

## Diversity of calcareous mosses of Mumbai

Gauri Soman

Department of Botany, Maharshi Dayanand College, Parel Mumbai-400012 (India)

### Abstract

Mosses are a highly developed group of Bryophytes, occupying unique position between lower cryptogams and vascular cryptogams, Mumbai, the capital city of Maharashtra and commercial capital of India is the principal seaport of western India. Muddy or Marshy areas are found near the coast belt of Mumbai. Few species of mosses were observed near marshy places. Some mosses were found to prefer lime rich substratum *i.e.* alkaline soil with pH 7.00-7.7 were observed growing in area under study. Such mosses are called calcareous mosses. Such mosses are highlighted in the paper with their description, habitats and distribution.

**M**osses are a highly developed group of Bryophytes, occupying unique position between lower cryptogams and vascular cryptogams. They like lower cryptogams, have filamentous protonema looking like some green filamentous algae and like high cryptogams they have a conducting stands. Systematic studies on some members of this group are available in the form of Moss floras of Eastern India (monographic work of Gangulee<sup>10</sup>, North West Himalayas<sup>3</sup> and Nilgiris<sup>9</sup>, Mosses of Western Ghats<sup>7</sup>, The flora of Khandala on the Western Ghats of India<sup>11</sup>. A third list of mosses from Western India<sup>14</sup>.

Mosses are highly sensitive to atmospheric pollution. They can absorb heavy metals from the atmosphere. They show several injury symptoms on exposure to metal pollutants. Thus they serve as very good bio-indicators to pollution. This aspect is of very

much importance to environmentalists and of great relevance in redeveloping and framing the urbanization aspects of commercial capital of India – Mumbai. For the preparation of the manuscript, relevant literature<sup>1-17</sup> has been consulted.

### *Area under study and significance of study:*

Mumbai, the capital city of Maharashtra and commercial capital of India is the principal seaport of Western India. It lies in 18°55' N and 72°54' E. The climate of this city is warm and humid. It is placed on the North West coastal side of Western Ghats. Soil cover in the city region is sandy whereas in the suburbs soil cover is largely alluvial and loamy. The underlying rocky region is composed of dark black basalt to red lateritic soil. Muddy or marshy areas are found near the coast belt.

The vegetation of this coastal areas is

mainly mangroves. However few species of mosses are also observed near marshy places.

The review of previous work indicates that the bryological diversity of this region is not much studied which can be of great help of ecologists.

The mosses were collected by frequent visits to different localities in and around Mumbai. The mosses collected were dried and stored in herbarium packets. They were identified and preserved in Bryophyte Herbaria.

The present paper highlights some calcareous mosses of Mumbai.

#### *Localities of collection :*

Mosses of Mumbai were collected from different places and localities described below :

1. Sanjay Gandhi National Park, Borivali. 2. Malabar Hill. 3. Mumbra 4. Powai and Vihar Lake Area 5. Elphanta island 6. Jogeshwari 7. Jijamata Garden Wall, Byculla, 8. Yehur hills, 9 Kanheri Caves.

Some mosses were found to prefer lime rich substratum *i.e.* alkaline soil with pH 7 or >7 and were observed growing in area under study. Such mosses are called as calcareous mosses<sup>15</sup>.

They were found growing at Sanjay Gandhi National Park, Borivli, near Mumbra, Malabar hill, Mumbai.

#### *Preservation of material – dry & wet :*

Mosses being more acidic in nature, they are easily preserved free from infection

by fungi and insects by themselves. Material collected in the field was exposed to dry in open shade. After drying it was kept in packets (13.5 x 15.5) cm in size. Date of collection, locality from where it was collected, latitude, habitat, etc. were noted in field note book and also on the packets containing the material. Some of the material which was very minute or less in quantity was preserved by preparing slides. Media used for preparing slides was Gum-Chloral.

The following calcareous mosses were recorded from area under study viz *Semibarbula orientalis*, *Gymnostomiella vernicosa*, *Splachnobryum indicum* and *Bryum coronatum*

A total no of 4 mosses were observed which are described below-

#### *1. Semibarbula orientalis* (Web) Wijket Marg.

Plants yellowish green to green, calciphilous, growing in dense tufts on old walls limy compounds. Stem brownish green 4-5 mm to 1.5 cm in height and unbranched. Leaves lax but clustered near apex, oblong to ovate. Lanceolate, spirally arranged upto 1.5mm in length and 0.3 mm in breadth, at base erecto-patent when moist, incurved and curled when dry, margin flat, papillose. Leaf apex rounded with pointed end.

Leaf laminar cells chlorophyllose, obscure, rounded quadrate or squarish to hexagonal. Leaf base cells large, rectangular, hyaline. Nerve distinct, light greenish yellow, **short, excurrent, rough at the back**, in T.S. leaf shows a row of deuter cells in the center or middle with a large patch of dorsal

and smaller patch of ventral sub-steredial cells. Plants sterile in nature.

*Distribution* : This sterile yellowish green to greenish material was growing luxuriantly on the calcareous soil at Malabar Hill, Mumbai.

Also grows at Khandala and Mahabaleshwar<sup>5</sup>. It is widely distributed Indo-Pacific species, mainly confined to the different regions of India viz. Darjeeling, Arunachal (NEFA) Pradesh, Eastern and Western Himalayas, Chhota Nagpur, Orissa, Pune, Nagpur and Kankeshwar etc. This species is also common in other countries viz. Nepal, Ceylon, Burma, Malaya, Java, Borneo, New Guinea, Philippines, Taiwan, South and East China, Central South Africa.

### 2. *Gymnostomiella vernicosa* (Hook.) Fleisch:

Plants very small, minute, forming velvety coating on calcareous walls of houses and temples. Stem 6-7mm long, filiform. Leaves broadly spatulate, obovate, concave, 0.3 mm long. Leaf margin erect, entire below, papilosecrenulate above. Laminar cells 4-6 side, hexagonal. Leaf base cells more elongated, rectangular, smooth, hyaline. Nerve **short, faint, percurrent reaching to the two-third part of the leaf or upto midleaf**. Sporophyte not seen.

#### *Distribution* :

This calcareous species is very common on limy walls of the compound of the temples at Borivali, Mumbai.

Also recorded at Old Mahabaleshwar<sup>2</sup> and at Khandala<sup>3</sup>. It is widely scattered in

tropical and sub-tropical countries in Asia like India, Pakistan, Burma, Srilanka, Singapore, Malayan archipelago, Java, Philippines, Amboina, etc.

### 3. *Splachnobrym indicum* Hamp. Et C Muel., Linnea 37:174.1872.

Plants delicate, in lax soft tufts, pale green. Stem reaching a height upto 2 cm long, simple laxly foliate. Leaves erect spreading, very slightly contorted when dry. 2.5 mm long, 1 mm broad, concave, oblong-lingulate, broadly rounded at apex. **Leaf margin narrowly recurved on one or both sides from leaf base to two third up**, minutely crenulate across the broad apex. Laminar cells lax, thin walled, chlorophyllose, obliquely rhomboidal and parenchymatous near apex. Marginal row of cells sub-quadrate or short rectangular more elongate, oblonghexagonal and prosenchymatous at leaf base. Nerve slender, ending some distance below, male plants not seen. In female plants archegonia 10-12 in number, in apical, lateral and extra axillary position.

Seta erect, 1.5 to 2 cm in height, dark brown, capsule cylindrical brownish, with narrow opercular lid. Peristome 16, deeply inserted with a vertical line of cleft, papillose. Spores brown, rounded, smooth-walled.

#### *Distribution* :

Plants of pale green tufts were growing on calcareous walls of houses at Mumbra, Mumbai.

Also recorded at old Mahabaleshwar<sup>4</sup> at Monkey Hill of Khandala<sup>5</sup>. This moss is also continued to Eastern Himalayan region, Calcutta, Burma, Thailand, Indonesia, North

and South Vietnam, Malaya, Phillipines, New Guinea, etc.

4. *Bryum coronatum* Schwaegr., Spec. Musc. Suppl. 1(2):103.71.1816;

A tuft of slender, dull, yellowish-green plants growing on rocks, old walls. Stems erect, 1 cm in height, laxly matted, with numerous subfloral innovations.

Leaves contorted when dry, ovate concave lanceolate, erect when moist, bordered; denticulate at the apex, 3 mm long 0.8 mm broad at middle region, but 0.5 mm broad at the base. Nerve excurrent. Leaf cells narrowly rhomboidal to hexagonal. Leaf base cells shortly rectangular. Leaf margin serrulated, bordered by a row of 2-3 elongated cells. Capsule cylindrical or oblong, pear-shaped, pendulous, 3 mm high with distinct neck. Operculum slightly pointed Peristome teeth papillose, transversely barred, yellowish orange coloured. Cilia 2 or 3 strongly appendiculate. Spores light brown globose to oval, smooth.

#### *Distribution :*

Very common on rocks and on calcareous walls at Sanjay Gandhi National Park, Borivali, Mumbai.

Also observed at Khandala<sup>5</sup>, at Mahabaleshwar<sup>5</sup>. This cosmopolitan moss shows striking features like noddling or pendulous capsule and that helps to make it out from other local species of the genus.

#### References :

1. Biradar, N.V., Mosses of N.W. Western

Ghats.

2. Bruhl, P. (1931). A Census of Indian Mosses. *Record Bot. Surv. India*, 13(1): 50.
3. Chopra R. S. (1975). Introduction of taxonomy of Indian Mosses.
4. Dabhade G.T. (1966) Some interesting mosses of India Published by Univ. of Poona and U.G.C.
5. Dabhade G.T. (1998) Mosses of Khandala and Mahabaleshwar
6. Dixon, H.N. (1909a) Mosses of Western India *J. Bom. Nat. Hist.*, 19: 536-537.
7. Dixon, H.N. (1909b) Mosses of Western Ghats *J. Bom.* 47: 157-164.
8. Dixoy, F. and T.H. Molkenboor (1961-70) *Bryologia*, Javania Vol. I & II, Ansterdan.
9. Foreau (1917) Mosses Flora of Nilgiris
10. Gangulee (1969) Moss floras of Eastern India.
11. Santapau (1967) The Flora of Khandala on the Western Ghats of India *Rec. Bot. Surv. India* XVI.
12. Schofield, W.B. (1985). Introduction to Bryology McMillan Publishing Comp. New York.
13. Schusler, R.M. (1984). New Manual of Bryology, Japan.
14. Sedgwick, L.J. (1913). A third list of mosses from Western India. *J. Bom. Nat. Hist Soc.* 22: pp 370-371.
15. Smith, A.J.E. (1982). Bryophyte ecology 1-505 Chapman and Hall Ltd. London.
16. Udar, Ram and Chandra (1976). Bryology is India Pp. 50. The Chronica Botanica co New Delhi.
17. Verdoon, F. (1932). Manual of Bryology. Chronica Botanica Publication.