



Bryophytes in Andhra Pradesh-The current status

D Sangeetha¹, S B Padal²

¹ Research Scholar, Department of Botany, Andhra University, Visakhapatnam, Andhra Pradesh, India

² Department of Botany, Andhra University, Visakhapatnam, Andhra Pradesh, India

Abstract

Bryophytes grow on different variety of areas like moist soils, rocks, dry soil, cement bridges, in water, on bark, soil cuttings on exposed roots, on branches, on leaves, dead and decaying organic matter etc. Andhra Pradesh a total of more than 104 species belonging to 80 genera and 50 families has been recorded. Of these Musci is the largest class comprising of 60 species, belonging to 50 genera and 25 families, Hepaticae is represented by 37 species and 30 genera and 20 families while class Anthocerotae is poorly represented by 6 species, 6 genera and 5 families. Pottiaceae is the largest family with 12 species under 10 genera followed by Bryaceae with 12 species under 6 genera. Fissidens and Bryum are the largest genera with 10 species each followed by Riccia with 9 species. Northern districts of Andhra Pradesh like Visakhapatnam and East Godavari show much diversity and density of bryophytes. The many studies have insisted that sufficient focus has not been given to study on bryophytes in Andhra Pradesh. In this work I study Bryophytes in Andhra Pradesh -The Current Status. This study would enable investigation of the use of bryophytes in further studies.

Keywords: bryophytes, Nallamalla Hills and hepaticae

Introduction

The term 'Bryophyta' is of Greek origin and refers to plants that "Swell up on hydration". The term Bryophyta was first introduced by Robert Brown (1866) to include algae, fungi, lichens and mosses. In recent years the term bryophyta includes Hepaticae, Anthocerotae and Musci. They are old lineages undergoing active speciation. Bryophytes are an important component of vegetation being the pioneers to colonize any terrestrial habitat and they have been around for 400 million years or more. These plants are referred to as "amphibians" of the plant kingdom owing to their preference to aquatic and other wet habitats and water being necessary for completing the life cycle. They have the remarkable capacity to turn fresh within short time which is known as "Resurrection plants". Plants occupied second largest group of land plants after angiosperms, nearly 23,000 species (Thieret, 1956) are distributed throughout the world. The many studies have insisted that enough focus has not been given to study the bryophytes in Andhra Pradesh. In this work I study Bryophytes in Andhra Pradesh -The Current Status. This study would enable investigation of the use of bryophytes in further studies.

These are characterized by the absence of vascular tissue and also lacking true roots, though many species have root like rhizoids. Bryophytes are the only land plants and with a dominant gametophyte generation. Persistent gametophyte is responsible for exploratory growth as well as for proliferation of a new generation through either sexual process. Sporophyte is dependent and ephemeral on the gametophyte for protection and nutrition. Although small, they can be very conspicuous growing as extensive mats. Usually, bryophytes show a preference to inhabit microclimatic niches such as crevices of near small shady springs, rocks and trees and so on. They can also inhabit variety of habitats like exposed arctic rocks, dark forest rocks, acid bogs, tree trunk, boulders washed by fast flowing streams, exposed roots, soil, weathered bones and glass surface etc. They survive, long period of desiccation without any underground organs or specialized structures. These are known as "xenomorphic forms".

This is a much neglected branch of plant science research in India. Bryophytes include three distinct lineages. Hepaticopsida, Anthocerotopsida and Bryopsida. In Hepaticopsida plant body is thalloid or foliose, liver shaped, hence these are known as liverworts. Anthocerotopsida is a very small group having 150 species, these are also known as hornworts because of the presence of long horn shaped sporophyte. Bryopsida, which are evolved and largest group of bryophytes show differentiation in plant body like roots (rhizoids), stem and leaf.

Bryophytes in India

Bryophytes are group of plants; it is the second largest, with about 25,000 species worldwide. About 2000 species of mosses, 816 species of liverworts and 34 species of hornworts are occurring in India in the present state of our knowledge. India is one of the 12 mega biodiversity countries in the world. India is the large area and a variety of phytoclimatic contribute to the great diversity of flora. The plants are distributed in the parts of Eastern and Western Himalayas, South India and Central India. Currently about 2480 taxa of bryophytes are

reported from India, comprising about 722 taxa of liverworts in 128 genera and 52 families, 36 taxa in 6 genera and 2 families of hornworts and about 1623 taxa in 342 genera and 57 families of mosses.

Western Ghats (includes Nilgiris, Anamalais, Palnis and Agasthyamalai) and the Eastern Ghats (includes Shervaroys) bryogeographical regions. The study reports 712 taxa of bryophytes from Tamil Nadu, India, comprising 211 taxa in 56 genera and 32 families of liverworts, 8 taxa in 4 genera and 2 families of hornworts, and 493 taxa in 189 genera and 44 families of mosses.

Bryophytes in Andhra Pradesh

The State of Andhra Pradesh grow between 12 37' and 19 54' North latitudes and 76 46' and 84 46' East longitudes. Geographically it occupies the middle portion of the eastern half of the Indian peninsula with an area of 1,60,205 sq. Kms. Elevation ranges from sea level to about 1500 m above mean sea level. The average rainfall in the state is 940.86 mm. Vegetation types in the state include Tropical semi-evergreen forests, Tropical moist deciduous forests, Dry deciduous forests, Dry savannah forests, and Tropical dry evergreen forests. Bryophytes are the good indicators of environmental conditions and envelope forest floor and tree trunks and aid in moisture conservation. They grow on a variety of habitats like rocks, moist soils, dry soil, cement bridges, in water, soil cuttings, on bark, on exposed roots, on leaves, on branches, on dead and decaying organic matter etc. Authors carried out study on bryophytes of Eastern Ghats of Andhra Pradesh. Systematic collections were carried out by conducting frequent field trips in different seasons and from different localities. Bryophytes were collected from different ecosystems such as forest floors, bark, leaves, logs, rocks, termite mounds, stream sides, waterfalls, ponds and moist soil in shady areas of forest.

Discussion

Despite of their small size, they comprise more components of photosynthetic production and the biomass in the ecosystem of forest. Bryophytes are used widely as bioindicators environment for their capacity to the pollutants of absorb. The more specific responses as some species are extremely sensitive to the pollutants. It also exhibit symptoms of visible injury even in the presence of very minute quantities of pollutants. Bryophytes have several features of biological making them particularly suited to serve as study organism in macro evolutionary population genetics and ecological research. Bryophytes are used so many purposes like in medicines, fuel in industries, horticulture, agriculture, household purposes, and as ecological indicators throughout the world. Bryophytes are the second largest group plants about 25,000 species in the worldwide. About 816 species of liverworts, 2000 species of mosses and 34 species of hornworts are occurring in India. Northern districts of Andhra Pradesh like Visakhapatnam and East Godavari show much diversity and density of bryophytes. All workers have insisted that enough focus has not been given to study of bryophytes in Andhra Pradesh.

The collected materials were processed and stored in the herbarium of Andhra University. A total of 104 species belonging to 80 genera and 50 families have been recorded. Of these Musci is the largest class comprising of 60 species, belonging to 50 genera and 25 families, Hepaticae is represented by 37 species and 30 genera and 20 families while class Anthocerotae is poorly represented by 6 species, 6 genera and 5 families. Pottiaceae is the largest family with 12 species under 10 genera followed by Bryaceae with 12 species under 6 genera. Fissidens and Bryum are the largest genera with 6 species each followed by Riccia with 9 species. Northern districts of Andhra Pradesh like Visakhapatnam and East Godavari show much diversity and density of bryophytes. *Heteroscyphus hyalinus*, *Plagiochila gollani*, *Frullania udarii*, and *Lejeunea cavifolia* grow on bark of variety of trees. *Bazzania tridens* grows on bark of *Terminalia alata*, *Frullania calcarata* and *Fabronia secunda* on bark of *Acacia melanoxylon*, *Octoblepharum albidum* on exposed roots and bark crevices. *Fissidens crenulatus* on the base of tree trunk and *Semibarbula ranuui* grows on coffee plant.

Bryophytes that grow on rocks on include *Racopilum cuspidigerum*, *Trachyphyllum inflexum*, *Ectropothecium compressifolium*, *Hyophila involuta*, *Philonotis hastata*, *P. mollis*, *Weissia eduntula*, *Brachythecium formosum*, *Bryum capillare*, *Macromitrium Fabronia secunda*, *tenerum*, *Bryum billardri* etc. Species that grow on cement bridges include *Barbula indica*, *Bryum coronatum*, *Bryum capillare*, *Hyophila involuta*, *B. porphyroneuron*, etc. Species that grow on soil and soil cuttings include *Asterella angust*, *A. wallichiana*, *Plagiochasma appendiculatum*, *Exormotheca ceylonensis*, *P. pterospermum*, *Cyathodium cavernarum*, *Dumortiera hirsuta*, *Marchantia linearis*, *Riccia billardieri*, *Targionia hypophylla*, *R. discolor*, *R. grollei*, *Bryum porphyroneuron*, *R. fluitans*, *R. gangetica*, *Hyophila involuta*, *Bryum capillare*, *P. mollis*, *Barbula indica*, *Weissia eduntula*, *Philonotis hastata*, etc. Endemic taxa are *Stereophyllum radiculosum* (Hook.) Mitt. (Endemic to India), *Entodontopsis nitens* (Mitt.) Buck (Endemic to India).

New distributional records to Peninsular India include *Semibarbula ranuui* Gangulee, *Atrichium undulatum* (Hedw.) P. Beauv., *Brachythecium formosum* Takaki, *Eurhynchium swartzii* (Turn.) Curnow, *E. hians* (Hedw.) Lac. Common taxa in Eastern Ghats include *Weissia eduntula*, *Barbula indica*, *Bryum porphyroneuron*, *Hyophila involuta*, *Bryum capillare*, *Trachyphyllum inflexum*, *Philonotis hastata*, *Fissidens involutus*, *Philonotis mollis*, *Marchantia linearis*, *Cyathodium cavernarum*, *Hydrogonium consanguineum*, *Riccia billardieri*, *Fissidens crenulatus*, *Hydrogonium consanguineum*, *Racopilum cuspidigerum*, *Ectropothecium compressifolium* and *Taxiphyllum taxirameum*. Rare taxa include *Bazzania tridens*, *Pheoceros laevis*, *Trematodon longicollis*, *Notothylas leverii*, *Wilsoniella decipiens*, *Dumortiera hirsuta*, *Atrichium undulatum*, *Campylopus aureus*, *Octoblepharum albidum*, *Macromitrium tenerum*, *Eurhynchium swartzii*, *Brachythesium formosum* and *Eurhynchium hians*.

Recommendations

1. To understand their ecology and Identify areas with luxuriant growth of bryophytes.
2. The studies need to carry out a systematic floristic study on the bryophytes of Andhra Pradesh specifically in the Addateegala East Godavari and Prakasham District.
3. This is not possible to the only other alternative is exist conservation by developing bryophyte gardens in green houses and glass.
4. Very few educational and research institutions with good laboratory facilities to the bryophytes
5. Lastly, do an *In vitro* propagation of endangered pecies and threatened to be re-introduced into the wild.
6. This is also enumerated the reasons for lacuna in the field of bryology research is need.
7. To eliminate interference in the forests and environmental pollution from the bryophytes.
8. All researches has a habitat approach of conservation is mandatory.
9. The rate at which taxonomic revisions are doing outside India is not incorporated in India.
10. Lack of experts in the field of Research.
11. No national or state level website or database available in the area.
12. Lack of availability of literature in the field of research.
13. It is lack of awareness towards this group of bryophytes in the world.
14. Some of the labs no reference herbarium available.
15. Few sporadic studies and no systematic studies carried out on bryophytes.
16. Very less financial support to carry out surveys and taxonomic studies on this group.

Summary and Conclusions

The study is based on the evaluation of type and authentic specimens available in Andhra University as well as those in several international herbaria and published data. The paper also discusses those species which were earlier known as endemic to the area but now show an extended range of distribution elsewhere and also the species earlier introduced from Eastern Ghats but now changed their status.

The distribution of species at different altitudes and different microclimates were encountered in the hills. Currently the critical habitat of the bryophytes is under threat against the ongoing anthropogenic activities like open cast mining in this region. The changes in the microhabitat of bryophytes may seriously affect the species composition very rapidly and thus upset the ecological balance. The total number of 104 species belongs to 80 genera and 50 families have been recorded. Of these Musci is the largest class comprising of 60 species, belonging to 50 genera and 25 families, Hepaticae is represented by 37 species and 30 genera and 20 families while class Anthocerotatae is poorly represented by 6 species, 6 genera and 5 families. Pottiaceae is the largest family with 12 species under 10 genera followed by Bryaceae with 12 species under 6 genera. Fissidens and Bryum are the largest genera with 6 species each followed by Riccia with 9 species. Northern districts of Andhra Pradesh like Visakhapatnam and East Godavari show much diversity and density of bryophytes.

Reference

1. Afroz Alam. Some Indian bryophytes known for their biologically active compounds, International Journal of Applied Biology and Pharmaceutical Technology, 2012;3(2):239-246.
2. Afroz Alam, Praveen Kumar Verma, Geeta Asthana, Sonu Yadav. Moss Flora of Palni Hills (Tamil Nadu), India- A Checklist. Archive for bryology, 2011, 112.
3. Daniels AED. Checklist of the bryophytes of Tamil Nadu, India, Archive for bryology, 2010, 65.
4. Dash PK, Sahu DK, Saxena DK. Bryoflora of Baphlamali hill in Eastern Ghats of Orissa, India. EPTRI - ENVIS Newsletter, 2009;15(1):3-8.
5. Divya Dandotiya, Govindaparyi H, Shantanu Suman, Prem L, Uniyal. Checklist of the bryophytes of India. Archive for bryology, 2011, 88.
6. Frego KA. Bryophytes as potential indicators of forest integrity. Forest Ecology and Management, 2007; 242:65-75.
7. Jayanta Barukial. A study of moss diversity in Assam Valley wet evergreen forests. Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online) An Online International Journal, 2011;1(4):1-8. Available at <http://www.cibtech.org/jls.htm>
8. Manju CN, Rajesh KP, Madhusoodanan PV. Checklist of the bryophytes of Kerala, India. Tropical Bryology Research Reports, 2008;7:1-24.
9. Nath V, Asthana AK. Studies on Indian Bryophytes, 50 years of National Botanical Research Institute (eds.) P. Pushpangadan, S.Kumar & V.K. Kochhar, 2005, 277-288.
10. Pandé SK. Some aspects of Indian Hepaticology. Journal of the Indian Botanical Society, 1958;37:1-26.
11. Praveen Kumar Verma, Srivastava SC. Endemism in Liverworts of Western Ghats and their present status, Archive For Bryology, 2011, 99.
12. Sandhya Rani S, Sowghandika M, Nagesh KS, Susheela B, Pullaiah T. Bryophytes of Andhra Pradesh. Bishen Singh Mahendra Pal Singh, 2014.
13. Sahaya Sathish S. Moss diversity in the Kolli hills of the Eastern Ghats of Tamil Nadu, Journal of Basic and applied biology special issue, 2013, 322-334.
14. Sahaya Sathish S. Antibacterial activity of mosses, Thuidium tameriscellum Bosch and Pyrobryum spiniforme Mitt, International Journal of Biological Technology. Special issue, 2012, 280-290.

15. Sahu V, Asthana AK, Nath V, Yunus M. Bryophytes: A Useful Tool in Heavy Metal Monitoring, Archives of Enviro News, Newsletter of ISEB India,2007:13(4).
16. Singh DK. Diversity in Indian Liverworts: Their Status, Vulnerability and Conservation. In: Nath, V. & A.K. Asthana (ed.), Perspectives in Indian Bryology, 2001, 325-354.