

Distribution of Lichens on *Quercus* and *Pinus* trees in Almora district, Kumaon Himalayas, India

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The paper presents the epiphytic lichen flora on *Quercus* and *Pinus* trees from four forest sites in Almora district of Kumaon Himalayas, India. *Q. semecarpifolia* consist of 25 lichen species, while *Q. leucotrichophora* and *Q. floribunda* are represented by 20 and 12 species, respectively. All the three species have dominance of *Parmelia* species. *Quercus floribunda* have smooth, soft bark and shows dominance of pyrenocarpous taxa. The cultivated trees of *Pinus roxburghii* has 19 species of lichens. The studied area show more generic diversity of epiphytic lichens as compared to the neighbouring Pithoragarh district. It also presents a comparative account of the present and past lichen species enumerated approximately thirty years earlier in 1976 from the area by Awasthi. A comparative account of lichen flora thriving on *Quercus*, *Pinus*, *Alnus*, *Betula* and *Abies* trees is also provided.

Key-words—Lichens, Kumaon, India.

INTRODUCTION

THE epiphytic lichen flora on *Quercus* and *Pinus* trees were studied from four forest sites from Pithoragarh district in Kumaon region (Upreti & Chatterjee, 1999). This communication, the second part of study, limit itself to the confine of Almora district.

Almora is one of the three districts of Kumaon Himalaya in Uttar Pradesh and lies in the north-east, between latitudes 28°59' and 30°49' north and longitudes 79°02' and 81°31' east. The district is spread over an area of 5,385 sq kms. According to the Forest Survey Report (Anonymous, 1991) the forest cover of the district is 2,095 sq. kms. It is about 38.0% of the total area. The forest composition of the district landscape with greater range of altitudinal occupance, give rise to variation in climate. Generally the vegetation is more temperate in character and species of *Quercus* and *Pinus* make their luxuriant appearance.

STUDY AREA

The following four localities of the Almora district were visited in May 1997 and collections were made from base to chest height of the trunk and from twigs of each case :

1. Karbala Pine Forest *Pinus roxburghii* forest (altitude 15-1600m)

2. Forest in and around Loharkhet to Talla-Dhakuri Forest of *Quercus leucotrichophora*, mixed with cultivated trees of *Cinnamomum*, *Prunus*, *Pyrus* and *Alnus nepalensis* (altitude 17-1800m), *Rhododendron*, *Betula alnoides* and *Acer* (altitude 1800-2000m)
3. Dhakuri-Dwali forest area Mixed forest of *Quercus semecarpifolia*, *Q. floribunda*, *Rhododendron*, *Betula alnoides*, *Ilex dipyrrena* and *Aesculus*
4. Dwali-Kaphini Forest Mixed forest of *Betula alnoides*, *Q. semecarpifolia*, *Q. floribunda* and *Alnus nepalensis* (altitude 2400-3000m)
Betula utilis and *Abies* (altitude 3000m-and above)

MATERIAL AND METHOD

In the laboratory the specimens were investigated morphologically, anatomically. The colour tests were performed with the usual reagents, i.e. K (5% potassium hydroxide), C (aqueous solution of calcium hypochlorite) and PD (paraphenylenediamine). Lichen substances were investigated with thin layer chromatography (TLC) in solvent A (180 toluene : 60 dioxane: 8 acetic acid) using the technique of Culberson (1972) and Walker and James (1980).

The identified material is preserved at Lichen Herbarium of National Botanical Research Institute, Lucknow (LWG).

OBSERVATIONS

Apart from the Karbala pine forest near Almora city, the other three forest sites are situated in the Pindari catchment, which is considered as 'Botanical hot spot' by Samant *et al.* (1993) on account of high community diversity as well as presence of a large number of sensitive plant species.

The ecological conditions and composition at different sites from where collection were made differ in details.

Site No. 1 : Karbala Pine Forest

The pine forest at Karbala, Almora, is a pure patch of cultivated *Pinus roxburghii*, at an altitude between 15-1600m. The trees are 50-70 feet high with an average diameter of about 2-4 feet. The forest is devoid of any ground flora.

The lichen flora of the trees is represented by 19 species (Table 1) from 10 genera, with dominance of *Parmelia*, comprising 11 species. *Parmelia austrosinensis* and *P. tinctorum* are commonly growing on twigs while *P. praesorediosa* occurs on trunk alongwith single species each of

Bacidia, *Buellia*, *Chrysothrix*, *Pertusaria*, *Ramalina* and *Usnea*.

When the lichen flora of Karbala pine forest is compared to lichens of pine forest of Pithoragarh district (Upreti & Chatterjee, 1999) there are three species in common (*Chrysothrix chlorina*, *Lecanora cinereofusca* and *Parmelia austrosinensis*). Both forest sites have similar growth form pattern, having dominance of foliose forms, followed by crustose and fruticose forms. Species of *Parmelia* exhibit their dominance in both the sites.

It is interesting to note that the four species of *Heterodermia* very commonly growing on both trunk and twigs on pine trees of Pithoragarh site are absent in the studied area.

Site No. 2 : Loharkhet-Talla-Dhakuri Forest

The forest falls in the Saryu river valley and the area in and around Loharkhet (1620m) to Talla-Dhakuri (2700m) consists of scattered patches of *Quercus leucotrichophora*. The forest area is thinned out for agricultural practices and comprises

Table 1 : Lichens of Karbala Pine Forest, Almora

Sl. No.	Name of species	<i>Pinus roxburghii</i> Trunks/twigs	Saxicolous
1.	<i>Bacidia inundata</i> (Fr.) Koerber		+
2.	<i>Buellia stigma</i> Tuck.		+
3.	<i>Chrysothrix chlorina</i> (Ach.) Laundon	+ Trunk	
4.	<i>Diploschistes candidissimus</i> (Krempelh.) Zahlbr.		+
5.	<i>Diploschistes gypsaceus</i> (Ach.) Nyl.		++
6.	<i>Heterodermia diademata</i> (Taylor) Awasthi	+ Trunk	+
7.	<i>Lecanora cinereofusca</i> H. Magn.	+ Trunk	
8.	<i>Leptogium</i> cf. <i>fallax</i> Mull Arg.	+ Trunk	+
9.	<i>Parmelia austro-sinensis</i> Zahlbr.	+ Trunk	
10.	<i>P. awasthii</i> (Hale Pat) Awasthi		+
11.	<i>P. expallida</i> Kurok.	+ Trunk	
12.	<i>P. cf. kamatii</i> (Patw. & Prabhu) A. Singh	+ Trunk	
13.	<i>P. koyaensis</i> Asan.	+ Trunk	
14.	<i>P. praesorediosa</i> Nyl.	+ Trunk	
15.	<i>P. pseudonilgherrensis</i> Asahina	+ Trunk	
16.	<i>P. pseudotinctorum</i> des Abb.	+ Trunk	
17.	<i>P. rampoddensis</i> Nyl.	+ Trunk	
18.	<i>P. texana</i> Tuck	+ Trunk	
19.	<i>P. tinctorum</i> Nyl.	+ Trunk	+
20.	<i>Pertusaria indica</i> Srivastava & Awasthi	+ Trunk	
21.	<i>Ramalina</i> cf. <i>africana</i> (Stein) Dodge	+ Trunk	
22.	<i>Usnea aciculifera</i> Vainio	+ Trunk/Twigs	

cultivated trees of *Prunus*, *Pyrus*, *Alnus* and *Cinnamomum* trees. The Talla-Dhakuri area has *Betula alnoides*, *Rhododendron* and *Quercus semecarpifolia* trees. Most of the *Q. semecarpifolia* trees of the area show no lichen growth on twigs and trunks as they are frequently lopped and pruned by the local inhabitants for fodder of their cattles. The lichen flora of *Q. leucotrichophora* in and

around Loharkhet is represented by 22 species of 11 genera, out of the total 68 species of lichens occurring in this forest area (Table 2).

The other common tree of the forest site is *Betula alnoides* having smooth barked trunk, show dominance of pyrenocarpous taxa, *Antracothecium* and *Pyrenula* along with crustose genera *Pertusaria* and *Lecanora*. The cultivated

Table 2 : Lichens of Loharkhet-Talla-Dhakuri Forest Site

Sl. No.	Name of species	<i>Quercus leucotrichophora</i>	<i>Betula alnoides</i>	<i>Prunus padam</i>	<i>Alnus nepalensis</i>	<i>Muscicolous</i>	<i>Terricolous</i>	<i>Saxicolous</i>	<i>Corticulous</i>
1.	<i>Antracothecium himalayense</i> var. <i>himalayense</i> (Räsänen) Awasthi								
2.	<i>A. himalayense</i> var. <i>pseudohimalayense</i> (A. Singh) in Awasthi		+						+
3.	<i>A. occulatum</i> Müll. Arg.		+						+
4.	<i>A. platystomum</i> var. <i>papillatum</i> Müll. Arg.								+
5.	<i>A. platystomum</i> var. <i>platystomum</i> Müll. Arg.								+
6.	<i>Bacidia incongruens</i> (Stirton) Zahlbr.								+
7.	<i>Caloplaca pindarensis</i> (Rasanen) Awasthi					+			
8.	<i>Candelaria concolor</i> (Dicks) B. Stein.							+	
9.	<i>Cetraria pallescens</i> Schaerer in Moritzi							+	+
10.	<i>Chrysothrix chlorina</i> (Ach.) Laundon	+							+
11.	<i>Cladonia furcata</i> (Huds.) Schrader						+		
12.	<i>Cladonia verticillata</i> (Hoffm.) Schaerer						+	+	
13.	<i>Collema subnigrescens</i> Degel.			+					
14.	<i>C. coccophorum</i> Tuck.							+	
15.	<i>Dermatocarpon vellereum</i> Zschacke							+	
16.	<i>Graphis</i> species No. 1	+						+	
17.	<i>Graphis</i> species No. 2								
18.	<i>Heterodermia diademata</i> (Taylor) Awasthi	+	+		+				
19.	<i>H. leucomela</i> (L.) Poelt	+						+	
20.	<i>H. speciosa</i> (Walfel) Trevisan							+	
21.	<i>Haematomma puniceum</i> (Sm. Ex. Ach.) Massal.								+
22.	<i>Lecanora cinereofusca</i> (H. Magn.)								+
23.	<i>L. fimbriatata</i> Stirton		+						+
24.	<i>L. perplexa</i> Brodo								+
25.	<i>Leptogium asiaticum</i> P. Jørg	+							
26.	<i>L. javanicum</i> Mont.		+						
27.	<i>L. trichophorum</i> Muell. Arg.	+							
28.	<i>Lecidea</i> species							+	
29.	<i>Lobaria kurokawae</i> Yoshimura	+						+	
30.	<i>L. retigera</i> (Borry) Trevisan	+							
31.	<i>Ochrolechia yasudae</i> var. <i>corallina</i> Poelt							+	
32.	<i>Parmelaria subthomsonii</i> Awasthi	+						+	
33.	<i>Parmelia bostrychodes</i> Zahlbr.							+	
34.	<i>P. cirrhata</i> Fr.	+	+						
35.	<i>P. muelleri</i> Vainio								
36.	<i>P. nepalensis</i> Taylor	+							+
37.	<i>P. praesorediosa</i> Nyl.								+
38.	<i>P. reticulata</i> Taylor	+						+	

Sl. No.	Name of species	<i>Quercus leucotrichophora</i>	<i>Betula alnoides</i>	<i>Prunus padam</i>	<i>Alnus nepalensis</i>	<i>Muscicolous</i>	<i>Terricolous</i>	<i>Saxicolous</i>	<i>Corticulous</i>
39.	<i>P. rhytidods</i> (Hale) A. Singh								+
40.	<i>P. rigidula</i> Kurok. in Hale & Hale							+	
41.	<i>P. setschwanensis</i> Zahlbr.							+	
42.	<i>P. texana</i> Tuck.	+							
43.	<i>P. wallichiana</i> Taylor	+			+				
44.	<i>Peltigera dolichorhiza</i> (Nyl.) Nyl.	+			+				
45.	<i>Pertusaria albescens</i> (Huds.) Choisy & Wein in Wein		+						
46.	<i>P. pallidula</i> Stirton		+						
47.	<i>P. punctata</i> Nyl.		+						
48.	<i>Porpidia albocoeules Cens</i> (Wulfen) Hertel & Knoph in Hertel							+	
49.	<i>P. hydrophila</i> (Fr.) Hertel & Knoph in Hertel							+	
50.	<i>Phaeophyscia pyrrophora</i> (Poelt) Awasthi & Joshi							+	+
51.	<i>Physcia alba</i> (Fee) Muell. Arg.								+
52.	<i>Platismatia erosa</i> Culb. & Culb.	+							
53.	<i>Pyrenula himalayense</i> Upreti		+						
54.	<i>P. immissa</i> (Stirton) Upreti		+						
55.	<i>P. immersa</i> Muell. Arg.	+	+						
56.	<i>P. introducta</i> (Stirton) Zahlbr.	+	+						+
57.	<i>P. pinguis</i> Fée		+		+				
58.	<i>Pyxine himalayensis</i> Awasthi								+
59.	<i>Ramalina</i> sp.								+
60.	<i>Stereocaulon foliolosum</i> Nyl.								+
61.	<i>Stereocaulon glareosum</i> (Saviz) H. Magn.							+	
62.	<i>S. paradoxum</i> Lamb.							+	
63.	<i>S. pomiferum</i> Duvign.							+	
64.	<i>Sticta nylanderiana</i> Zahlbr.	+						+	
65.	<i>S. platyphylloides</i> Nyl.	+							
66.	<i>Tephromela khatiensis</i> (Räsänen) Lumbsh								
67.	<i>Usnea orientalis</i> Mot.							+	
68.	<i>U. subsordida</i> Stirton	+							+

trees of *Prunus*, *Pyrus* and *Cinnamomum* favour good growth of some foliose species of *Collema* and *Parmelia*.

When compared with the *Q. leucotrichophora* forest site of Pithoragarh district the forest shows only three species (*Heterodermia diademata*, *Leptogium trichophorum*, and *Parmelia reticulata*) in common. The forest site has comparatively dominance of moisture and shade loving species of *Sticta*, *Lobaria*, *Leptogium* and *Peltigera*.

Site No. 3 : Dhakuri-Khati-Dwali Forest Area

The forest area falls in Pindari river valley. The general vegetation comprises temperate plants. Dhakuri to Khati is a descent of 400m to Khati. The vegetation on the way showed the dominance

of *Elsholtzia* shrubs, intermingled with *Carpinus viminea* and species of *Quercus*.

Khati situated at altitude of 2600m on the bank of Pindari river, displays rich vegetation. The vegetation in the Pindari gorges near Khati is disturbed due to terrace cultivation. The vegetation is of mixed type. Conifers, oaks, maples, walnuts and chestnuts are frequently grown there.

Starting Khati, the botany, all the way to Dwali situated at 3000m is chiefly composed of *Rhododendron arboreum*, *Carpinus viminea*, *Pyrus vestita*, *Ilex dipyrena*, *Betula alnoides*, *Juglans regia*, *Aesculus indica*, *Quercus floribunda*, *Euonymus pendulus*. This area is thickly forested with *Rhododendron-Quercus* association. Under the

shade of trees the shrubby vegetation comprised of *Viburnum foetens*, *Gardneria*, *Rosa* and *Rubus*.

The vegetation of Dwali is exceedingly profuse and the plants of temperate zones predominate. The region is surrounded by rocky mountains and is the meeting place of Kaphini and Pindari gorges. The bank of the gorges are heavily forested with Pines (Himalayan Cypress, *Cupressus torulosa*, *Cedrus deodara*, and *Taxus baccata*). *Rhododendron arboreum*, *R. companulatum*, *Ilex dipyrena*, *Acer caudatum* are the other trees commonly growing in the forest.

Out of the total 36 lichen species occurring in the forest site (Table 3), the lichen flora of *Q. semecarpifolia* is represented by 23 species of 13 genera. The younger trees, having smooth, soft trunk bark provide a suitable substratum for growth of pyrenocarpous taxa (*Pyrenula* and *Lithothelium*) along with species of *Bacidia*, *Lecanora*, *Leptogium* and *Lobaria* while the mature tree trunks are mostly dry, rough show scarce growth of few lichen species.

Q. floribunda, the other oak species of the forest, represent 6 species of 3 genera. The smooth barked trunk support a luxuriant growth of pyrenocarpous lichen genus *Anthracotheicum*.

Betula alnoides and *Ilex dipyrena* are the other major trees of the area which have smooth barked trunk and show plenty of pyrenocarpous, graphidaceous and crustose taxa. *Ilex* seems to be more suitable for growth of pyrenocarpous lichen genus *Anthracotheicum* while *Betula* prefers the graphidaceous taxa and species of crustose lichens, like *Caloplaca*, *Lecanora* and *Pertusaria*.

Site No. 4 : Dwali-Kaphini Forest Area

From Dwali, the path of Kaphini is a steep ascent upto an altitude of 3200m. The flora along the way to Kaphini is very dense and exhibits rich herbaceous vegetation. The forest is mostly composed of evergreen trees and conifers. *Pyrus foliosa* and *Syringa emodi* growing in abundance along with *Rhododendron*, *Betula* (*B. alnoides* and *B. utilis*) and *Quercus* (*Q. semecarpifolia* and *Q. floribunda*) species.

Quercus semecarpifolia and *Q. floribunda*, *Betula alnoides* and *Alnus nepalensis* dominates elevations between 2400-3000 m, whereas the higher altitudes above 3000m comprises trees of *Betula utilis* and *Abies*, *Taxus baccata*, *Pyrus foliosa* and *Syringa emodi*.

The trees are draped with epiphytic ferns. The shrubby vegetation includes plants like *Viburnum foetens*, *Prunus cornuta*, *Berberis* and *Salix*. The lichen flora of *Q. semecarpifolia* is poorly represented by 3 species of 3 genera and that of *Q. floribunda* by 12 species of 5 genera. *Betula alnoides* and *Alnus nepalensis*, the two smooth barked tree species show dominance of pyrenocarpous species of *Anthracotheicum*, *Pyrenula* and graphidaceous taxa.

Betula utilis, a common tree species of the higher elevations bear luxuriant growth of lichens. Out of total 57 species known in the forest site (Table 4), it is represented by 20 species of 12 genera. *Abies*, the common conifer tree species of the area show dominance of fruticose and foliose lichen taxa, like *Bryoria*, *Cetraria*, *Heterodermia* and *Usnea* on their twigs.

DISCUSSION

It is clear from the Table 5 that three species of *Quercus* in three forest sites of Pindari Catchment area of Almora district, are represented by 43 epiphytic lichen species of 19 genera. *Quercus semecarpifolia* represent the occurrence of 25 species of 18 genera, followed by *Q. leucotrichophora* and *Q. floribunda* with 20 species of 11 genera and 12 species of 7 genera, respectively. The mature trees of *Q. semecarpifolia* and *Q. leucotrichophora* have identical bark characters providing similar growth conditions to the epiphytic lichens. They, thus share 10 species in common, while *Q. floribunda* have smooth, soft barked trunk share only 3 to 2 species each with *Q. semecarpifolia* and *Q. leucotrichophora* respectively.

The *Pinus* trees occupy lower altitudes (15-1600 m) than the *Quercus* trees and the trunk bark is dry and rough, share only 2 and one species each

Table 3 : Lichens of Dhakuri-Khati-Dwali forest site

Sl. No.	Name of species	<i>Quercus floribunda</i>	<i>Quercus semecarpifolia</i>	<i>Betula alnoides</i>	<i>Alnus nepalensis</i>	<i>Ilex dipyrina</i>	Terricolous
1.	<i>Anthracothecium globiferum</i> Muell. Arg. var. <i>microsporum</i> A. Singh	+				+	
2.	<i>A. himalayense</i> var. <i>himalayense</i> (Räsänen)	+					
3.	<i>A. platystomum</i> var. <i>papillatum</i> A. Singh & Upreti	+				+	
4.	<i>A. thwaitesii</i> (Leighton) Muell. Arg.	+					
5.	<i>Bacidia nigrofusca</i> (Muell. Arg.) Zahlbr.		+ young tree				
6.	<i>Caloplaca flavorubescens</i> (Huds.) Laundon			+			
7.	<i>Cetraria pallescens</i> Shaerer in Moritzi		+ Twig				
8.	<i>Chrysothrix chlorina</i> (Ach.) Laundon		+ Twig				
9.	<i>Cladonia scabriuscula</i> (Delise in Duby) Leighton		+				
10.	<i>Graphis scripta</i> (L.) Ach.			+			
11.	<i>Graphis</i> sp.		+ young tree	+			
12.	<i>Lecanora caesiorubella</i> Ach.		+ young tree				
13.	<i>L. cinereofusca</i> H. Magn.		+ young tree				
14.	<i>L. fimbriatula</i> Stirton						
15.	<i>L. subrugosa</i> Nyl.		+ young tree				
16.	<i>Lecanora</i> species			+			
17.	<i>Leptogium asiaticum</i> P. Jørg		+ young tree				
18.	<i>L. pedicellatum</i> P. Jørg		+ young tree				
19.	<i>L. trichophorum</i> Muell. Arg.		+ young tree				
20.	<i>Lithothelium himalayense</i> Upreti & Aptroot		+ young tree				
21.	<i>Lobaria kurokawae</i> Yoshimura		+ young tree				
22.	<i>L. retigera</i> (Bory) Trevisan		+ young tree				
23.	<i>Parmelia cirrhata</i> Fr.		+ mature tree				
24.	<i>P. dilatata</i> Vainio		+ young tree				
25.	<i>P. nepalensis</i> Tyalor		+ mature tree				
26.	<i>P. reticulata</i> Taylor		+ young tree				
27.	<i>P. rhytidods</i> (Hale) A. Singh		+ young tree				
28.	<i>P. wallichiana</i> Taylor		+				
29.	<i>Peltigera dolichorhiza</i> (Nyl.) Nyl.		+				
30.	<i>P. rufescens</i> (Weiss.) Humb.		+				
31.	<i>Pertusaria albescens</i> (Huds.) Choisy & Wern. in Wern.						
32.	<i>Pyrenula glabrescens</i> Vainio		+ young tree				
33.	<i>Ramalina sinensis</i> Jatta		+ young tree				
34.	<i>Sticta nylanderiana</i> Zahlbr.		+ young tree				
35.	<i>Usnea orientalis</i> Mot.		+ mature tree				
36.	<i>U. perplexans</i> Stirton		+ young tree				

with *Q. semecarpifolia*, *Q. leucotrichophora* and *Q. floribunda*, respectively.

The *Q. semecarpifolia* trees of the forest of Dwali-Kaphini, near higher elevations (3000m) show poor representation of lichens, as only 3 species of 3 genera occur on them. *Q. semecarpifolia*, which are frequently looped and pruned, do not bear lichen growth on them in Talla-Dhakuri area probably due to lack of moisture on the trunk and twigs.

There is luxuriance of foliose lichens in all the three *Quercus* species, with dominance of 8 species of *Parmelia*. *Quercus leucotrichophora*, *Q. semecarpifolia* and *Q. floribunda* are represented by 16, 13 and 3 species of foliose lichens, respectively. Both *Q. semecarpifolia* and *Q. floribunda* contain 9 species each of crustose lichens, while *Q. leucotrichophora* has only 3 species.

Some lichen show exclusive or narrow range

Table 5 : Lichen species of three *Quercus* tree in Almora district.

Sl.No.	Name of species	<i>Q. leucotrichophora</i>	<i>Q. semecarpifolia</i>	<i>Q. floribunda</i>	Growth form type
1.	<i>Anthracothecium depressum</i>		+		C
2.	<i>A. globiferum</i> var. <i>globiferum</i>			+	C
3.	<i>A. himalayense</i> var. <i>himalayense</i>			+	C
4.	<i>A. polystomum</i> var. <i>papillatum</i>			+	C
5.	<i>A. thwatesii</i>			+	C
6.	<i>Bacidia nigrofusca</i>		+		C
7.	<i>Cetraria pallescens</i>	+	+		Fo
8.	<i>Chrysothrix chlorina</i>		+		C
9.	Graphidaceae	+	+	+	C
10.	<i>Heterodermia diademata</i>	+			Fo
11.	<i>H. leucomela</i>	+			Fo
12.	<i>Lecanora caesiourbella</i>			+	C
13.	<i>L. cinereo fusca</i>		+	+	C
14.	<i>L. fimbriatula</i>			+	C
15.	<i>L. subrugosa</i>		+		C
16.	<i>Leptogium asiaticum</i>	+	+		Fo
17.	<i>L. pedicellatum</i>		+		Fo
18.	<i>L. trichophorum</i>	+	+		Fo
19.	<i>Lithothelium himalayense</i>		+		C
20.	<i>Lobaria kurokawae</i>	+	+		Fo
21.	<i>L. retigera</i>	+	+		Fo
22.	<i>Parmelia cirrhata</i>	+	+		Fo
23.	<i>P. dilatata</i>		+	+	Fo
24.	<i>P. nepalensis</i>	+	+		Fo
25.	<i>P. reticulata</i>	+	+		Fo
26.	<i>P. rhytidods</i>		+		Fo
27.	<i>P. subthomsonii</i>	+	+		Fo
28.	<i>P. subaurulenta</i>				Fo
29.	<i>P. texana</i>		+		Fo
30.	<i>Peltigera dolichorhiza</i>	+			Fo
31.	<i>Pertusaria concinna</i>				Fo
32.	<i>P. leucosorodes</i>			+	C
33.	<i>Phaeophyscia hispidula</i>			+	C
34.	<i>Platismatia erosa</i>	+	+		Fo
35.	<i>Pyrenula globrescens</i>	+			Fo
36.	<i>P. immersa</i>	+			C
37.	<i>P. introducta</i>	+			C
38.	<i>Ramalina sinensis</i>		+		C
39.	<i>Sticta nylanderiana</i>		+		Fr
40.	<i>S. platyphylloides</i>			+	Fo
41.	<i>Usnea orientalis</i>	+			Fo
42.	<i>U. perplexans</i>		+		Fr
43.	<i>U. subsordida</i>	+	+		Fr

C= Crustose, Fo= Foliose, Fr= Fruticose

of phorophyte preference as has been found in area covered under this study by *Anthracothecium* on *Q. floribunda* and *Pyrenula* on *Q. leucotrichophora*. When the lichen flora of *Quercus* trees of Almora district is compared with the neigh-

bouring Pithoragarh district, enumerated by Upreti and Chatterjee (1999), it shows eight species common in both. There is much generic and specific diversity of epiphytic lichens on the *Quercus* trees of Almora district.

Awasthi (1975) enumerated 122 species of lichens in route from Kapkote (750 m) to Pindari Glacier (3750 m), of which 47 species of 16 genera were epiphytic on different phorophytes of the area. In the present investigation a total 79 species of 28 genera were found growing on the trees of this area, of which the *Quercus* species represent 43 of 19 genera, compared to 36 species of 13 genera of the Pithoragarh district. The lichen genera *Anthracotheicum* and *Pyrenula* having five and seven species respectively growing luxuriantly on smooth barked tree in the area, were not recorded by Awasthi (1975). It is interesting to note that in the past three decades probably the lichen flora of the forest area has been changed quite significantly due to the frequent human activity in the sites, as evident from the Working Plan for the West Almora Forest Division, Kumaon Circle, U.P. (1966-1996). There is distinct decrease in forest of *Q. leucotrichophora*, *Q. dilatata* from 13271 ha to 8793.3 and 2929 to 608.4 ha, respectively and in Pine forest from 49472 ha to 42732.64 ha.

Pinus roxburghii trees in both the districts have more or less the same number of species of the similar genera.

It can be concluded from the above studies that some lichen species show high substrate preferences, as pyrenocarpous lichen genera *Anthracotheicum* and *Pyrenula* grow exclusively on smooth, soft-barked trees of *Alnus nepalensis*, young *Quercus leucotrichophora* and *Q. floribunda*. These lichens are completely absent on the rough-barked trees on *Pinus roxburghii* and *Quercus semecarpifolia*. Young trees support the lichen communities dominated by crustose forms.

Full grown mature trees sustain the climax communities dominated by foliose and fruticose lichens.

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