

Study on Bryoflora of Kannavam Forest, Kannur District, Kerala, India

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ARTICLE DETAILS

Article History

Published Online: 16 Apr 2020

Keywords

Bryophytes, diversity, morphology, taxonomy, tropical forests.

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ABSTRACT

Kannavam Forest is a tropical forest located in the Kannavam Village with an area of 400 hectares, in Thalassery taluk of Kannur district of Kerala state. The forests canopy favors the luxuriant growth of lower plants and bryophytes. Specimen collections were carried out during the period of August 2017 to March 2018, morphological and taxonomical studies were carried out. A total 20 species which belong to 16 genera, 12 families, 8 orders and 2 classes of bryophytes were identified. Of these, 8 orders, 11 families, 14 genera, 18 species and 3 varieties are mosses, 1 orders, 1 family, 2 genera and 2 species were liverworts. The result revealed the presence of some rare species, never reported from the state of Kerala and also in Kannur before. This study was a pioneer work in diversity of bryoflora in Kannavam forest.

1. Introduction

Bryophytes were diverse and a distinct group of primitive plants (Bapna & al., 2000), with about 25,000 species distributed over the world, making in the second largest group of land plant. They were considered as 'Amphibians of plant kingdom' as water is indispensable for growth and sexual reproduction (Cases & al., 2006). The group includes three distinct lineages viz., liverworts, hornworts and mosses. Bryophytes grow on a wide range of substrates. They grow on logs, mud walls, tiled roofs which grow closely packed together in mats or cushions on soil (terricolous), growing as epiphytes on barks of trees (corticolous), on leaves (folicolous or epiphyllous), on rocks (rupicolous), on stones (saxicolous), on fallen logs (lignicolous), river banks and road sides are common sights.

Bryophytes play an important role in an ecosystem in many ways: (i) Bryophytes have a great capacity to stabilize soil, particularly mosses are very effective and successful soil binder and nutrient trapper, (ii) They have high water holding capacity and ability to tolerate desiccation. Bryophytes are spread by apical growth and even after their subsequent decay, the apex grows in a mat in favorable condition which helps to hold the water and soon the young ones; cover the soil area, (iii) They form a moist wet ground to form a cushion; which ultimately helps to grow the other vascular seedlings later. This maintains the high humidity regime within such forest, (iv) Filtering takes place through fall and runoff water through the bryophyte mat and peat using cation exchange system. This is an additional significance of the forest ecosystems elsewhere in the world (Bates 1990). Bryophytes have ecological association with microorganisms, protozoans, rotifers, nematodes, earthworms, molluscs, insects, spiders and many other invertebrates (Gerson, 1982) as well as other plants and fungi. Ecological significance of Kannur district is famous for wetlands and highlands. The present study was an attempt to explore Bryoflora of the forest patch of Kannavam in Kannur district.

2. Materials and Methods

Study area

The study area i.e., the Kannavam Forest, is located in small Kannavam Village/hamlet with an area of 400 hectares, in Thalassery taluk in Kannur district of Kerala state, India. It comes under Chittariparamba Panchayath. This district is the second Northern most district of Kerala and lies between 11°40' and 12°08' N latitude and 75°11' and 76°08' E longitude and is bounded on the North by Kasaragod district of Kerala state, on the South by Calicut and Wayanad, on East by Karnataka state and on West by Arabian sea. Kannavam is 40 km away from Kannur town and is well connected by road. Major population was *Kurichyas* tribe. Their inhabitations were surrounded by Kannavam forest. Specimen collections were carried out during the period of August 2017 to March 2018. Three major substrates viz. Soil, rock and wood were classified as micro habitats. Wood substrate includes tree trunks, branches and twigs, logs and stumps, the bryophytes were collected from all these microhabitats. Plants growing firmly adhered to their substrata were scraped with the help of a knife or cut along with the substratum with a chisel. Any adhering extraneous material was washed off with care, without damaging the reproductive structures particularly in hepatics. Zipper bags were used for keeping the collections and were stored in a refrigerator when they could not be examined immediately. Collected specimens were carefully separated from each other and exposed in a packet made of some absorptive paper to air-dry. Photographs were taken whenever necessary to show their habit and habitat using a Nikon digital camera. Morphological characters were studied using Leica stereo microscope anatomical studies were carried out using Magnus camera. Identifications were made with the help of Gangulee's Mosses of Eastern India and Adjacent Regions (1969 - 1980) and other related works especially recent revisions and monographs and also by comparing with protologues, types and authentic specimens as and when required (Ref. No.4,7,9,10). Materials that could not be determined were referred to experts.

3. Results and Discussion

The present study focused on the diversity of bryophytes in Peruva, Kannavam forest, in Kannur district, Kerala. The result shows that, the place was rich in bryophyte diversity with the presence of some rare species, never reported from the Kerala state and Kannur district before. The results were as follows-

Species Composition

On the basis of the field survey conducted in the forest area, a total of 20 species classified among 16 genera and 12 families in 8 orders were collected, identified and listed. The ratio of family to genera and species was in 1: 1.33: 1.25. Out of the total 20 species observed in the study site, mosses were dominant with 18 species. The relation of liverworts to mosses was 1:9. However no hornwort species were observed from the study site. Compared to well explored protected areas such as the Silent Valley National Park in the Western Ghats of India which consists of 211 species, and 3 varieties belonging to 125 genera, 50 families, 15 orders and 3 classes of bryophytes (Raja, 2012) and the Aralam Wildlife Sanctuary in the Western Ghats of India with a total 116 taxa includes 9 mosses, 27 liverworts (Manju et. al., 2015), the result reveals that the study site is holding proportionally a very luxuriant bryodiversity.

Examining the distribution of the recorded families, the study has found that *Fissidentaceae* is the largest family with 3 species in one genus. It was followed by *Sematophyllaceae* with 3 species in 3 genera. Of the two liverworts reported, two species belonged to *Geocalyceae* and *Lejeuneaceae*. Altogether 16 genera which include 14 mosses and 2 liverworts of bryophytes were recorded in the study site. The most dominant genus was *Fissidens* Hedw. with 3 species and the genera, *Calymperes* and *Hyophila* were represented by two species each.

Different bryophytes were recorded from various substrata occur at the kannavam forest. Among the 18 species of mosses observed, corticolous forms tend to dominate (15each), followed by rupicolous (5), terricolous (2) and lignicolous (1). No saxicolous and folicolous forms were observed. The total two liverwort species reported from the study area were found to grow lignicolous forms. Liverworts were not observed to abundant in the study site as the collection was made during the dry season of the year. This result emphasizes the importance of a detailed floristic study on bryophytes in this region.

Table 1
Enumeration of Mosses and liverworts recorded in Kannavam Forest, Kannur, Kerala

Family & Genus	Species	Habitat
CLASS: MUSCI		
ORDER: DICRANALES		
Dicranaceae		
<i>Leucoloma</i> Brid.	<i>L. taylorii</i> (Schwägr.) Mitt., J. Proc. Linn. Soc.	C&T
<i>Leucobryaceae</i>		
<i>Leucophanes</i> Brid.	<i>L. octoblepharoides</i> Brid.***	C
<i>Octoblepharum</i> Hedw.	<i>O. albidum</i> Hedw.	C
ORDER: FISSIDENTALES		
Fissidentaceae		
<i>Fissidens</i> Hedw	<i>F. jungermannioides</i> Griff.***	T,R & C
	<i>F. bryoides</i> Hedw.	T,R & C
	<i>F. sylvaticus</i> Griff.	T,R & C
ORDER: SYRRHOPODONTALES		
Calymperaceae		
<i>Calymperes</i> Sw. ex F. Weber	<i>C. andamense</i> Besch.*	R
	<i>C. tenerum</i> Müll.Hal.	R
ORDER: POTTIALES		
Pottiaceae		
<i>Hyophila</i> Brid.	<i>H. spathulata</i> (Harv.) A. Jaeger**	C
	<i>H. involuta</i> (Hook.) A. Jaeger	
ORDER: ISOBRYALES		
Neckeraceae		
<i>Neckeropsis</i> Reichenb.	<i>N. andamana</i> (Müll. Hal.) M. Fleisch.	L
<i>Homaliodendron</i> M. Fleisch.	<i>H. exiguum</i> (Bosch & Sande Lac.) M. Fleisch.	C
ORDER: HOOKERIALES		

Hookeriaceae		
<i>Chaetomitrium</i> Dozy & Molk.	<i>C. papillifolium</i> Bosch & Sande Lac**	C
ORDER: HYPNOBRYALES		
Hypnaceae		
<i>Ectropothecium</i> Mitt.	<i>E. cyperoides</i> (Hook. ex Harv.) A. Jaeger	C
Plagiotheciaceae		
<i>Entodontopsis</i> Broth.	<i>E. anceps</i> (Bosch & Sande Lac.) W.R. Bucklre & land***	T
Sematophyllaceae		
<i>Meiothecium</i> Mitt.	<i>M.jagorii</i> (Müll. Hal.) Broth.**	L
<i>Sematophyllum</i> Mitt.	<i>S. humile</i> (Mitt.) Broth.	
<i>Wijkia</i> H.A. Crum	<i>W. baculifera</i> (Dixon) H.A. Crum*	C
CLASS: HEPATICAE		
ORDER: JUNGERMANNIALES		
Geocalyaceae		
<i>Heteroscyphus</i> Schiffn.	<i>H. argutus</i> (Reinw. & al.) Schiffn.	C
Lejeuneaceae		
<i>Lejeunea</i> Lib.	<i>F. flava</i> (Sw.) Nees	C

* Added here to the flora of Peninsular India

** Added here to the flora of Kerala

***. Added here to the flora of Kannur District

Additions to the flora of Kerala: *Calymperes andemense*. Besch, *Chaetometrium papillifolium* Bosch & Lac, *Hyophila spathula* (Harv) Jaeg, *Wijkia baculifera*(Dix.) Crum. Bomb.

Additions to the flora of Kannur District Mosses:
Leucoloma taylorii (Schwägr.) Mitt.,
Leucophanes octoblepharoides Brid., *Fissidens jungermannioides* Griff., *Fissidens bryoids* Hedw., *Calymperes andemense*. Besch, *Hyophila involuta* (Hook.) A.Jaeger, *Homaliodendron exiguum* (Bosch & Sande Lac.) M. Fleisch, *Chaetometrium papillifolium* Bosch & Lac, *Ectropothecium cyperoides* (Hook. ex Harv.) A. Jaeger, *Stereophyllum anceps* Broth., *Meiothecium jagorii*(C. Muell) Broth., *Sematophyllum humile* (Mitt.) Broth.

4. Conclusion

The present study was the first to deal the bryophyte diversity of the Kannavam forest, Kannur. It provides baseline information on the bryoflora of the region. The occurrence of 20 species from a comparatively a very small area like Kannavam forest highlights the high bryophyte diversity potential of the study site. Since the bryophytes show luxuriant growth particularly after rain, a more systematic specimen collection covering different seasons, during and after monsoon showers is needed to facilitate completeness in survey and inclusive of various stages of life-cycle. Further investigation on ecological relationships of these plants is also recommended. It will help to thrive light on future studies on the bryophytes in the district, Kannur.

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