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Terricolous mosses of Mumbai

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Abstract

Mosses are highly developed groups of bryophytes having a unique position between lower cryptogams and vascular plants prefering marshy swamps or wetland habitats for their abundant growth. They play an important role in conservation of buffer zones or edges between wetland and forest ecosystems habitats. 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 costal side of Western Ghats.Muddy or marshy areas are found near the coast belt. The present paper highlights diversity of terricolous mosses growing in around Mumbai, with their ecological habitats and growth forms.

Mosses 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 1969, 71, 74) North West Himalayas[3] and Nilgiris (Foreau, 1917), different workers, but those in Western India remained mostly unworked with some exception.

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 revelence in redeveloping and framing the urbanization aspects of commercial capital of India – Mumbai.

India mosses had attracted the attention of many bryologist like Hamilton (1802-1803) who explored the moss flora of Nepal, Burma and Assam. Further detail studies as the flora of mosses in India were continued by Biradar[1], Wallich (1828), Mueller (1853), Mitten (1859), Gollan (1896), Gammie (1896), Kirtikar (1897), Brotherus (1898), Blatter (1905), Sedgwick (1908-13), Bruhl[2], Pottier de la Varde (1931), Chopra (1935), Dixon[5,6], Foreau (1961), Norkett (1961), Gangulee (1963), Dabhade[4] and others.

In the last decade of the 19th Century, mosses of Western Ghats were collected from diverse localities by enthusiastic botanists like Woodrow (1895), Surgeon-general Kirtikar (1897), Mr. Sedgwick[11], Rev. Father Blatter (1905) and a few others. Dr. Kirtikar (1897), had collected the mosses of Mahabaleshwar, Matheran and they were published in Birdwoods "**Catalogue of the Flora of Matheran and Mahabaleshwar"** 1897. In 1908, Maxwell and Dixon (1921) made a collection from forest of Kanara District and Sedgwick[11] from different localities in Western Ghats such as Purandar, Poona, Mahabaleshwar, Lonavala, Khandala, Trimbakeshwar, etc. They were published in three different papers on the **"Mosses of Western Ghats".** Gammie (1905-1910) and Burns (1910) collected mosses from SakarPather of Lonavala and adjacent area. Dixon[5,6] who had special interest in the mosses of Sahyadris of Western Ghats discovered several new genera and species like Marceyopsis sp. (1910), Hyophilopsis Sp. (1911) Bryosedwickis Kirtikaricarde. et Dix. (1912), etc. After Dixon[5,6], there has been a big gap in studies on moss flora of Western Ghats. Norkett and Dabhade[4], have been collecting them at Mahabaleshwar, Khandala, Purandar Fort, Kandwshwar, Kasara (ThalGhat), AmbaGhat, etc. in Western Ghats. Dabhade[4] has thoroughly worked out the monographic work on "The mosses of Mahabaleshwar and Khandala" with a note on the Genus *Riccia* (Mich.) L. from Maharashtra.

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 costal 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 costal 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 terricolous 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. Elphenta island 6. Jogeshwari 7. Jijamata Garden Wall, Byculla, 8. Yehur hills, 9 Kanheri Caves. 10.Malabar hills

However terricolous mosses were observed growing inYeoor,Mumbra,Sanjay Gandhi National Park,Borivli, Malabar hills,

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 is 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.

Observations-A total number of 8 terricolous mosses were observed which are described below-

1. Archidium birmannicum Mitt. Ex Dix., *J. Ind. Bot. Soc. 2:175, t-1 1921 :*

Non comose, sterile plants of 5-8 mm in height, growing on moist ground with lax leaves. Leaves narrow at apex and middle region and borad at the base, ovate lanceolate, 0.5-7 mm in length and 0.2 to 0.3 mm in breadth. Nerve concolorus, percurrent, reaching below the apical cells. Upper leaf cells prosenchymatous, subrectangular to irregularly rhomboidal in shape. The leaf base cells rectangular to subrectangular, broad. At the base of leaf, margin bordgered by two rowed rhomboidal to rectangular cells. Leaf margin slightly undulated. Plants sterile.

Distribution- It was growing on moist ground at Yeoor .
It has been also reported from W Bengal, Assam, Nilgiris.

2. Hymenostylium recurvirostre (Hedw). Dix. Rev. Bryol. Lich, 6:96, 1934 :

Plants slender, incompact tufts, stem elongate, eradiculose, branched, rust coloured laxly foliate, 1.5 to 2 cm high. Leaves incurved, flexuose when dry, widely. Spreading not crisped, erectopatent, linear – lancedate, acuminate when moist and 1 to 2 mm long. Leaf margin recurved on one side below. Nerve nearly percurrent, ceasing just below apex. Upper laminar cells chlorophyllose, quadrate to subquadrate, smooth. Sporagonia terminal. Seta slender, smooth erect 0.6 to 1 cm long capsule wide mouthed. Short broadly ovoid, glossy. Persistome absent. Opercular lid with an oblique, subulate, rostrate beak. Spores round slightly papillose.

Distribution :

It was growing luxuriously in tufts on rocks at Mumbra.

It is also common in Western Ghat, Mahabaleshwar[4] Khandala[4] in Western Himalaya, Kashmir, Darjeeling, Sikkim and in other countries like Western Tibet, Burma, East Nepal Phillipines, China etc.

3. Hyophila involuta (Hook) Jaed. Ber. *S. Gall. Naturw. Ges 1871 – 71, 354 (Ad. 1:202) :*

Plants common on large stones of basalt, on compound, wall; dark green incolour

and with tufts of rhizoids at the base. Stem 1 – 1.5 cm high. Leaves long, Spathulate with falcate lamina 0.8 to 1.5 mm long. Leaf margin wavy, entire or serrate to crenulate to upper side and mostly involute when dry. Nerve percurrent, ceasing below the 2-3 cells of apex. Leaf cells small quadrate to hexagonal, mamillose. Leaf base cells large rectangular, pellucid.

Seta erect, elongate 2 to 2.5 cm high. Capsule 4-5 mm high,erect, cylindrical lid conical, beak oblique. Spores light brown, rounded.

Distribution :

This species was luxuriantly growing on basaltic rocks near pipe line on stony compound at Sanjay Gandhi National Park, Borivali, Mumbai.

This species is very common in India and south – East Asia. It is found also at Darjeeling, Sikkim Norht Bihar, Orissa, Madhya Pradesh, Khasia Hills, Western Himalaya, Upper Gangetic plain, Nilgiri&palni Hills, North Kanara and in countries outside, Burma, North & South Viethan, East China, Korea, Japan, Philippinese, Indonesia, North Central America, Europe etc.

4. 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, shortexcurrent, rough at the back, in T.S. leaf showing a row of deuter cells in the centere 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 soil at Malbar Hill, Mumbai.

Also reported from Khandala[4] and Mahabaleshwar (Dabhade, 1969). It is widely distributed Indo-Pacific species, mainly confined to the different regions of India Viz. Darjeeling, Arunachal (NEFA) Pradesh, Eastern and Western Himalayas, Chota Nagpur, Orissa, Poona, Nagpur, Kankeshwar etc. This species is also common in other countries viz. Nepal, Ceylon, Burma, Malaya, Java, Borneo, New Guinea, Phillilpines, Taiwan, South and East China, Central South Africa.

5. 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 spathalate, 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 uptomidleaf. Sporophyte not seen.

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

Also reported from Old Mahabaleshwar (Dabhade, 1969) and at Khandala (Dabade, 1968). It is widely scattered in tropical and sub-tropical countries in Asialike India, Pakistan, Burma, Ceylon, Singapore, Malayan archipelago, Java, Philippines, Amboina, etc.

6. 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 laxy foliate. Leaves erect spreading, very slightly contorted when dry. 2.5 mm long1, 1 mm broad, concavte, 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 exillary 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 turfts was growing on soil and walls of houses at Mumbra Mumbai.

Also found in old Mahabaleshwar (Dabhade, 1969) at Monkey Hill of Khandala (Dababde, 1968). This moss is also confined to Eastern Himalayan region, Calcutta, Burma, Thailand, Indonesia, North and South Vietnam, Malaya, Phillipines, New Guinea, etc.

Genus – Bryum Hedw., Spec. Musc. 178, 1801 (Derived from Green Bryon, which means a cryptogamic plant).

This genus is widely distributed tropical, subtropical and alpine region of the world. It is also having a large range of variation upto the level of species, subspecies and varieties. The Indian species of this genus are about 95. Plants are robust to small growing in more or less lax carpet on rocks and ground or in close tufts, rarely gregarious. Stems erect, usually with subfloral innovations. Lower leaves small; upper leaves large, often in comal tufts. Nerve variation percurrent or excurrent, rarely shorter. Leaf cells smooth, rhomboidal in midleaf, Sometimes in several rows at the margin forming a distinct border. Basal cells regular or irregularly rectangular. Seta elongate, curved or hooked at the tip, cylindrical, capsule generally pendulous, pyriform, clavate or with a tapering neck; peristome double with 16 keeled teeth.

This genus is represented by two species Viz; B. argenteum Hedw and B. coronatumSchwaegr.

7. Bryum argenteum Hedw *:*

Small, silvery white, glossy plants with short reddish brown erect stem 1.5 cm in height and julaceous branches. Leaves crowded, broadly ovate, concae, short acuminate, 2.2 mm long, 0.5 mm broad. Nerve percurrent, ending below the apex. Leaf cells narrowly rhomboidal, colourless with firm, pale walls. Leaf base cells short, rhomboidal, sometimes subrectangular, chlorophyllose, often tinged with red. Sporophyte not seen.

Distribution :

Dense cushion of silvery, white glossy plants were growing on bricks and stones at Sanjay Gandhi National Park, Borivali, Mumbai

Also grows atKhandala and at Mahabaleshwar[4]. The species is common at Kodaikanal; Eastern and Western Himalayas. It is also reported from Kadziberg, O.F.S.of S. Africa by Sim(1925, 1973) and other tropical, subtropical and temperate countries of the world. It is cosmopolitan species and is popularly called 'Silver Thread Moss'. It can be identified by its silvery white glossy appearance in the field.

8. 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 walls at Sanjay Gandhi National Park, Borivali, Mumbai and at Khandala[4], at Mahabaleshwar (Dabhade, 1967). 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.

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