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BRYOPHYTES IN INDIA –THE CURRENT STATUS

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ABSTACT

The checklist of the bryophytes of India reports total 2489 taxa of bryophytes from India, comprising 1786 species in 355 genera of mosses, 675 species in 121 genera of liverworts and 25 species in six genera of hornworts. A total of 31 Species of bryophytes including 20 liverworts, 2 hornworts and 9 mosses under 17 family and 22 genera are reported here for the first time from the Bothamalai hills in the Eastern Ghats of India. In this checklist of Kerala, a total of 465 bryophyte taxa are accepted, comprising 148 taxa of liverworts, 10 taxa of hornworts and 307 taxa of mosses. Western Ghats (includes Nilgiris, Anamalais, Palnis and Agasthyamalai) and the Eastern Ghats (includes Shervaroys) bryogeographical regions studied by Daniels in 2010. A checklist by him 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. All workers have insisted that enough focus has not been given to study the bryoflora in India. They have so far been ignored for many reason especially their relatively less economic value. But recent studies have proven that they could be the resource of many phytochemical and pharmaceutical compounds.

KEYWORDS: Bryophytes, Bothamalai hills and Bryflora.

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INTRODUCTION

The term bryophyta was derived from two Greek words; *bryon* meaning moss and *phyton* meaning plant. Robert Brown was the first man who introduced this term in 1864 to include the algae, the fungi, the lichens and the mosses. However, in recent years this term has been used to mention the group of plants which includes the members of non vascular cryptogams.

The bryophytes are highly specialized group of plants with second highest assemblages among land plants after the flowering plants. Their surviving capacity is enormous as they survive under wide variety of environmental condition and forming strong part of the ecosystem where they grow. They grow in forests, wet lands, desert (hot as well as cold) and other habitats. Though basically terrestrial, there are a few aquatic forms such as *Riccia fluitans, Ricciocarpus natans* and *Riella spp*. Plants like *Cryptothallus* and *Buxbaumia* are saprophytic genera of liverworts and mosses on contrary to the rest of the bryophytes, which are autotrophic. They have been classified under three diversified classes viz., Hepaticae, Anthocerotae and Musci (liverworts, hornworts and mosses respectively).

Bryophytes play an important role in nutrient cycling, soil formation, providing microhabitat for other plants and animals, promote seed germination and fill gaps in the habitat. In the recent years bryophytes have been widely used for pollution monitoring and bioremediation as well as in the molecular biology studies. Due to rapid urbanization and pressures inflicted by growth of human population and their intense activities the biodiversity is greatly influenced and bryophytes have been observed to be most affected. The conservation of bryophyte is very important in view of their critical role in ecosystem dynamics. They can be conserved by establishment of moss gardens and protected areas, sacred groves and in-vitro technique and also by regular monitoring, and periodic collection of data on rare and threatened species (Divya Dandotya, 2011).

The bryophytes, the second largest group of plants after angiosperms deserve a much important place than what they have today in biological research .They have been remaining a neglected group of plants till the

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recent past in spite of their importance in establishing ecosystem stability ,nutrient recycling, pollution indicators and in other aspects. Recent phytochemical studies show that they can also serve as a treasure trove for a variety of bioactive compounds. Though the urgent need to study the bryoflora is felt by the scientific community, absence of enough literature and guidelines remain a sporadic one. Being one among the 12 mega biodiversity countries, India has been divided into seven bryogeographical regions.

DISCUSSION

Despite their small size, they comprise major components of the biomass and photosynthetic production (Frego, 2007) in forest ecosystems. Bryophytes are widely used as bioindicators of environment for their unique capacity to absorb the pollutants and very specific responses as some species are extremely sensitive to pollutants and exhibit visible injury symptoms even in the presence of very minute quantities of pollutants (Sahu *et al*., 2007). They have several biological features making them particularly suited to serve as study organism in macro evolutionary population genetics and ecological research. Bryophytes are used in medicines, household purposes, horticulture, agriculture, fuel in industries and as ecological indicators throughout the world (Nath & Asthana., 2005).

Bryophytes are the second largest group of plants, with about 25,000 species worldwide (Buck and Goffinetnet, 2000). 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. The plants are distributed in Eastern and Western Himalayas, South India and Central India (Nath & Asthana, 2005). According to Lal(2005) currently, about 2480 taxa of bryophytes (including intraspecific taxa) are reported from India (including island groups,and Sikkim), 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.

India is one of the 12 mega biodiversity countries in the world. The large area and a variety of phytoclimatic contribute to the great diversity of the Indian flora (Singh, 1997; 2001).

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These biogeographical zones with diverse topographical variations and climatic conditions have been divided into seven bryogeographical regions. They are the Western Himalayas, the Eastern Himalayas, the Punjab and the West Rajasthan, the Gangetic Plains, the Central India, the Western and the Eastern Ghats and the Deccan Plateau (Pandé, 1958) recently, the islands of Andaman and Nicobar in the Bay of Bengal have been proposed as the eighth region to be included.

The checklist of the bryophytes of India reports total 2489 taxa of bryophytes from India, comprising 1786 species in 355 genera of mosses, 675 species in 121 genera of liverworts and 25 species in six genera of hornworts. Some of the genera of mosses like Fissidens, Barbula, Campylopus, and Bryum are found to have largest number of species. In liverworts, Riccia, Porella, Frullania, Lejeunea, Plagiochila and Jungermannia are recorded to be species rich genera and in hornworts Anthoceros is well represented by species. Pottiaceae, Lejeuniaceae and Notothyladaceae are largely represented in India. The data include total of 340 species as endemic of which 269 species are of mosses, 67 are of liverworts and 4 are of hornworts. The data on the status of the taxa as rare, endangered, vulnerable and threatened is also provided along with the checklist. Out of 133 rare species 78 are of mosses and 53 are liverworts and nearly 14 species are recorded as endangered (Divya Dandotya, 2011).

Tamil Nadu, formerly known as the Madras State, is situated in the eastern part of the southern tip of peninsular India and comprises part of the Deccan Plateau, the Western Ghats (includes Nilgiris, Anamalais, Palnis and Agasthyamalai) and the Eastern Ghats (includes Shervaroys) bryogeographical regions (Daniels, 2010). A checklist by him 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. History of bryophyte recording in Tamil Nadu and the contribution of eminent bryologists have also been summarized in this checklist. The checklist states that Tamil Nadu supports approximately 29 % of the Indian liverwort flora, 22 % of the hornwort flora and 30 %

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of the moss flora. Indian endemic species are well represented in the state. Of the approximately 152 liverwort taxa endemic to India (including all island groups and Sikkim), 30 liverworts (19%) are known from Tamil Nadu, ten of which are apparently endemic to the state.Of the 19 Indian endemic hornworts, two (10 %) are currently known from Tamil Nadu. About 65 Indian endemic mosses are known from Tamil Nadu, about 48 of these apparently endemic to Tamil Nadu (Daniels, 2010).

Afroz Alam et al (2011) provided the current status of mosses of Palni hills. In his checklist he has confirmed the occurrence of 54 taxa of mosses has been recorded in Kodaikanal and neighbouring areas. Of which 12 taxa are new to the Palni hills which indicates the potential of this region in nourishing the bryo-diversity.

The status of endemic liverworts in the Western Ghats 'one of the major Hot spots' of plant biodiversity have been studied by Praveen Kumar Verma and Srivastava (2011). The study is based on the evaluation of type and authentic specimens available in Lucknow University Hepatic Herbarium (LWU) as well as those in several international herbaria and published data. A total number of 54 liverworts were found to be endemic to Western Ghats in India. 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 Western Ghats but now changed their status.

A total of 31 Species of bryophytes including 20 liverworts, 2 hornworts and 9 mosses under 17 family and 22 genera are reported here for the first time from the Baphlamali hills in the Eastern Ghats of India. All the species reported here are new distributional records of occurrence for the State. 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 (Dash et al 2009). Jayanta Barukial (2011) has done the enumeration of 127 species of Mosses under

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71 genera belonging to 27 families from the Assam Valley Wet Evergreen forests, Assam, India. Manju *et al* (2008) have published the checklist of the bryophytes of Kerala, India. In this checklist of the bryophytes they have included some taxa that are reported for the first time from the State. A total of 465 bryophyte taxa are accepted, comprising 148 taxa of liverworts, 10 taxa of hornworts and 307 taxa of mosses. Sanjay Kumar Sharma and RR Choyal (2011) studied the distribution of moss in the Topography of Kangra District (H.P),India. They have reported a total number of nine species.

All workers have insisted that enough focus has not been given to study the bryoflora in India. They have so far been ignored for many reason especially their relatively less economic value. But recent studies have proven that they could be the resource of many phytochemical and pharmaceutical compounds (Afroz Alam, 2012).

With the above said background we are in a urgent need give due importance in the study of bryoflora. Environmental Information System Centre, Tamilnadu has insisted the following things to be done with special care.

SUMMARY AND RECOMENTATIONS

India reports total 2489 taxa of bryophytes from India, comprising 1786 species in 355 genera of mosses, 675 species in 121 genera of liverworts and 25 species in six genera of hornworts (Divya Dandotya, 2011). A total of 31 Species of bryophytes including 20 liverworts, 2 hornworts and 9 mosses under 17 family and 22 genera are reported here for the first time from the Bothamalai hills in the Eastern Ghats of India. A total of 31 (Dash *et al* 2009). Jayanta Barukial (2011) has done the enumeration of 127 species of Mosses under 71 genera belonging to 27 families from the Assam Valley Wet Evergreen forests, Assam, India. Manju et al (2008) have published the checklist of the bryophytes of Kerala, India. In this checklist a total of 465 bryophyte taxa are accepted, comprising 148 taxa of liverworts, 10 taxa of hornworts and 307 taxa of mosses. Western Ghats (includes Nilgiris, Anamalais, Palnis and Agasthyamalai) and the Eastern Ghats (includes Shervaroys) bryogeographical regions studied by Daniels in 2010.

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RECOMENTATIONS

1. There is an urgent need to carry out a systematic floristic study on the bryophytes of South India particularly the Western and the Eastern Ghats.
2. Identify areas with luxuriant growth of bryophytes and try to understand their ecology.
3. Minimize environmental pollution and interference in the forests.
4. A habitat approach of conservation is mandatory.
5. However, if this is not possible the only other alternative is *ex situ* conservation by developing bryophyte gardens in glass and/or green houses.
6. Finally, make an *in vitro* propagation of threatened and endangered species to be re-introduced into the wild.

It has also enumerated the reasons for lacuna in the field of bryology research

1. Lack of experts in the field.
2. Only a few educational and research institutions with good laboratory facilities.
3. No national or state level website or database available.
4. Lack of availability of literature.
5. The rate at which taxonomic revisions are being done outside India is not incorporated in India.
6. Lack of awareness towards this group of plants.
7. No reference herbarium available.
8. Very few sporadic studies and no systematic study carried out.
9. Lack of financial support to carry out surveys and taxonomic studies on this group

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