

## Lichens for Sustainable Environment

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### Abstract

Most of the studies related to Biodiversity have been undertaken on higher groups of plants. Lower groups of organisms; despite their pivotal role in stabilizing the ecosystems have got least attention till date. That is why data on their number, diversity in the habit, habitat and their potential as useful organisms is not fully documented and understood. The present study is one such step towards the collection of information on one of the lower but significant group of organisms i.e lichens. Lichens are the early land colonizers of terrestrial habitats and perhaps the oldest living creatures on earth. Lichens are the association of a fungus and an alga which results in a stable thallus with specific structure. The alga present in lichens is photoautotrophic contributing towards carbon sequestration, thus controlling global warming. Besides, they withstand extreme environmental conditions, indicate level of pollution, help in paedogenesis, serve as food option, have medicinal value, are used for dye making and perfumery and in lichenometric studies. They are considered as the repository for novel genes and compounds. They are rich in secondary metabolites which function as chemical defense against various abiotic and biotic stresses. The present study was initiated for documenting the lichen diversity in a part of Pir Panjal mountain ranges of Inner Himalaya. So far 44 species have been collected and identified from the area. Many factors have been identified during the course of study impacting the growth of lichens in Rajouri district. Many of the species are being exploited for one or the other reason. Therefore, it is imperative to conserve such taxa so that their role to sustain the hilly environment is ensured.

**Keywords:** Biodiversity, Lichens, Paedogenesis, Lichenometric

## Introduction

Among the different Himalayan states in India, Uttarakhand and Himachal Pradesh are well explored for their lichen distribution and good records of lichens from these states are available. Lichenological investigations have recently been initiated in the state of Jammu and Kashmir and out of 22 account of lichens are known from only 14 districts (Sheikh *et al.*, 2006). Absolutely no collection or records of lichens from the Rajouri, Kathua, Poonch and Kupwara districts are available in the J&K state (Sheikh *et al.*, 2006).

Rajouri district of J&K state is situated in the lower hills of Pir Panjal mountain range with an average elevation of 915 m asl. The unique topography of the district along with the climatic conditions supports a wide range of vegetation i.e from subtropical to alpine. The region is dominated by *Pinus roxburghii* which covers 60 % of the total area along with *Phyllanthus emblica*, *Dalbergia sissoo*, *Olea ferruginea*, *Cassia fistula*, *Acacia catechu*, *Syzygium cumini* and *Punica granatum*. However, *Quercus leucotricophora*, *Buxus wallichiana*, are found in the temperate part of the district covering approximately 25% of the area. The representatives of *Rhododendron arboreum*, and *Juniperus communis* also occur in the region. During the recent survey of the district in 63 localities of 7 tehsils only 44 species were reported. During the study, many possible factors responsible for scarce growth of lichens in the study area were observed and are discussed in results and discussions section of the paper.

## Materials and methods

A total of 63 localities of 07 tehsils such as Darhal, Thanna mandi, Naushehra, Rajouri town, Sundrebani, Kalakote and Budhal were surveyed and lichens were collected from them. The specimens were collected from tree bark, rocks and soil. The specimens were dried up and preserved in the herbarium of Centre for Biodiversity Studies, BGSB University, Rajouri (J&K).

The lichen specimens were identified by studying their morphology, apothecial anatomy and chemistry at the Lichenology Laboratory, National Botanical Research Institute (CSIR), Lucknow and Conservation Biology Laboratory, Centre for Biodiversity Studies, BGSB University, Rajouri. The chemical investigations of the specimens were performed following the techniques of Walker and James (1980). For authentication of the specimens lichenological literature of Awasthi (1988, 1991), Divakar (2001) and Upreti (1991) was consulted.

## Conclusions

A total of 44 species belonging to 32 genera and 18 families were recorded after the identification of taxa collected from the study area. Out of these, 20 species were crustose lichens. These lichens exhibit luxuriant growth. Rest of the species were of foliose, squamulose and leprose forms which were represented by 18, 3 and 2 species respectively (Fig. 1). Only one species of the fruticose form was found in the region.

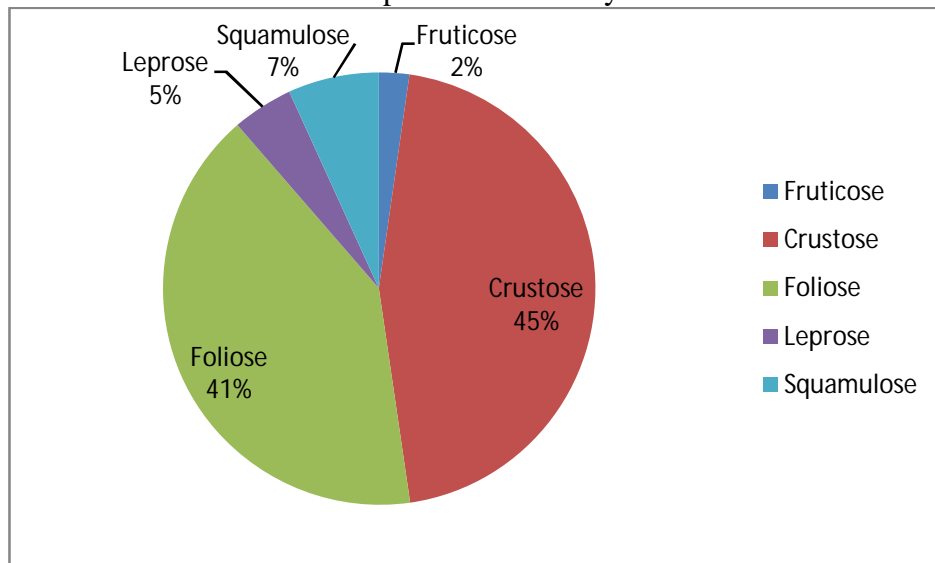
The corticolous and saxicolous lichens were represented by 20 species each form predominant in the area. Three species were found growing both on the rocks as well as the bark of the trees and one species was found growing over the soil surface.

As compared to the lichen diversity of other adjoining districts, Rajouri district shows less diversity of lichens. This could be attributed to many factors. Although the district shows wide altitudinal gradient ranging from 490 m asl in Sunderbani to 4700 m asl in Pir Panjal range, occurrence of small hillocks with scanty vegetation does not support much lichen growth. Some of the areas of the district encounter dry conditions through out the year.

The forests of the region are also disturbed because of heavy anthropogenic stress due to activities of the military and paramilitary forces, counter insurgency operations and development activities. Moreover, construction of roads and buildings is also affecting the natural landscape and vegetation growing and thus affecting lichen growth.

Local inhabitants also get involved in lopping and pruning of trees for fulfilling fodder and timber requirements. Tree felling for agriculture is also contributing to the destruction of the lichen habitats thus affecting their growth and distribution. The various afforestation programmes initiated in the region has led to abundant plantation of *Eucalyptus* species whose bark is flanky in nature which does not promote lichen growth. However, forests which have been conserved or regenerated are showing initiation of lichen communities. Since the lichens are slow growing organisms it will take longer time for them to transform into big communities.

Urbanization and deforestation have been identified as the major threats to the lichens of the region, so efforts are needed to regularly monitor and assess the extent of impact of these activities on lichen growth and establishment. This can be achieved by organizing cooperative conservation programs and dissemination of information regarding their importance and role in sustainable environment to local people to have a balance between economic development and healthy environment.



**Figure 1** Percentage of various growth forms of lichens in District Rajouri

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