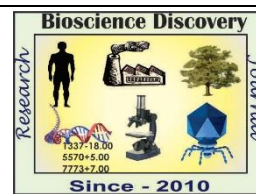


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Print & Online, Open Access, Research Journal Available on <http://jbsd.in>

ISSN: 2229-3469 (Print); ISSN: 2231-024X (Online)

Research Article



Studies on corticolous Mosses from Panhalgad in Western Ghats of Maharashtra, India

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Article Info

Received: 08-08-2017,

Revised: 18-09-2017,

Accepted: 22-09-2017

Keywords:

Mosses, Corticolous,
Panhalgad, Western Ghats.

Abstract

Nine corticolous mosses have been collected from Panhalgad in the Western Ghats of Maharashtra in different season's viz., *Pogonatum microstomum*, *Campylopus flexuosus*, *Leucobryum bowringii*, *Fissidens bryoides*, *Fissidens macrosporoides*, *Funaria nutans*, *Anomobryum auratum*, *Bryum capillare*, *Bryum uliginosum* belonging to six families from five orders. This is the first consolidated record of mosses from Kolhapur District.

INTRODUCTION

Panhalgad is the hill station area under investigation that lies towards eastern spur of Western Ghats. It coordinates 16.48' N 74.7' E. It stands on a dark basalt rock, with thick laterite, reddish-brown soil. The city sprawls in the Panhalgad fort commands a panoramic view of the valley below. Panhalgad imposing fort 18 km built on an outlying spur of the Sahyadri, rising more than 783.7 mt. above plain and is largest of all the Deccan forts. The fort area experiences an averages maximum temperature of 28-32⁰ C and minimum 18-22⁰ C with an overall annual rainfall of about 1645 mm. The relative humidity is as high as 75% during monsoons but it reduces significantly later. Due to high rainfall and humidity Panhalgad is an ideal spot for the growth of bryophytes including mosses. Mosses of Panhalgad region have not been precisely reported till date and therefore it is sincere attempt to observe, understand and reveal the flora noted for the first time in Kolhapur District. In the present investigation, 9 species of corticolous

mosses belonging to 5 orders and 6 families are reported.

As far as studies on bryophytes from Kolhapur district including Panhalgad are concerned only liverworts and hornworts are studied by Joshi and Biradar (1984), Lavate (1999), Dongare (2004), Lavate (2015a and 2015b). Magdum *et al.* (2016) has published checklist of 129 species of mosses, belonging to 11 orders; 26 families and 59 genera from the Western Ghats of Maharashtra.

The present paper is the first consolidated record of nine corticolous mosses from Panhalgad from Kolhapur District in the Western Ghats of Maharashtra.

MATERIALS AND METHODS

The material has been collected from different localities of Panhalgad viz., Teen Darwaza, Sajja Kothi, Tabak Udyan, Pusti Buruj, Shahu Maharaj statue, Masai Road, and Parashar Ashram during different seasons especially following rains in the year 2010-2015.

Mosses collected were air dried in open shaded area, pressed and stored in well kept in packets 13.5 x 13.5 cm in size with their respective dates and collection, locality, habitat, etc. being marked on the packets for further studies. The species collected were identified by using standard literature *i.e.* floras, manual, monograph, Research articles by Chopra (1975), Chaudhary and Deora (1993 and 2001), Dabhade (1998), Gangulee (1985), Nair *et al.* (2005), Lal (2005), Chaudhary and Sharma (2000), Chaudhary *et al.* (2006 and 2008), Daniels and Daniel (2013), Sandhya Rani *et al.* (2014) and Alam (2015).

Nomenclature and citation were updated by using Tropicos and IPNI (International Plant Name Index).

OBSERVATIONS

The present paper is the first consolidated record of nine corticolous mosses from Panhalgad from Kolhapur District in the Western Ghats of Maharashtra *viz.*, *Pogonatum microstomum*, *Campylopus flexuosus*, *Leucobryum bowringii*, *Fissidens bryoides*, *Fissidens macrosporoides*, *Funaria nutans*, *Anomobryum auratum*, *Bryum capillare*, *Bryum uliginosum* belonging to six families from five orders (Table 1).

Table 1: List of Corticolous Mosses reported from Panhalgad.

Name of Species
Order-Polytrichales
Family- Polytrichaceae
Genus-Pogonatum
<i>Pogonatum microstomum</i> (R. Br. ex Schwägr.) Brid.
Order-Dicranales
Family- Dicranaceae
Genus-Campylopus
<i>Campylopus flexuosus</i> (Hedw.) Brid.
Family – Leucobryceae
Genus – Leucobryum
<i>Leucobryum bowringii</i> Mitt.
Order-Fissidentales
Family- Fissidentaceae
Genus-Fissidens
<i>Fissidens bryoides</i> Hedw.
<i>Fissidens macrosporoides</i> Mitt.
Order-Funariales
Family- Funareaceae
Genus-Funaria
<i>Funaria nutans</i> (Mitt.) Broth.
Order-Eubryales
Family- Bryaceae
Genus-Anomobryum
<i>Anomobryum auratum</i> (Mitt.) Jaeg. Ber. S. Gall.
Genus-Bryum
<i>Bryum capillare</i> Hedw.
<i>Bryum uliginosum</i> (Brid.) B.S.G.

1. *Pogonatum microstomum* (R. Br. ex Schwägr.) Brid., Bryol. Univ. 2: 745. 1827. **(Plate I-i):** Gametophyte dioecious, small, greenish, erect, varying in size, often tall and showy; stem 2 to 2.5 cm long, unbranched; leaves 5-6 mm X 1.2 mm scale like and acute, curled when dry at apex, lanceolate; seta straight; capsule toothed, covered with calyptra; lamellae numerous, covering entire ventral surface, 4-5 cells high; peristome teeth 32, homogenous; operculum broadly convex with a short beak; calyptra felty, covering the whole capsule.
2. *Campylopus flexuosus* (Hedw.) Brid. Muscol. Recent. suppl., 4: 71. 1818. **(Plate I-ii):** Gametophyte simple, tuft, delicate; stem 1-2 cm long, brown, proliferating; leaves 0.3-4.2 mm long, lanceolate, margin inflexed except at base, tip slightly serrate; seta red brown, cygneous when moist, bend when dry; capsule 1-2 mm long, ovate, cylindrical; operculum subulate to rostrate; calyptra yellow-green, base fimbriate; spores 25-30 µm in diameters, brown, granulate.
3. *Leucobryum bowringii* Mitt. Musc. Ind. Or.: 26. 1859. **(Plate I-iii):** Gametophyte dioecious, small, epiphyte, having tuft branched stem; stem 0.2-0.3 cm long, erect, clothed with scaly leaves; leaves 0.4-0.8 cm long, flexuose or contorted, lanceolate to linear-lanceolate, gradually narrowed to subtubulose apices from oblong base; costa thin, filling almost the entire leaf acumina, dorsal side of leaf acumina smooth; seta 0.1-1.7 cm long, slender, reddish; capsules horizontal to inclined, ovoid to ellipsoid; operculum conical rostrate with long beak; calyptrae cucullate; spores yellowish or brownish, nearly smooth to minutely papillose.
4. *Fissidens bryoides* Hedw., Sp. Musc. Frond. 153, 1801. **(Plate I-iv):** Gametophyte very small 2-4 mm long; stem unbranched, sometime branched, reddish brown; leaves 6-8 pairs lanceolate to oblong-lanceolate, acute to short-acuminate apex, margin entire; seta 6 mm long, light brown; capsule 0.2-1.2 mm long, cylindrical with oblique operculum up to 1 mm long; spores light, rounded and brown in colored.
5. *Fissidens macrosporoides* Mitt., J. Linn. Soc. Bot. Suppl. 1: 140. 1859. **(Plate I-v):** Gametophyte 0.6-0.9 mm long, brown-green, 0.7-1.0 pairs of leaves; leaves oblong-lanceolate, apex obtuse, broader at base, margin entire, curled when dry; costa reddish-brown, ecurrent; seta 4-6 mm long, reddish-brown; capsule 0.2-0.3 mm long, cylindrical, yellowish-brown; spores 7.5-12.5 µm in diameter, rounded.
6. *Funaria nutans* (Mitt.) Broth. Nat. Pflanzenfam I(3): 522. 1903. **(Plate I-vi):** Gametophyte 2-3 mm in long, small, green-yellow, erect, forming a mat; stem delicate, slender, covered with leaves; leaves 1.5 mm long, 1.5 mm broad closely attaches to stem, lanceolate; seta 4-5 mm long, short, delicate, reddish; capsule 0.1-1.5 mm long, asymmetric; spores brown in colour.
7. *Anomobryum auratum* (Mitt.) Jaeg. Ber. S. Gall. Naturw. Ges. 1873-74, 142, 1875. **(Plate I-vii):** Plants densely tufted, shining green, julaceous below, branched with catkin like branches up to 2 cm. long densely radiculose below, branched by 2-3 equally julaceous subfloral innovations leaves 1.5 mm. long, cymbiform, ovate-elliptical, densely imbricate to give shoot a cylindrical appearance, apiculate to obtusely rounded, margin entire; Costa slender, pale brown, ending well below apex; upper cell with thickened walls, linear, 1-2 × 4.77 µm wide and 8-14 × 4.77 µm long; basal cell thin walled hyaline, rhomboidal, hexagonal to subrectangular 4-5 × 4.77 µm wide and 6-15 × 4.77 µm long. Middle cells 1-2 × 4.77 µm wide and 16-18 × 4.77 µm long.
8. *Bryum capillare* Hedw. Sp. Musc. Frond. 182. 1801. **(Plate I-viii):** Gametophyte 0.2-3.5 cm long, epiphyte, yellow-green, growing in patches; stem 0.1-0.2 cm long on which leaves are arranged spirally; leaves leathery, linear-lanceolate, apex acuminate, flat base, arranged in distal position, margin entire; costa strong, single, percurrent; seta 0.1-2.4 cm long, erect but arcuate at tip, red; capsule horizontal, clavate-pyriform to ovate-cylindrical.
9. *Bryum uliginosum* (Brid.) B.S.G. Bryol. Eur., 4: 88. 399. 1839. **(Plate I-ix):** Plants in loose tufts, olive green to brownish, growing in bogs or damp sandy places. Stem deep purple, erect, ± 4 mm. long. Leaves soft clustered in comal tufts, erect to patent when moist, erect and appressed when dry. Costa brown, excurrent in an arista ± 2 mm. long. Leaf cells thin walled and rectangular to rhomboid. Seta apical, slender, erect but arcuate at tip. ± 2.6 cm. long. Capsule horizontal to pendulous, operculum small, conical and Peristome deep inserted. Spores rounded 20 to 30 µ in diameter. Autoicous, antheridia reddish, ± 610 µ long.

RESULTS AND DISCUSSION

The present investigation deals with the 9 corticolous mosses belonging to 5 orders from 6 families which are growing on the bark of trees with diverse habitat and localities of Panhalgad and adjacent areas. Presently mosses facing main threats in the form of pollution and natural habitat loss due to anthropogenic activities like heavy traffic, tourist centres, increasing residential colonies. In case of epiphytes species growing on tree base can cope with the pollution conditions better than those of tree trunks. Shady and alkaline niches are more preferred by bryophytes. Mosses are considered as the most appropriate plant material to study the atmospheric deposition of heavy metals (Govindapuri *et al.*, 2010).

Panhalgad is an ideal habitat for the luxuriant growth of bryophytes especially mosses (Lavate, 1999, 2015a and 2015b). Rare and threatened species of mosses can be extinct before their exploration. So, there is an urgent need to explore and conserve the same.

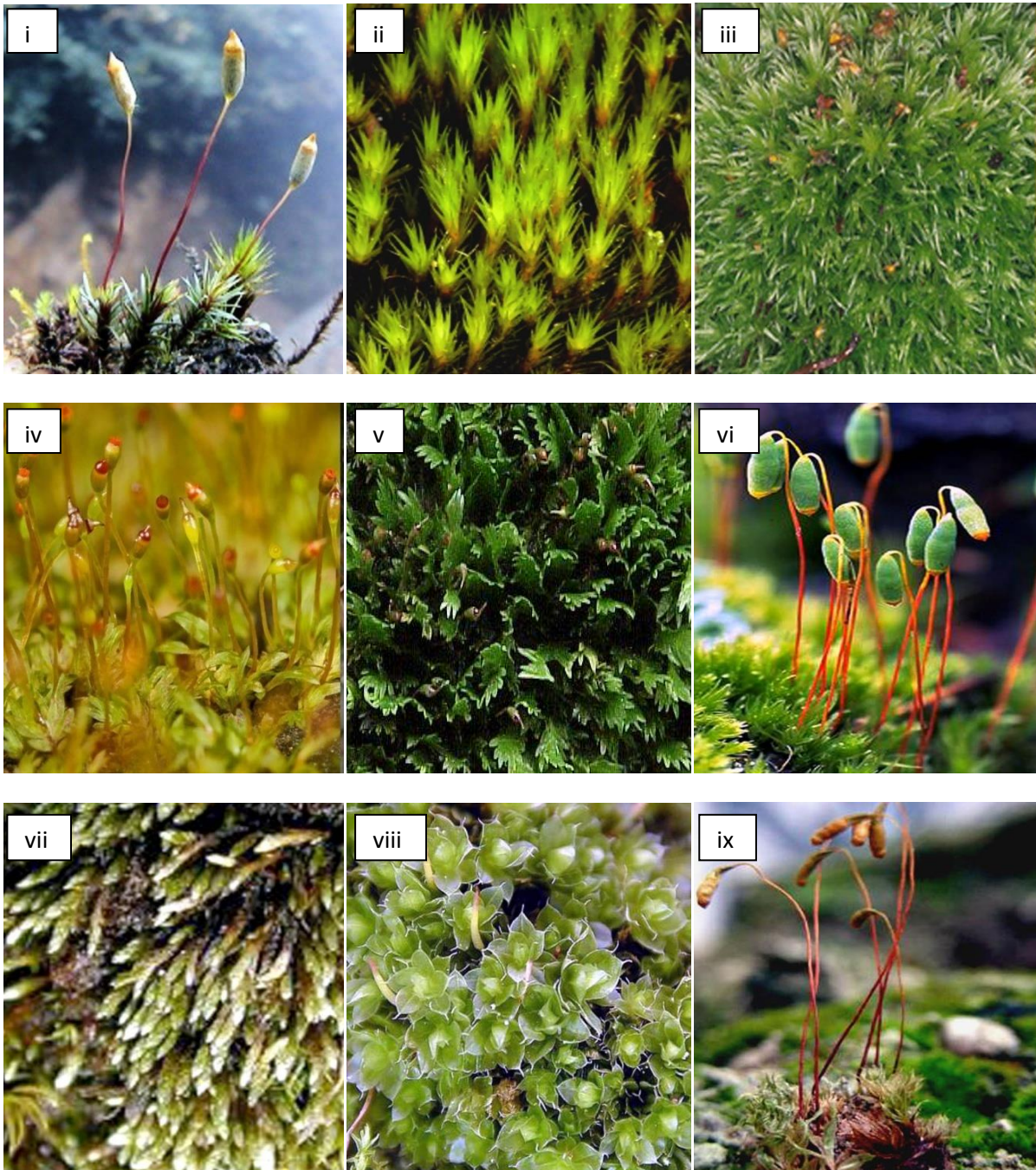
ACKNOWLEDGEMENT

Authors are very much thankful to Dr. D.K. Gaikwad, Head Department of Botany, Shivaji University, Kolhapur for providing the laboratory facilities. Also, authors are thankful to the Principals of KRP Kanya Mahavidyalaya, Urun-Islampur and Raje Ramrao Mahavidhyalaya, Jath for their constant help.

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Plate - I



i) *Pogonatum microstomum*, ii) *Campylopus flexuosus*, iii) *Leucobryum bowringii*, iv) *Fissidens bryoides*, v) *Fissidens macrosporoides*, vi) *Funaria nutans*, vii) *Anomobryum auratum*, viii) *Bryum capillare* and ix) *Bryum uliginosum*.

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How to cite this article

Magdum S M, Lavate R A, Patil SM and Dongare MM, 2017. Studies on corticolous Mosses from Panhalgad in Western Ghats of Maharashtra, India. *Bioscience Discovery*, **8**(4):796-801.