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RESEARCH ARTICLE

A PRELIMINARY OBSERVATION OF LICHEN FLORA IN THREE DISTRICTS OF JAMMU & KASHMIR

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ABSTRACT

A total of 77 lichen species belonging to 38 genera and 18 families are enumerated from the three districts of Jammu & Kashmir. Kistwar district has maximum diversity of lichens represented by 43 species where as Jammu and Rajouri districts exhibits 30 and 19 species respectively. The crustose lichens have marked dominance over the other lichen forms represented by 41 species while as foliose and fruticose lichens are represented by 35 and 1 species respectively. Corticolous (growing on tree bark) lichen species exhibits their dominance in the area represented by 46 species while as saxicolous (growing on rocks) lichen species are represented by 28 species.

INTRODUCTION

Lichens are the most fascinating and widely distributed organisms on this planet. Lichens, the mutualistic association of an alga (green and/or blue green) and fungus are the most successful symbiotic organisms in nature. Their specific structure and unique physiology enable them to colonize on a number of substrates in varied climatic conditions. This unique association probably evolved as an adaptation to the varied microhabitats withstanding extreme microclimatic conditions unfavourable for the fungi and algae in isolation (Negi and Upreti 2000). It is estimated that there are about 13,500 to 17000 (Hale 1974; Hawksworth and Hill 1984) lichen species throughout world. India is represented by 2303 lichen species (Singh and Sinha 2010) which represents 14% of world lichen population. The present communication deals with the Preliminary observation of lichens from Jammu, Kishtwar, and Rajouri districts of Jammu province, which received a little attention lichenologically than Kashmir province. The literature scanned revealed that Jammu district is represented by 11 species and no records of lichens from Rajouri and Kishtwar districts (Sheikh *et a*l., 2006). Thus to explore systematically the lichen flora of the state extensive collection of lichens in the three districts was carried out along with their habitat preferences and distribution along altitude and land use types.

The state of Jammu & Kashmir exhibits large altitudinal variations ranging from 300 - 6500 m above m.s.l. The climate varies from tropical to alpine. The localities surveyed within the three districts exhibit distant variations in altitude and vegetation cover (Table 1). Jammu district (74 24' and 75 18', East longitude and 32^0 50' and 33^0 30' North latitude), has a sub-tropical climate. Kishtwar district (longitude 75^0 76' E and latitude 33^0 67' N) has temperate climate and Rajouri district (32^0 58' N latitude, 74^0 4' E) the climate varies from semi-tropical in the southern part to temperate in the mountainous north. The sub-tropical region receives regular monsoons whereas the northern part is prone to hailstorms and excessive rain.

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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 are lodged in the Lichen Herbarium of National Botanical Research Institute (LWG), Lucknow and Department of Environmental Sciences, University of Jammu. The specimens were identified by studying the morphology, anatomy and chemistry. The recent literature of Awasthi (1988, 1991 & 2000), Upreti (1984, 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 & James (1980).

RESULTS AND DISCUSSION

A total of 77 species of 38 genera and 18 families of lichens are enumerated (Table 2) from the three districts of J&K.

Table 1. Localities in the three districts, their altitude and dominant vegetation

District	Locality	Altitude	Dominant Vegetation
Jammu	Kalidhar	600-700m	Mangifera indica, Pinus roxburghii, Mallotus phillippensis
Rajouri	Moghla	600m	Mangifera indica, Mallotus phillippensis
	Treru	700m	Toona ciliate, Carrissa opaca Pinus roxburghii, Mallotus phillippensis
Kistwar	Sarthal	1600-2100m	Pinus roxburghii, Juglans regia, Quercus leucotrichophos, Celtis australis
	Karthai	1900-2000m	Cedrus deodara, Alnus nitida, Pinus roxburghii,

Table 2. Distribution of Lichens in different localities, their substratum and growth forms
(Note:C = Crustose, F = Foliose, Fr = Fruticose, R = Rock, B = Bark, - = Absent, + = Present, Locality Name: 1 = Treru, 2 = Moghla, 3 = Kalidhar, 4 = Sarthal, 5 = Karthai,

S.No.	Lichen Taxa	Localities					Substratum	Growth forms
		1	2	3	4	5		
1	*Aspicilia calcarea* (L.)Mudd	-	-	-	+	-	R	C
2	*Aspicilia praeradiosa* (Nyl.) Poelt & Leuck.	-	-	-	+	-	R	C
3	*Bacidia arnoldiana Korber*	-	+	+	+	-	R	C
4	*Bacidia incongruens* (Stirton) Zahlbr.	+	-	+	-	-	B	C
5	*Bacidia* sp.	-	-	+	-	-	R	C
6	*Caloplaca cerina* (Ehrh. Ex Hedwig) Th.Fr.	-	-	-	+	-	B	C
7	*Caloplaca flavovirescen* (Walfen)D.Torre& Sarnath	-	-	-	+	-	B	C
8	*Caloplaca juniperi* Poelt & Hinter	-	-	-	+	-	B	C
9	*Caloplaca malaensis* (Rasanen) Awasthi	+	-	-	-	-	B	C
10	*Caloplaca subsoluta* (Nyl.) Zahlbr.	+	-	+	+	-	R	C
11	*Candelaria concolor*(Dicks.) B.Stein	-	-	+	+	-	B	C
12	*Chrysothrix candelaris*(L.) Laundon	-	-	-	+	-	B	C
13	*Dermatocarpella squamulosum* (Ach.) H. Harada	-	-	+	-	-	R	C
14	*Dermatocarpon miniatum* (L.) Mann.	-	-	+	-	-	R	C
15	*Dermatocarpon vellereum*Zschacke	-	-	+	-	-	R	F
16	*Diploschites*sp.	-	-	+	-	-	R	C
17	*Dirinaria aegialita* (Afz. In Ach.) Moore	-	-	+	-	-	B	F
18	*Endocarpon rosettum* A. Singh & Upreti	-	-	+	-	-	R	C
19	*Endocarpon* sp.	-	-	+	-	-	R	C
20	*Endocarpon subrosettum* A. Singh & Upreti	-	-	+	+	-	R	C
21	*Flavoparmelia carperata*(L.) Hale	-	-	+	+	-	B	F
22	*Flavopunctelia flaventior* (Stirton) Hale	-	-	+	+	-	B	F
23	*Graphis* sp.1	+	-	-	-	-	B	C
24	*Graphis* sp.2	+	-	-	-	-	B	C
25	*Hyperphyscia adglutinata* (Flörke) Mayrh.& Poelt	+	+	+	-	-	B	F
26	*Hyperphyscia* sp.	-	-	+	-	-	B	F
27	*Hyperphyscia synolla* (Tuck.in Nyl.) Kalb	-	-	-	+	-	B	F
28	*Lecanora achroa* Nyl.	-	-	+	-	-	B	C
29	*Lecanora campestris* (Schaerer) Hue	-	-	+	-	-	R	C
30	*Lecanora coriensis* (Hue) Laumdon	-	-	+	-	+	R/B	C
31	*Lecanora frustulosa* (Dickson) Ach.	-	-	-	+	-	R	C
32	*Lecanora garovaglii* (Körber) Zahlbr	-	-	-	+	-	R	C
33	*Lecanora muralis var. muralis* (schreber) Rabenh	-	-	-	+	+	R	C
34	*Lecanora perplexa* Brodo	+	-	+	-	-	B	C
35	*Lecanora* sp.1	+	-	-	-	-	B	C
36	*Lecanora* sp.2	+	+	-	-	-	B	C
37	*Lecanora* sp.3	-	-	+	-	-	B	C
38	Lecanora *sp.4*	-	-	-	+	-	B	C
39	Lecanora *sp.5*	-	-	-	+	-	B	C
40	*Lepraria lobificans* Nyl	+	+	-	-	-	R/B	C
41	*Lepraria* sp.1	+	+	-	-	-	B	C
42	*Lepraria* sp.2	+	-	-	-	-	B	C
43	Lepraria *sp.3*	-	-	+	-	-	B	C
44	*Leptogium* sp.	-	-	-	+	-	R	F
45	*Melanelia elegantula* (Zahlbr.) Essl.	-	-	-	-	+	B	F
46	*Parmelina pastillifera* (Harmand) Hale	-	-	-	+	-	B	F
47	*Parmelia* sp.	-	-	+	-	-	B	F
48	*Parmotrema praesorediosum* (Nyl.) Mobreg	+	-	+	-	-	B	F
49	*Parmotrema tinctorum* (Nyl.) Hale	-	-	-	-	+	B	F
50	*Pertusaria melastomella* Nyl.	-	-	+	-	-	B	C
51	*Pertusaria* sp.	-	+	-	-	-	R	C
52	*Phaeophyscia hispidula* (Ach.) Essl.	-	-	-	+	-	B	F
53	*Phaeophyscia nepalensis* (Poelt) Awasthi	-	-	-	+	-	B	F
54	*Phaeophyscia orbicularis* (Necker) Moberg	+	+	+	+	+	R/B	F
55	*Phylliscum indicum*Uperti	-	-	+	+	-	R	C
56	*Phylliscum* sp.	-	-	+	-	-	R	C
57	*Physcia aipolia* (Ehrh. In Humb.) Furnr.	-	-	-	+	-	B	F
58	*Physcia dilatata*Nyl.	-	-	-	+	-	B	F
59	*Physcia* sp.	-	+	-	-	-	B	F
60	*Physcia tribacia* (Ach.) Nyl.	-	-	-	+	-	B	F
61	*Physconia detersa* (Nyl.) Poelt	-	-	-	+	-	B	F
62	*Physconia pulverulenta (Hoffm.)Poelt*	-	-	-	+	+	B	F
63	*Psora decipiens* (Hedwing) Hoffm.	-	-	+	-	-	R	C
64	*Punctelia neutralis* (Hale) Krog.	-	-	-	+	-	B	F
65	*Punctelia subrudecta* (Nyl.)Krog.	-	-	-	+	-	B	F
66	*Pyxine cocoes* (Sw.)Nyl.	-	-	+	-	-	B	F
67	*Pyxine subcinerea* Striton	+	+	+	-	-	B	F
68	*Ramalina sinensis* Jatta	-	-	-	+	-	B	Fr
69	*Rhizocarpon disorum* (Naeg. ex Hepp) Mull. Arg.	-	-	-	+	-	R	C
70	*Staurothele fissca* (Taylor) Zwack	-	-	+	-	-	R	C
71	*Verrucaria coerulea* (Ram.) DC. In Lam. & DC.	-	+	+	+	-	R	C
72	*Xanthomendoza fulva (Hoffm.) Sochting, Karnefelt & S. Konder*	-	-	-	+	-	B	F
73	*Xanthomendoza ulophyllodes* (Rasanen) Sochting, Karnefelt & S. Konder	-	-	-	+	+	B	F
74	*Xanthoparmelia coreana (Gylen.) Hale*	-	-	-	+	-	R	F
75	*Xanthoparmelia mexicana* (Gyeln.) Hale	-	-	-	+	+	R	F
76	*Xanthoria candelaria* (L.) Arn.	-	-	-	+	-	B	F
77	*Xanthoria elegans* (Link) Th.Fr.	-	-	-	+	-	R	F
	TOTAL	15	10	35	40	8		

The three districts exhibit poor to good growth of lichens. The poor growth of lichens is attributed to the presence of coal mines working for the past several years. The dry climatic conditions together with low altitude in the area are other factors responsible for poor growth of lichens. Out of 77 species reported from three districts, Kistwar district has maximum diversity of lichens represented by 43 species where as Jammu and Rajouri district exhibit 30 and 19 species respectively. Among different localities Sarthal forest area in Kishtwar and Kalidhar forest area in Jammu have good growth of lichens. Both the localities are situated in high altitudinal range and possess comparatively more thick and humid forest patches.

The crustose lichens have marked dominance over the lichen forms represented by 41 species while as foliose and fruticose lichen is represented by 35 and I species respectively. Corticolous species exhibit their dominance in the area represented by 46 species while as saxicolous area represents d by 28 species. Among the three districts, Kishtwar has good growth of lichens; the higher (1600-2100 m) altitudinal ranges with luxuriant growth of *Cedrus deodara, Pinus roxburghii, Quercus leucotrichophora* forest provide a very good habitat for the growth of many lichern taxa. Majority of lichens area found growing on trunks and twigs of *Pinus rouxburghii* and *Quercus leucotrichophora* in Sarthal area of Kishtwar district where as in Karthai area of this district lichen diversity was less as compared to Sarthal area. Jammu district showed less lichen diversity than Kistwar district due to the presence of broad leaved forest consisting of *Mangifera indica, Syzygium cumini, Mallotus phillipinses* trees, favours a good growth of few crustose lichens. The *Mangifera indica* trees preferred by the species *Pyxine, Pertusaria, Phaeophysia* and *Leparia.* Rajouri district has poor growth of lichens especially in the Moghla area, where only 10 species were reported. The presence of Coal mines which releases SPM, SO_2, CO pollutants may be the main factor which could be attributed for poor lichen diversity in the area. Treru area of this district had comparatively good growth of lichen. The area is dominated by *Pimus roxburghii, Toona cilata, Carrica fistula* which support a good lichen flora.

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