

Liverworts and Hornwort Flora of District Kathua, J&K, India

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Abstract: Bryophytes, called as Lilliputians and amphibians of plant kingdom, are considered first land dwellers which originated in Devonian period of Palaeozoic era since then they have been surviving and evolving in varying climatic conditions. They are of immense biological, ecological, and phylogenetic significance. The present study was conducted in district Kathua, J&K, India. A total of 24 taxa (foliose and thallose including 3 hornworts) belonging to 12 families and 4 orders were found in the study site.

Key words: Liverworts; hornworts; Kathua.

1. Introduction

Bryophytes called as Lilliputians of plant kingdom aren't just small Tracheophytes but the most diverse group of land plants with more than 20,000 species worldwide (Sharma and Langer, 2014). Currently, about 2489 taxa of bryophytes (including interaspecific taxa), comprising 1786 species in 355 genera of mosses, 675 species in 121 genera of liverworts and 25 species in six genera of hornworts are reported from India (Dandotiya *et al.*, 2011). They are pioneers of the terrestrial vegetation. Bryophytes are of immense ecological and high aesthetic value. They grow in variety of life forms contributing to the main component of montane forest due to high degree of soil binding capacity besides the water retention characteristics (Smith, 1982; Alam, 2011).

The Jammu and Kashmir state, a part of north-west Himalayas, shows a great diversity of liverworts. It is divided into three regions namely Jammu, Kashmir and Ladakh.

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Bryofloristic studies have been done extensively in Kashmir and Ladakh regions (Stephani, 1900-1924; Kashyap, 1929 & 1932; Robison, 1965; Kaul & Dhar, 1968; Srivastava, 1979; Bandey *et al.*, 1998; Tanwir and Langer, 2006) whereas in Jammu region, scattered studies have been done in the Rajouri, Poonch, Jammu and Udhampur districts (Langer and Tanwir, 2002; Tanwir and Langer, 2002; Langer *et al.*, 2003; Tanwir and Langer, 2006; Tanwir *et al.*, 2008; Rashid *et al.*, 2012).

During past few decades, the entire Himalayas range has suffered severe habitat destruction on the account of tourism, urbanization, over exploitation of the forest resources and deforestation due to which large number of these plants has disappeared from their natural habitats. Therefore, taxonomic and habitat studies and listing of these species is the most important job in the hands of the researchers. This information can be utilized to study the impact of changing climate and to protect and conserve these valuable plants from the threat of extinction. The present study was undertaken to enlist the various bryophytes growing in Kathua district.

2. Material and methods

2.1 Study site

District Kathua, the gateway to the state of Jammu and Kashmir is located between 32° 00' 17"- 32° 00' 55" N latitude and 75° 01' 00" to 76° 00' 16" E longitude, encompasses 2,651 km² area. Geographically, the district covers a part of middle Himalayas (Bani Tehsil), Doon area, Shiwaliks (Billawar and Basohli tehsils)

and piedmount region (Kathua and Hiranagar tehsils). District Kathua experiences sub-polar, temperate and tropical monsoon type of climate. Winters are very cold with higher reaches experiencing heavy snowfall while summers are extremely hot in the paramount region with mercury touching 45° C in the month of June (Rao *et al.*, 2015). The annual rainfall varies from 912 to 1801 mm (Sharma *et al.*, 2012).

2.2 Material and methods

Field surveys were undertaken during different seasons. The collected plant material was press dried in papers and pasted on the herbarium sheets. The identification of species has been done by consulting Schuster (1984), Asthana and Srivastava (1991), Zhu (2005) and Daniels (2010). The identified specimens were than list alphabetically.

3. Results and discussion

Preliminary survey of various locations of district Kathua has yielded 21 liverworts and 3 hornworts. These taxa have been enumerated. Schuster (1984) system of classification was followed for the arrangement of order and families. The genera within the family and species within the genus are sequenced alphabetically.

Metzgeriales Chalaud

Fossombroniaceae Hazsl. *nom. conserv.*

Fossombronia wondraczekii (Corda) Dumort. ex Lindb., Helsingf. Dagbl. 1873.

Location: Gulakh; Moist shady soils of pine forest.

Pelliaceae H.Klinggr.

Pellia endiviifolia (Dicks.) Dumort., Recueil Observ. Jungerm.: 27, 1835.

Location: Bani, Kandla, Kardoo and Parnala. Moist shady soil, stone in water or bank of river.

Jungermanniales H.Klinggr.

Jungermanniaceae Rchb.

Jungermannia lanceolata L. Syst. Samml. Krypt. Gewiichse 2: 4, 1797; non *J. lanceolata* L., Spec. Plant., p. 1131, 1753

Location: Kardoo, Jarminala and Kadla; Moist soil covering cemented wall or rocks.

Jungermannia truncata Nees, Enum. Pl. Crypt. Jav. 29, 1830.

Location: Parnala and Sukrala; moist soil.

Jungermannia kanaii Amakawa, *J. Hattori Bot. Lab.* 30: 194, 1967.

Location: Galakh and Satwain; on moist soil, concrete walls or rocks.

Solenostoma gollanii Steph., Spec. Hepat. 6: 81. 1917. Syn: *Jungermannia (Luridae) tenerrima* Steph., Spec. Hepat. 6: 93, 1917.

Location: Satwain; on moist soil concrete walls or rocks.

Geocalyceae H.Klinggr.

Heteroscyphus pandei S.C. Srivast. et A. Srivast., Lindbergia 15 (6): 197, 1989.

Location: Bani; on moist surface of rock or stone.

Plagiochilaceae Müll.Frib

Plagiochila gollanii Steph., Bull. Herb. Boissier (sér. 2) 5 (10): 938 (588), 1905.

Location: Karroh; moist slightly exposed concrete wall.

Jubulaceae H. Klinggr.

Frullania muscicola Steph., Hedwigia 33 (3): 146, 1894.

Location: Galakh and Bani; on moist shady soil or epiphyte on tree trunk.

Marchantiales Limpr.

Aytoniaceae Cavers

Asterella angusta (Steph.) Mahab. & Bhate, J. Univ. Bombay 13(5): 5, 1945.

Location: Parnala, Dinga Amb, Galakh, Satwain, Rihalta and Jhoterd; on moist soil covered rock or moist exposed soil.

Asterella pathankotensis (Kash.) Kachroo

Mannia foreau Udar & Chandra, Can. J. bot. 43 (1): 148, 1965.

Location: Dinga Amb, Bani and Basohli; on moist exposed soil and on concrete walls.

Plagiochasma appendiculatum Lehm. et Lindenb., Nov. Stirp. Pug. 4: 14, 1832.

Location: Dinga Amb, Thain Dam, Kareloo, and Basohli; on moist shady or slightly exposed rock or concrete wall.

Plagiochasma intermedium Lindenb. et Gottsche, Syn. Hepat. 4: 513, 1846.

Location: Sukrala, Dinga Amb, Parnala, Salan and Marto Nagrota; on moist shady soil, concrete walls or rocks.

Reboulia hemisphaerica (L.) Raddi, Opusc. Sci. 2 (6): 357, 1818.

Location: Dinga Amb and Bani; on moist soil, concrete walls or rocks.

Conocephalaceae Müll.Frib. ex Grolle

Conocephalum conicum (L.) Dumort., Commentat. Bot. (Dumortier): 115, 1822.

Location: Bani; on moist shady soil near water or under water.

Marchantiaceae Lindl.

Dumortiera hirsuta (Sw.) Nees, Nova Acta Phys.-Med. Acad. Caes. Leop.-Carol. Nat. Cur. 12 (1): 410, 1824.

Location: Dumi-nala, Karooh and Bani; on moist and shady soil, rocks near the water.

Marchantia paleacea Bertol., Opusc. Sci. 1: 242, 1817.

Location: Bani, Karooh, Dumi-nala and Kadla; grow on moist shady soil, and covered rocks near small water fall or water stream.

Marchantia polymorpha L., Sp. Pl. 1: 1137, 1753.

Location: Phinter; on moist and shady soil near water canal.

Ricciaceae Rchb.

Riccia discolor Lehm. et Lindenb., Nov. Stirp. Pug. 4: 1, 1832.

Location: salan, Galakh and Bani; on moist soil, concrete wall or rock slightly exposed to sunlight.

Cyathodiaceae Stotler et Crand.-Stotl.

Cyathodium cavernarum Kunze, Nov. Stirp. Pug. 6: 18, 1834.

Location: Galakh and Salan; on moist soil or concrete wall.

HORNWARTS

Anthocerotales Limpr.

Anthocerotaceae Dumort.

Anthoceros erectus Kashyap, New Phytol. 14 (1): 9, 1915.

Location: Dumi River; on moist and shady soil.

Notothyladaceae Müll.Frib. ex Prosk.

Notothylas himalayensis Udar et D.K.Singh, J. Bryol. 11 (3): 451, 1981.

Location: Dinga Amb; on moist and shady soil.

Phaeocerozoideae Häsael

Phaeoceros laevis (L.) Prosk., Bull. Torrey Bot. Club 78 (4): 347, 1951.

Location: Dumi River; on moist and shady soil.

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