Diversity of Potential lichens on Banj oak twigs in Banlekh forest of district Champawat, Kumaun Himalaya

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Abstract: The Parmelioid lichens on Banlekh forest of Champawat (Uttarakhand) comprises 45-60%, Usnioid (Usneaceae 17-30% and Ramalinaceae 15-30%) found on different diameter class fallen twigs of *Quercus leucotrichophora* A. Camus (Banj oak). The study observed the twig diameter class 0-1 cm and 1.1-2 cm is excellent for the large thallus of the members of family Ramalinaceae. The villagers of the Banlekh area are not using these 15 potential lichens due to lack of information and knowledge.
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Introduction

The ecological and floristical study of Banlekh (Champawat) forest vegetation on lichens is not studied earlier. This group of plant is considered "difficult" by many botanists and is therefore often neglected and superficially treated. In the present work an attempt has been made for survey and study of potential lichens of Banlekh forest. Uttarakhand is rich in lichen diversity and about 500 spp out of which 158 species are reported from Kumaun Himalayan region of the state (Kumar, 2008). Kumar & Upreti (2008) also reported 12 species of lichens found on *Quercus leucotrichophora* (banj oak), 16 on *Q. floribunda* Wall. ex Rehder and 29 on *Q. semecarpifolia* Sm. twigs respectively form Chopta forest of Uttarakahnd. Sati, et al (1992) described 8 species of lichens supported by *Q. leucotrichophora* trees from Nainital Hill. Upreti & Chaterjee (1999) reported 20 species of lichens found on *Q. leucotrichophora* from Pithoragadh and Almora district of Kumaun Himalaya.

The present study provides estimation of fallen twig lichens of *Q. leucotrichophora* in Kumaun Himalayas. The determination of the contribution of fallen twigs of oak trees, which were colonized by lichens and collected for commercial exploitation in most of the areas.

Materials and Method:

Study area

The district Champawat constituted in the year 1997 is located between 29º5′ and 29º30′ in northern altitude and 79º55 and 80º3′at the center of eastern longitude. The Ram Ganga River acts as a border between Champawat and Pithoragadh in north while Jabgura and Pannar rivers in south and west is a border between Champawat, U. S. Nagar and Almora districts simultaneously. The study area Banlekh of district Champawat Kumaun Himalaya is located at 1600m altitude (amsl). Total 68 twigs (fallen) samples of *Q. leucotrichophora* bearing lichens were collected from 100x100 meter area in the month of October 2009 to May 2010. The collected twigs were categorized into five diameter size classes of 0-1cm, 1.1-2cm, 2.1-3cm, 3.1-4cm and more than 4.1cm. The percentage contribution of lichen family Parmeliaceae, Usneaceae and Ramalinaceae growing on twigs of each class were measured.

Results and discussion

Fifteen species of six genera belonging to three families of lichens are recorded. Family Parmeliaceae (4 genera & 8 species), Usneaceae (single genera & 4 species) and Ramalinaceae (single genera and 3 species) respectively (Table 3).

All five diameter class twigs of *Q. leucotrichophora* exhibit luxuriant growth of Parmelioid lichens together with fruticose forms of Usneaceae and Ramalinaceae (Usnioid).

(i) Number of individuals of all three families lichen are found in abundant between twig diameter class 0-1cm and 1.1-2cm.
(ii) Increasing diameter (>4.1cm) of the twigs indicating that all the epiphytic lichens required more space for their colonization (Table 1).
(iii) Table 1 indicates that the smooth and thin (0-1 cm diameter) twigs are fall in large numbers (28 twigs) but thick twigs (>2cm diameter) are fall by chance.
(iv) The contribution of Parmelioid (foliose forms) lichen on oak twigs ranges from 45.11 to 67.85 %, it is approximately triple of Usnioid (17.14 to 30.18% Usneaceae and 15.78 to 29.72% Ramalinaceae (Table 2).
(v) Twigs of 0-1cm diameter class supported a good composion of Parmelioid, Usnioid lichens.

Table 1: Different diameter classes twigs of *Q. leucotrichophora* with number of individuals of lichens

Twig diameter class (cm)	Number of individuals of lichens on fallen twigs			No. of twigs fall
	Parmeliaceae	Usneaceae	Ramalinaceae	
0-1	51	27	33	28
1.1-2	32	21	17	17
2.1-3	22	10	6	9
3.1-4	22	6	7	6
>4.1	24	16	13	8

Table 2: Different diameter classes twigs of *Q. leucotrichophora* with representing percentage wise contribution of lichens

Twig diameter class (cm)	Percentage wise contribution of lichens on fallen twigs		
	Parmeliaceae	Usneaceae	Ramalinaceae
0-1	45.94	24.32	29.72
1.1-2	45.11	30.00	24.28
2.1-3	57.89	26.31	15.78
3.1-4	67.85	17.14	20.00
>4.1	45.28	30.18	24.52

The luxuriance of lichen growth on *Quercus leucotrichophora* twigs may possibly be attributed to the retention of moisture because of their hanging position. The flow of rainwater and melting of snow along the hanging twigs provide greater microclimate and exposure to moisture. According to Pike et al. (1975), twigs being at the edge of the trees canopy receive higher levels of light than most of the remaining surfaces of the tree. Rainfall strikes foliage and twigs directly and these receive additional water, which drips from higher branch system. The exposure, and low water holding capacity of the bark, twigs dry out quickly after rainfall. Twigs can however hold a considerable load of snow during and after snowfall.

Wolseley and Pryor (1999) studied the lichen communities on twigs of *Quercus petrarea* (Matt.) Liebl.) in Welsh woodland site and concluded that there is a correlation between environmental condition and lichen communities of twigs. Bark texture, roughness, pH and position of twigs, amount of moisture as rain tracks or humidity, aspect and illumination of the surface, acidification of the atmosphere are the specific characteristics of the substratum influence the growth of lichens on twigs. Kumar (2009) suggested the growth of lichens might be depends on type of substratum, forest type, light, temperature and moisture condition. The annual growth of a potential species of Parmelioid lichen (*Parmotrema nilgherrense* (Nyl) Hale) is recorded about 7.28 mm² per year and used as sacrificial fire (Havan).

Based on the ecological roles rather than taxonomy the epiphytic lichens of the Oak trees can be grouped into Parmelioid (*Everniastrum*, *Parmotrema*, *Cetrariopsis* and *Sticta*), Usnioid (*Usnea*, *Ramalina*) lichens. Gunnar (1978) reported that some species of Parmelioid lichens are most primitive pioneers on the ash twigs (annual shoots) the first colonization occurs. The great regulatory occurrence of lichen species not only as the colonization, but also occur concerning the further development of the lichen vegetation.

Uperti et al. (2005) enumerated 38 commercially used lichens from different states of India. Out of 38, 24 species of fifteen genera belongs to Parmelioid lichen with maximum representation of *Everniastrum* and *Parmotrema* species followed by Usnioid (8 species of 2 genera) lichens. Lichen genera *Everniastrum*, *Parmotrema*, *Rimelia*, *Parmelaria*, *Usnea*, *Lobaria*, and *Ramalina* are exploited exhaustively for their commercial use.

Shah (1997) and Upreti et al. (2005) also emphasizes the need for protection and conservation of lichens in India due to their intensive exploitation.

Table 3. List of potential lichens of the study area

Sl. No.	Lichen taxa	Family	Uses
	Parmelioid lichens		
1.	*Everniastrum nepalense* (Taylor) Hale ex Sipman	Parmeliaceae	Useful for preparing garam masala, sabhar masala, meat masala and curry powder
2.	*Everniastrum cirrhatum* (Nyl) Hale	Parmeliaceae	Upreti, et. al (2005) mentioned Gaddi tribe of Kangra valley (HP), used this lichen for sacrificial fire (Havan) and Bhaiga, Bhil, Bhilala, Gond, Korka, Muria of M.P as spice and flavouring agent for meat and vegetables. Similarly Lepchas & Nepalese of Sakyong valley, North Sikkim used the species as vegetables.
3.	*Parmotrema nilgherrense* (Nyl) Hale	Parmeliaceae	For sacrificial fire (Havan)
4.	*Parmotrema wallichiana* (Taylor) Elix & Hale	Parmeliaceae	As folk medicine
5.	*Parmotrema mesotropom* (Müll. Arg.) Hale	Parmeliaceae	Used in cosmetic and perfume industries.
6.	*Bulbothrix bulbochaeta* (Hale.) Hale.	Parmeliaceae	Commercially useful
7.	*Bulbothrix meizospora* (Nyl.) Hale.	Parmeliaceae	Commercially useful
8.	*Rimelia reticulata* (Taylor) Hale & Fletcher	Parmeliaceae	Bhaiga, Bhil, Bhilala, Gond, Korka, Muria of M.P as spice and flavouring agent for meat and vegetables.
	Usnioid lichens		
9.	*Usnea pectinata* Taylor	Usneaceae	Malayans still employ this species medicinally for colds and as a tonic (Sharma & Sharma, 2000).
10.	*Usnea longissima* Ach.	Usneaceae	Bhotia & Garhwalis of Uttarakhand used this species as stuffing material, spice and ingredient of a poultice for bone setting. In Used as mattresses at seasonal camps in British Columbia. Turner, et. al (1983) reported valued for absorbent qualities like wound dressing, bany diapers, sanitary napkins for women, wiping salmon.
11.	*Usnea orientalis* Mot.	Usneaceae	Book et. al (1972) mentioned that it is an important dietary item during winter for musk deer (*Moschus moschiferus*).
12.	*Usnea aciculifera* Vinio	Usneaceae	Source of usnic acid.
13.	*Ramalina sinensis* Jatta	Ramalinaceae	Showing antimicrobial properties (Burkholder et. al 1945).
14.	*Ramalina conduplicans* Vainio	Ramalinaceae	Medicinally important
15.	*Ramalina himalayensis* Ras.	Ramalinaceae	Medicinally important

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