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Studies on Terricolous mosses from Trimbakeshwar in Western Ghats, Maharashtra, India

Hile Vijay K.¹, Dabhade G. T.², Deshbhratar Shantaj M.³ and Raut Sonali R.³

¹Department of Botany, Bhavan's H. S. College, Chowpatty, Mumbai

²Department of Botany, Birla College, Kalyan, Dist.-Thane

³Department of Zoology, Bhavan's H. S. College, Chowpatty, Mumbai

ABSTRACT

Trimbakeshwar is very rich and abundant in bryophytic vegetation. The present paper deals with eight terricolous mosses from five families, collected during various exploratory visits to different locations of area under studies. *Funaria hygrometrica* Hedw., *Gymnostomiella vernicosa* (Hook) Fleisch, *Bryum coronatum* Schwaegr, *Bryum argenteum* Hedw., *Bartramidula roylei*(Hook.)B. S. G., *Hyophila involute* (Hook.)Jaeg., *semibarbula orientalis* (Web.) Wijk & Marg., *Fissidens splachnobryoides* Broth. Are observed and reported for the first time from these areas under investigation.

Keywords: Mosses, Terricolous, bryophytic, Trimbakeshwar.

INTRODUCTION

Mosses are highly evolved group of bryophyta having unique position between lower and higher cryptogams. The mosses like lower cryptogams, possess filamentous protonema resembling some green filamentous algae and also similar to higher cryptogams possessing conducting strands. Mosses play a key role in the formation of natural biotic communities and are indicators of pollution and forest conditions. They are also recognised as biomonitors of aerial distribution of heavy metals, gaseous pollution and radio isotopic products of nuclear explosions used for biochemical prospecting [9]. Mosses also possess antibiotic, antimicrobial and anti-tumorigenic properties[7]. In addition to this mosses are good absorbents of lead, copper etc. [10].

Trimbakeshwar is the area under investigation that lies towards eastern spur of Western Ghats. The Western Ghat is considered as a "green paradise" for studies of bryophytes [12]. It is 28 Km by road from Nasik, Maharashtra. The elevation of Trimbakeshwar is about 600 mt. above sea-level. It stands on a dark basalt rock, with lateritic black soil. The area experiences an average maximum temperature of 30 – 34°C & minimum 18 to 22°C, with an overall annual rainfall of about 2500 mm. Winds are not as severe to that of Thal ghat and their velocity is significantly reduced (8 to 10 Km/hr). The relative humidity is as high as 70 % during monsoons but it reduces significantly later. Mosses of Trimbakeshwar region have not been precisely reported till date and therefore it is a sincere attempt to observe, understand and reveal the flora noted for the first time in this area. In the present investigation, 8 species of Terricolous mosses belonging to 4 orders and 5 families are reported.

MATERIALS AND METHODS

The material has been collected from different localities of Trimbakeshwar. The varied localities are foothills/footsteps of Nil Parwat, Gorakhnath Temple, Old walls near Kushavart, Bramhagiri hill, MIDC- Compound, stony walls near Tahasildar Office etc.

Materials collected in these fields were dried in open shade. Later it was kept in packets 13.5×13.5 cms in size, with their respective dates of collection, locality, habitat, etc. being marked on the packets for ready reference. The species collected were identified by using standard literature [1-8].

Observations-

1. *Funaria hygrometria* Hedw.,

Plant loosely or closely tufted, 1–1.5 cm high. Leaves yellowish green, upper leaves large, imbricated, concave, lanceolate or widely oblique, shortly pointed, lower leaves small; never percurrent, ceasing at the apex. Laminar cells elongated, hexagonal to rectangular, polygonal to rhombic, 180 μ long, 27 μ broad, long at base, somewhat shorter towards the apical region, little narrow at the margin which is entire, basal cells large, rectangular to subrectangular. 115-120 μ long and 32-33 μ broad. Seta long 2.1 – 2.5 cm., flexuose, reddish, strongly twisted and hygroscopic when dry, brownish with yellow tinge, deep red or orange, with a side mouth; capsule asymmetrical, inclined, pyriform, oblique, gibbous at back, striate, furrowed, wide mouthed when dehiscing, sulcate, when dry, 3 mm long, 1.5–2 mm broad, peristome complete, oblique, 550 – 560 μ long, 40 – 50 μ broad at base, inner ones or equal length with the outer, processes shorter than the teeth, operculum convex. Spores rounded, brown, 25–26 μ in diameter.

2. *Gymnostomiella vernicosa* (Hook.) Fleisch

Plant very small, minute, forming velvety coating on walls of houses and temples. Stem 5–7 mm long, filiform., Leaves broadly spatulate, obovate, concave, 0.3 mm long, Leaf margin, erect entire below, papillosecrenulate above. Laminar cells 4–6 side, hexagonal, with firm wall, 10–15 μ long and 6 μ broad. Leaf base cells more elongated, rectangular, smooth, hyaline, 22–26 μ long and 15–17 μ broad. Nerve short, faint, percurrent, reaching to the two-thirds part of the leaf or up to midleaf. Plants Dioecious.

3. *Bryum coronatum* Schwaegr

Dioicous a tuft of slender, dull, yellowish–green plants growing on rock & old walls. Stem 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, 59.5 μ long, 13 μ broad. Leaf base cells shortly rectangular, 37.8 μ long, 17.4 μ broad. 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 (Exostome) papillose, transversely barred, yellowish orange coloured, 94 μ broad at base. Endostome colourless. Spores light brown, globose to oval, smooth 12-20 μ in diameter.

4. *Bryum argenteum* Hedw.

Small, Dioicous, silvery white, glossy plants with short reddish brown erect stem 1.5 to 2 cm. in height . Leaves crowded, broadly ovate, concave, 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, 56 μ long, 12 μ broad. Leaf base cells short rhomboidal, sometimes subrectangular, chlorophyllose, often tinged with red, 25.6 μ long 14 μ broad. Plant sterile.

5. *Bartramidula roylei* (Hook.f.) B.S.G.

Plants in loose, low cushions of pleasant light green colour growing on rocks with mineral soils, reaching a height of 0.5 to 1.8 cm with whorls of 3-5 sub-floral innovations, felted below by smooth, rhizoids and dirty covering a large distance of the stem. Leaves more or less erecto-patent when moist, closely appressed when dry, lanceolate, 1 to 1.5 mm long, narrow, their base slightly decurrent; leaf margin apex acuminate in the lower half, in the upper half serrulate. Upper leaf cells long, rectangular to elongated, hexagonal 42 μ long and 5.3 μ broad. Leaf base cells lax, rectangular dilated, translucent, 38 μ long and 10 μ broad. Marginal cells near the leaf base quadrate to irregularly rectangular, 16.9 μ long and 10.3 μ broad. Nerve single, brownish, excurrent. Sporophytes not seen.

6. *Hyophila involuta* (Hook.) Jaeg.

Plants common on large basalt stones on compound wall; dark green in colour and with tufts of rhizoids at the base. Stem 1-1.5 cm high. Leaves long, spatulate, 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, mamilllose. Leaf base cells large, more or less rectangular, pallucid.

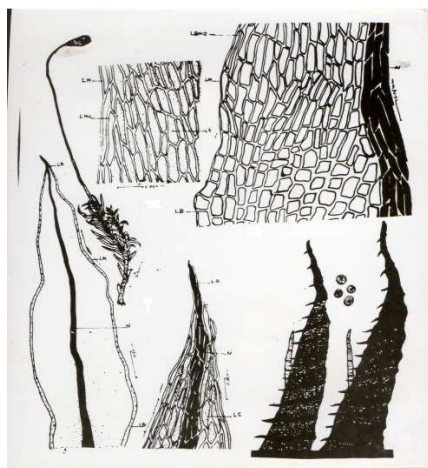
Seta erect, elongate, 2 to 2.5 cm high. Capsule 4-5 mm high, erect, cylindrical or needle like, lid conical, beak oblique. Spores light brown, rounded, smooth, 12μ in diameter.

7. *Semibarbula orientalis* (Web.) Wijk. & Marg.

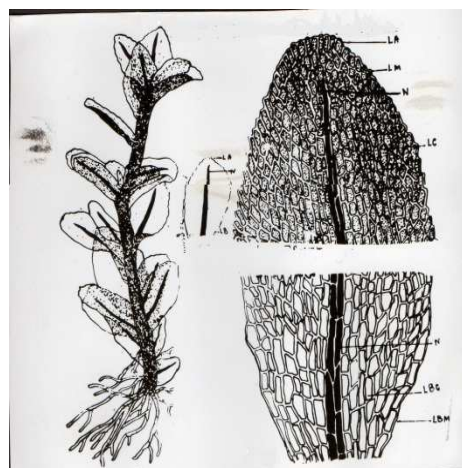
Plants yellowish green to green, calciphilous, growing in dense tufts on old walls, limy compounds. Stem brownish green, 4-5 mm to 1.5 cm in height and unbranched. Leaves lax but clustered near apex, oblong to ovate-lanceolate, spirally arranged, upto 1.5 mm in length and 0.3 mm in breadth, at base erectopatent when moist, incurved and curled when dry; margin flat, papillose. Leaf apex rounded with a pointed end. Leaf (Laminar) cells chlorophyllose, highly papillate, obscure, rounded quadrate or squarrose to hexagonal, to 9μ wide. Leaf base cells large, rectangular, hyaline $35-40\mu$ in length and 8μ in breadth. Nerve distinct, light greenish yellow, short excurrent rough at the back. In t.s. leaf showing a row of detour cells in the center of middle with a large patch of dorsal and a smaller patch of ventral sub-steredial cells.

8. *Fissidens splachnobryoides* Broth.

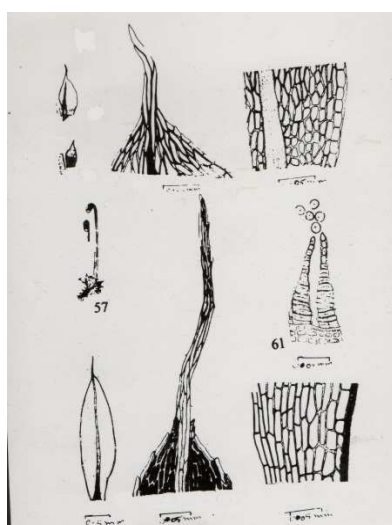
Plants robust, gregarious, dull yellowish green, stem upto 1 cm long, flaccid, brownish red. Leaves 10-11 pairs slightly contorted when dry, oblong lanceolate, shortly acuminate, upto 3.5 mm long, bordered all around with 3-4 rows of narrow linear cells, dorsal lamina tapering below and usually ending above the leaf insertion, leaf base semiamplexicaul, narrow rounded, nerve incomplete ending below apex, brownish. Laminar cells lax, Prosechymatous, oval-rhomboidal to polygonal, reticulate, chlorophyllose, 31.9μ mm long and 12.6μ broad. Basal cells rectangular to sub-rectangular. Gemmae axillary, clavate, septate, stalked, 19.4μ long, 12.4μ broad.



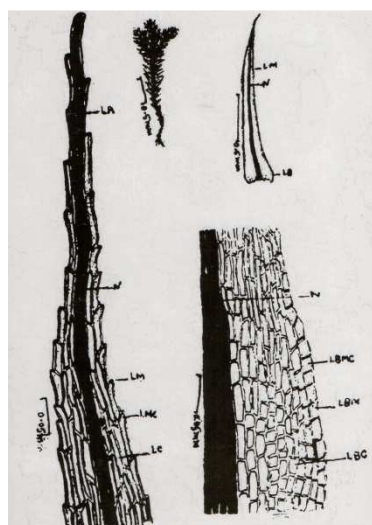
Funaria hygrometrica Hedw.

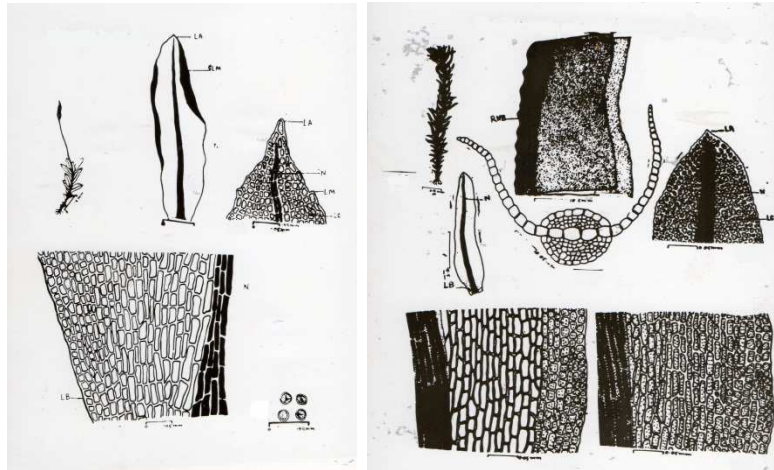


Gymnostomiella vernicosa (Hook) Fleisch

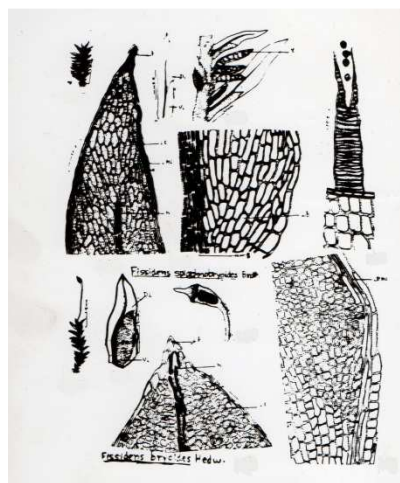


Bryum coronatum Schwaegr & *Bartramidula roylei* (Hook.f.) B.S.G.
Bryum argenteum Hedw.





Hyophila involute(Hook.)Jaeg., *semibarbula orientalis*(Web.) Wijk &Marg.



Fissidens splachnobryoides Broth.

DISCUSSION

The present investigation deals with soil borne mosses from diverse habitats and different localities of Trimbakeshwar and its adjacent areas. Considerable attention is focused on the habitat, association of bryophytic species and taxonomic treatment. Eight Terricolous mosses belonging to four orders and five families are included in this paper.

The Family Archidiaceae under Order- Bryales represents *Funaria hygrometrica* Hedw. *Gymnostomiella vernicosa* (Hook) Fleisch growing on lateritic soil in pure and mixed strands. Order Eubryales represents *Bryum coronatum* Schwaegr, *Bryum argenteum* Hedw from family Bryaceae & *Bartramidula roylei*(Hook.f.)B.S.G. from family Batramiaceae. *Bryum coronatum* grows on calcareous walls whereas *Bryum argenteum* is found on moist scattered stones and bricks. *Hyophila involute* (Hook.) Jaeg grows on exposed rocks, on creeks and crevices while *semibarbula orientalis* (Web.) Wijk & Marg grow on calcareous & alkaline soil both being from order Pottiales and Family Pottiaceae. Order Fissidentales represent only one member *Fissidens splachnobryoides* Broth found on humid rich, ± acidic soil. During the field work it has been noticed that severe pollution, heavy traffic, tourist centres, increasing residential colonies are main threats affecting the growth of mosses of this sensitive area. Comparatively, the moss flora of Kasara Ghat [11] & Khandala [8] with that of Trimbakeshwar, it is noted that as we move southwards, more and more humid species of various genera of mosses begin to appear and a travel towards north reveals more of dried species of moss.

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