42^0 and longitude 76^0 and 22^0 46' with altitude varying between 1300-2100m. Kangra region has hot wet summer and cold winter. The winter extends from December to February while the summer season extends from March to end of June. The rainy season in this region is long (July – September). The maximum temperature at Kangra remains up to 40^0C. The humidity and moisture are major growth factor in case of mosses. The distribution and environmental parameters related to the mosses of the Kangra district were studied over a period of seven month *i.e.,* from March to September during the years 2008 to 2010. During rainy seasons i.e. July to September the mosses start vegetative growth and even encroaches and covers the soil with their smoothing rich greenery till autumn. During the study nine species of mosses were collected. The name of the species, its occurrence, Soil moisture percentage, Soil pH values, Plant density, Plant abundance and Plant frequency percentage are given in Table1.

Table 1 shows among the mosses *Pogonatum microstomum* species showing luxuriant growth where

maximum soil moisture content was present; *Bryum biocolor* and *Bryum cellular* species show luxuriant growth where maximum pH value of soil is found as compare to the other studied mosses in Kangra district..

Among the collected mosses *Funaria hygrometrica* showed maximum plant density, *Pogonetum microstomum* and *Polytricum* densifolium had maximum plant abundance values whereas *Funaria hygrometrica* had maximum frequency percentage .So the present investigation of survey area showing that the distribution of mosses depend on number of factor such as soil moisture, soil pH. From the month of April to June mosses begin to dry due to the less humidity and soil moisture contents and high temperature (drying without dying). A few mosses such as *Funaria hygrometrica* survives during this unfavorable span and show insignificant difference in their density throughout the year. Many workers from different parts of India and abroad also studied Bryoflora (Chum *et al.*, 1973). Chopra (1975), Pande and Joshi (2004) studied phytochemical, biomass and net primary productivity in bryophyte community growing on central Himalayas. Bryophytes are very important constituents of many hill ecosystems inspite of their small size and relatively low biomass. Kangra hills are represented by luxuriant growth of bryoflora. Their significance as pioneer in succession stages in Kangra hill is well known and has been widely recognized. Terrestrial bryophytes are important for soil fixation, mineral recycling, humus accumulation and moisture retention. Later on they play a major role in establishment of different communities. Bryophytes are responsible for maximum carbon gain of any forest cover and after death add organic matter to the substratum.

The bryophyte vegetation is influenced largely by the nature of parent rock or substratum and is further influenced by microclimate. Rich diversity of bryoflora at Kangra district may be due to its preference for microclimate. During colonization of any habitat, microclimate and niche are known to play important roles in luxuriant growth of bryophytes both in terms of frequency and abundance around the year.

Table 1. Mosses found in the Kangra District of Himachal Pradesh.

Species	Plant Habitat	Soil Moisture %	Soil pH	Plant Density	Plant Abundance	Plant Frequency %
Aerobryidium filamentosum	Ground with loamy soil, Porous rock	1	6.5	13.7	11.6	5
Barbula convolute	Ground with loamy soil , Sedimentary rock	1	6.2	2.2	1.1	4
Bryum argenteum	Ground with loamy soil, Sedimentary rock	1	6.6	2.1	1.1	16
Bryum biocolor	Ground with detritus soil, Calcareous rock	1.5	6.9	1.9	3.3	16
Bryum cellular	Ground with detritus soil, Calcareous rock	1.4	6.9	1.2	1.6	12
Fimbraria dilatata	Under canopy of Deodar and Pine trees	2.8	6.5	16	18.6	20
Funaria hygrometrica	Calcareous rock	2	6.2	17.3	12	45
Pogonetum microstomum	Tracking water, Moist region	3.5	6.5	15	30	42
Polytrichum densifolium	Ground with loamy soil, Sedimentary rock	3	6.8	26	30	40

Rich flora during rain is highly distinctive and could be due to rich moisture and relative humidity. These investigations of moss species are helpful in knowing the status of individual moss species in the study area and thus play an important role in their preservation and making us aware about their usefulness.

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