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Lichen flora of Surinsar-Mansar wildlife sanctuary, J&K

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Abstract : The present study conducted to enumerate the lichens from the so far unexplored Surinsar-Mansar wildlife sanctuary, J&K, revealed the presence of 30 species belonging to 18 genera from 14 families. The species belonged to different growth forms (21 crustose, 8 foliose and 1 fruticose) and are also growing on various substrata (corticolous-17 and saxicolous-13). *Mangifera indica* hosted the maximum number (12) while *Pinus roxburghii* did not host any lichen species in this area.

Key Words: Lichen flora, Surinsar-Mansar wildlife sanctuary, J&K.

INTRODUCTION

Lichens dominate 8% or more of the earth's terrestrial area (Ahmadjian, 1995). These are amongst the most significant indicators of air pollution and ecosystem health (Richardson 1992; Upreti and Pandev 1994; Wolseley *et al.* 1994; Upreti, 1995; Sloof, 1995; Mistry, 1998; Vokou *et al.*, 1999). Lichens form important component of biodiversity of any area and have been explored exhaustively from the different region of the country including the Himalaya in the last half of the 20th century. However, the Jammu province of J&K State, which is also an important segment of the Himalayan belt, has not received much attention except for few reports (Awasthi and Singh,1970; Sheikh *et al*., 2006 a and b).

The systematic exploration of the lichen flora has been made from lichenologically unexplored Surinsar-Mansar Wildlife Sanctuary (latitude 32^0 41\ to 32^0 49\ N, longitude 74^0 59\ to 75^0 59\ E and altitude 540- 835 m above m.s.l with an area of 97.82 sq. kms) which has got its name from the twin lakes situated at two corners of this Wildlife sanctuary. The vegetation in this Sanctuary comprises of Northern dry mixed deciduous forest, Himalayan subtropical dry scrub and Himalayan subtropical pine forest. The area is dominated by the different trees like, *Acacia catechu, Acacia modesta, Albizzia lebbeck, Bombax ceiba, Cassia fistula, Dalbergia sissoo, Ficus benghalensis, F. palmata Lannea coromandelica, Mallotus philippensis, Mangifera indica, Melia azedarach, Phoenix sylvestris, Phyllanthus emblica , Pinus roxburghii* and *Toona ciliata,* etc. which are supporting the lichen flora.

MATERIALS AND METHODS

The lichen collections were made from base to head height of the tree trunks and rocks. Along with the lichen collection the details of locality, substratum and altitude were also recorded. The labeled and dried specimens have been lodged in the Lichen Herbarium of National Botanical Research Institute (LWG), Lucknow. The specimens were identified by studying the morphology, anatomy and chemistry. The recent literature of Awasthi (1988, 1991 and 2000), Singh and Upreti (1984), Upreti, (1988), Divakar (2001) and Nayaka (2004) was consulted for identification of most of the lichen taxa. The morphology of the taxa was studied under stereo-zoom binocular microscope. Anatomical details of the thallus and fruiting bodies were studied in free hand sections with water as mounting medium under compound microscope. The colour spot tests were carried out on cortex and medulla with the usual chemical reagents, such as aqueous potassium hydroxide (K), Steiner's stable para-phenylenediamine (PD) and aqueous calcium hypochlorite (C). Thin Layer Chromatography was performed for authentic identification of the lichen substances in solvent system A (Toluene, 180 ml: 1-4 Dioxane, 60ml : Acetic acid,8 ml) following Walker and James (1980).

RESULTS AND DISCUSSION

The survey of Lichens species growing on different substratum – trees and rocks, in the Surinsar-Mansar Wildlife Sanctuary revealed the presence of 30 species of lichens, belonging to18 genera and 14 families (Table 1).

Diversity of Lichens : The perusal of the table

revealed that the area is dominated by crustose lichens (21 species) as compared to foliose lichens (8 species). *Cladonia corniculata* is the only fruticose lichen recorded from the area. On the basis of substratum type 17 species have been observed to be corticolous (growing on the bark of trees) while 13 have been recorded as saxicolous (growing on rocks). Physciaceae and Verrucariaceae with 4 genera & 6 species each have been observed to be the most dominant families in the Sanctaury. These are followed by Teloschistaceae with 2 genera and 4 species. Similarly, *Caloplaca* and *Pyxine* with 3 species each, have been recorded as the dominant genera of the area. *Phaeophyscia orbicularis, Hyperphyscia adglutinata, Pyxine subcinerea, Lepraria lobificans, Dermatocarpon miniatum, Dermatocarpon vellereum, Lecanora perplexa, Phylliscum indicum* and *Endocarpon subrosettum* have been observed to be the most common lichens growing in the sanctuary .

Vegetation vs Lichens : The different lichen species growing on different trees in Surinsar-Mansar Wildlife Sanctuary has been depicted in Table 2. The perusal of the table reveals that the *Mangifera indica* is hosting the maximum number of lichen species (12) which may be attributed to the texture of bark - smooth and fissured bark. Survey also revealed the presence of seven lichen species on *Mallotus philippensis*, six on *Toona ciliata* , 3 each on *Albizzia lebbeck* and *Ficus palmata,* and 2 lichen species each on *Acacia modesta, Bombax ceiba, Cassia fistula, Dalbergia sissoo, Ficus benghalensis,, Lannea coromandelica, Melia azedarach* and *Phyllanthus emblica* while *Phoenix sylvestris* has been found to host only one lichen species. *Pinus roxburghii* , one of the dominant tree of the study area , did not host any lichen species which may be attributed to the exfoliating nature of bark.

Visual observation also revealed that the rocks along the

Table 1. Lichens with their growth forms and substratum from Surinsar-Mansar wildlife sanctuary.

S. No.	Lichen taxa	Family	Growth Form	Substratum
1.	*Bacidia* sp.	Bacidiaceae	C	Co
2.	*Buellia* sp.	Physciaceae	C	Co
3.	*Caloplaca malensis* (Rasanen) Awasthi	Teloschistaceae	C	Co
4.	*Caloplaca kashmirensis* Joshi, Y. & Upreti	Teloschistaceae	C	Co
5.	*Caloplaca subsolata* (Nyl.) Zahlbr.	Teloschistaceae	C	S
6.	*Candelaria concolor* (Dicks.) B. Stein.	Candelariaceae	F	Co
7.	*Catillaria pulverea* (Borrer) Lettau	Catillariaceae	C	Co
8.	*Cladonia cartilaginea* Müll. Arg.	Cladoniaceae	Fr	S
9.	*Cryptothecia* sp.	Arthoniaceae	C	S
10.	*Dermatocarpella squamulosum* (Ach.) H.Harada	Verrucariaceae	C	S
11.	*Dermatocarpon miniatum* (L.) Mann.	Verrucariaceae	C	S
12.	*Dermatocarpon vellereum* Zschacke.	Verrucariaceae	F	S
13.	*Endocarpon rosettum* A.Singh & Upteri	Verrucariaceae	C	S
14.	*Endocarpon subrosettum* A.Singh & Upteri	Verrucariaceae	C	S
15.	*Hyperphyscia adglutinata* (Flörke) Mayrh. & Poelt	Physciaceae	F	Co
16.	*Lecanora perplexa* Brodo.	Lecanoraceae	C	Co
17.	*Lecanora* sp.	Lecanoraceae	C	Co
18.	*Lepraria lobificans* Nyl.	Lichenes imperfecti	C	S
19.	*Lepraria* sp.	Lichenes imperfecti	C	Co
20.	*Parmotrema praesorediosum* (Nyl.) Hale	Parmeliaceae	F	Co
21.	*Pertusaria quassiae* (Fée) Nyl.	Pertusariaceae	C	Co
22.	*Pertusaria* sp	Pertusariaceae	C	Co
23.	*Phaeophyscia orbicularis* (Necker) Moberg.	Physciaceae	F	Co
24.	*Phylliscum indicum* Upreti	Lichinaceae	C	S
25.	*Phylliscum* sp.	Lichinaceae	C	S
26.	*Pyxine cocoes* (Sw.) Nyl.	Physciaceae	F	Co
27.	*Pyxine petricola* Nyl. in Crombie	Physciaceae	F	Co
28.	*Pyxine subcinerea* Stirton	Physciaceae	F	Co
29.	*Verrucaria acrotella Ach.*	Verrucariaceae	C	S
30.	*Xanthoria elegans* (Link.) Th.Fr.	Teloschistaceae	C	S

Note: C = Crustose, F = Foliose, Fr = Fruticose, Co = Corticolous, S= Saxicolous.

Table 2. Lichen species growing on different trees in Surinsar-Mansar wildlife sanctuary.

S. No.	Lichen taxa	Tree type
1.	*Bacidia sp.*	*Mallotus, Mangifera*
2.	*Buellia sp.*	*Mallotus*
3.	*Caloplaca malensis* (Rasanen) Awasthi	*Mallotus, Mangifera, Toona*
4.	*Caloplaca kashmirensis* Joshi, Y. & Upreti	*Mangifera,*
5.	*Candelaria concolor* (Dicks.) B. Stein.	*Mangifera,*
6.	*Catillaria pulverea* (Borrer) Lettau	*Mangifera,*
7.	*Hyperphyscia adglutinata* (Flörke) Mayrh. & Poelt	*Acacia modesta, Albizzia, Cassia, Dalbergia, Ficus benghalensis, F. palmata,, Lannea, Mallotus, Mangifera, , Melia, Phyllanthus, Toona*
8.	*Lecanora perplexa* Brodo.	*Mallotus, Mangifera, Toona*
9.	*Lecanora sp.*	*Mallotus, Toona*
10.	*Lepraria sp.*	*Mallotus Mangifera,*
11.	*Parmotrema praesorediosum* (Nyl.) Hale	*Albizzia,*
12.	*Pertusaria quassiae* (Fée) Nyl.	*Bombax*
13.	*Pertusaria sp.*	*Mangifera*
14.	*Phaeophyscia orbicularis* (Necker) Moberg.	*Acacia modesta, Albizzia, Cassia, Dalbergia, Ficus benghalensis, F. palmata,, Lannea, Mallotus, Mangifera, , Melia, Phyllanthus Phoenix, Toona*
15.	*Pyxine cocoes* (Sw.) Nyl.	*Mangifera, Melia*
16.	*Pyxine petricola* Nyl. in Crombie	*Bombax*
17.	*Pyxine subcinerea* Stirton	*Ficus palmata, Mangifera, Melia, Toona*

springs and small streams passing through the sanctuary have more diversity of lichens both qualitatively and quantitatively.

The available enumeration of lichens will act as a baseline record for carrying out future biomonitoring studies in the area.

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