

## Study of Moss Flora and Growth Forms of Moss in Varied Habitats in Dharmshala of Kangra District (H.P), India

Rajaram Choyal<sup>1</sup> and \*Sanjay Kumar Sharma<sup>2</sup>

<sup>1</sup>Department of Environmental Science, M.G.S University, Bikaner (Rajasthan)

<sup>2</sup>Department of Botany, Govt. Degree College, Nurpur, Distt. Kangra (H.P)

\*Author for Correspondence

### 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. Mosses collected from different habitats such as mosses growing on humus-rich soil, on calcareous soil, on lateritic soil, on peaty soil, on forest floor. Growth forms also studies like mosses growing as mixed societies, in unmixed stands, on exposed rock, in moist mud and Aquatic mosses, Epiphytic mosses.

**Key Words:** Density, Abundance, Frequency

### INTRODUCTION

India with its varied geographical, altitudinal and climatic conditions has a rich moss flora comprising of about 2037 species spread over 326 genera and 46 families. However, not much information is available as to their ecology, especially the soils and other conditions under which they grow (Schuster, 1980). This leaves a serious gap in our understanding of the moss flora in the Indian subcontinent. Earlier works on Indian mosses do not give this information; but the recent works on the mosses of Eastern India by Gangulee H.C. (1974) and on distribution of moss in the topography of Kangra district (H.P) by Sharma, S.K and Choyal, R.R (2011) have mentioned stratum of each species on which it grows. However, there is no comprehensive work on moss flora of Himachal Pradesh.

It has been observed that several species are highly restricted to certain habitats and some to particular geographical locations. Analysis of the mosses collected from various localities of Dharmshala (H.P.), is only intended as an help for further work on the moss flora of Northern India. However, it does not claim to be exhaustive as it deals with only two places in as samples and hence the conclusions drawn from them at best be considered as tentative. Some mosses, like angiosperms, are indicative of soils, and indicate climate under which they grow.

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 corticolous 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.

### MATERIAL AND METHODS

The material were collected from various localities of Dharmshala tehsil of Kangra District (H.P). Survey and collection of mosses from different sites differing on their altitude were carried out. The work was mainly carried out in the month of March to September. The materials collected were subjected to detailed morphological examination under the microscope for its genus & species identification. Their identification was confirmed by matching the herbarium sheets at P.G. college Dharmshala (H.P.) and M.D.P.G. college, Srigananager (Rajasthan). Only the species fully identified and confirmed are included here. Collected mosses from the respective sites were preserved for future documentation.

### RESULTS AND DISCUSSION

Study area was Dharmshala Tehsil of Kangra District of Himachal Pradesh. It is a hill station which has cool and dry climate. Dharmshala lies in between latitude 30° 15' to 42° and longitude 76° and 22° 46' with altitude

### Research Article

varying between 1300-2100 mtrs. Dharmshala 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) 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°C.

The soil in the hilly region of Dharmshala is loam placed above slightly compact soil of light grey color. Soil has plenty of minerals.

#### Varied Habitats, their Moss Flora and Growth forms

##### Habitats:

##### (i) Mosses growing on humus-rich soil :

The following mosses are generally found on humus-rich soil more or less acidic: Pogonatum abides forma neesii., Fissidens walker, F. bryoides F.zollengeri., F.splachnobryoides, Garckea phaecoides, Pleurochaete squarrosa. Brachymenium acuminatum, Bryum wightii., Bartramidula bartramiodes, Leucodon secundus, Thuidium cymbifolium, Rhynchostegiella humillima. And Vesicularia reticulata.

##### (ii) Mosses on calcareous soil :

The following mosses calciphilous and prefer alkaline soil: Hydrogonium consanguineum, Semibarbulla orientalis, Gymnostomiella vernicosa, Splachnobryum indicum. Bryum coronatum. etc.

##### (iii) Mosses on lateritic soil :

Some mosses are indicative of their substratum. For example, species of Merceya (M. latifolia. M. ligulata, M. gedana) etc. are the indicative of the underground copper deposits. The soil at Dharmshala is lateritic, quite rich in oxides of Iron. Pogonatum aloides, Funaria hygrometrica, Brachymenium acuminatum. B. exile, Bryum ghatense. grow on lateritic soils and show extreme xerophytic adaptations .

##### (iv) Mosses on peaty soil :

Brachymenium turgidum, B. nepalense grow on peaty soils but not on very highly acidic.

##### (v) Mosses growing on forest floor :

Following mosses grow on forest floor which contains a lot of leaf debris :

Brachymenium exile., Bryum wightii., Diaphanodon procumbens., Pterobryonopsis walkeri, Meteriopsis reclinata, Pinnatella calcuttensis., Symphydon angustus., E. plicatus. Entodon prorepens., Stereophyllum tayoyense, S. anceps, S. ligulatum., S. fulvum, Glossadelphus vivicolour,

Bryosedgwickia kirtikarii, Ectropothecium cyperoides, Vesicularia reticulata.

##### Growth forms.

##### (i) Mosses growing gregariously as mixed societies :

Following mosses grow gregariously together :

Anoetangium stracheyanum, Anomobryum auratum, Pohlia flexuosa, Orthotrichum virens, Ditrichum laxissimum, Bartramidula bartramiodes, P. heterophylla, Philonotis hastate, P. secunda.

##### (ii) Mosses growing in unmixed strands :

The following mosses grow generally in pure unmixed strands :

Hyophila involuta, Hydrogonium consanguineum, Semibarbulla orientalis, Physcomitrium coorgense, Funaria hygrometrica, Entosthodon nutans, Gymnostomiella vernicosa, Splachnobryum indicum, Bryum argenteum, Bryum coronatum.

##### (iii) Mosses growing on exposed rocks and similar Situations :

A peculiar feature of Dharmshala is that they receive heavy precipitation in four months from the middle of June to end of Sept. but for the rest of the year, particularly summer months (April-May) there are no rain. The places where they grow on exposed rocks and edges get completely dried up. In such places mixed associations of mosses Hyophila involuta, Anomobryum auratum, Pohlia flexuosa, Bryum coronatum, B. ghatense., Bartramidula bartramiodes, B. roylei. Philonotis hastata come up. They have varied degrees of tolerance to desiccation. Generally two or three of them grow together in one place.

##### (iv) Aquatic mosses :

Some mosses grow partially in water or under water when attached to the rocks below, e.g. Fissidens sedgwickii which grows underwater in rocky stream Fissidens grandifrons Brid.. Mnium rostratum schrad. also grow in water.

##### (v) Mosses in moist mud :

The following mosses grow in marshy places :

Pogonatum aloides, F. splachnobryoides, F. bryoides, Fissidens walkeri., Physcomitrium coorgense, Funaria nutans.

##### (vi) Epiphytic mosses :

Epiphytic mosses are commonly found at various places. In Dharmshala. With the onset of monsoon they regenerate quickly, but get completely dried up after January. They form long, pendulous chains hanging from tall trees. Sometimes the whole tree looks as if it is festooned with mosses. They generally grow on trunks

### Research Article

and branches, adhering firmly to the bark, e.g. *Diaphandon procumbens*, *Meteriopsis reclinata*, *Entodon prorepens* and *E. plicatus* and *Bryosedgwickia kirtikani*. etc. Some of them grow on tree trunk near soft surface e.g. *Pterobryopsis walkeri*. and some grow anywhere on a tree e.g. *Stereophyllum* sp., *Symphiodon angustus*: some only at great heights on trees e.g. *Macromitrium sulcatum*, *Meteriopsis reclinata*. *Pinnatella calcuttensis*.

Some mosses take their nutrition from the decomposing bark, e.g. *Macromitrium sulcatum*, *Levierella fabronacea*, *Stereophyllum tavoyense*, *S. ligulatum*, *S. anceps*. etc. Others collect some soil by their intertwined rhizoids and grow on it. e.g. *Brachymenium turgidum*. Some form compact cushions on the debris and partly on the soil accumulated on the bark, e.g. *Octoblepharum albidum*, *Compylopus goughi*. etc. No moss was found as epiphyllous

### REFERENCES

**Chum HA Steere and Anderson LE (1973)**. A new list of mosses of North America of north Mexico. *The Biological Times*. **76** 85 -130

**Chopra R (1975)** Introduction to taxonomy of Indian Mosses. (CSIR Publication, New Delhi, India)

**Gangulee HC (1974)** . Mosses of eastern India and adjacent regions. Council of scientific and industrial research, New Delhi, India.

**Hooker (1849)**. *Icones plantarum* (Collection of mosses of Assam) India (The Chronica Co., Calcutta )

**Nakamura, T (1992)** Effect of Bryophytes on survival of Conifer Seedling in Sub alpine forest of Central Japan, *Ecological Research* **7** 155-162.

**Pande N And Joshi P (2004)**. Phytochemical, biomass and net Primary Production of Bryophyte community growing on decaying log in silver fir forest of central Himalaya. *Geophytology* **32** 19-23.

**Pant GB and Tewari SD (1983)**. An assessment of Bryophyte vegetation of Nainital and its environment. *Journal of the Indian Botanical Society*. **62** 268-275.

**Saxena (2005)**. Potential of bryophytes in forest establishment. *Indian Journal of Forestry* **28** 425-428.

**Showman RE (1985)**. Gavin Area, Air quality Biomonitoring studies. American Electric Power Service Corporation. Columbus ,Ohio. (Cambridge University Press).

**Schuster, RM. (1980)**. The Hepaticae and Anthocerotae of North America, east of the hundredth meridian. Vols.1- 4, Columbia University Press, New York. Vols 5-6. The Field Museum Chicago.

**Sharma,SK and Choyal, RR (2011)**, Distribution of moss in the topography of Kangra district (H.P) Ind. *Jour. Of Fundamental and Applied Life Science*. **12** 54-156