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Quantitative analysis of fallen lichen vegetation in eleven forest sites of a *Quercus semecarpifolia* forest of Garhwal Himalaya, India

Balwant Kumar

Department of botany,

Kumaun University, Nainital- 263002 (India)

Email: drbalwantkumararya@gmail.com and balwantkumararya@yahoo.co.in

Tel: 09758023091 and 09410952957

ABSTRACT: The present study was carried out on eleven forest sites dominated by *Quercus semecarpifolia* forest to assess fallen lichen (fall from trees) diversity between 2500m to 3500m elevation in Garhwal Himalaya. A total of ten fallen lichens were recorded from the study area. [Nature and Science. 2009;7(2):95-100]. (ISSN: 1545-0740).

Keywords: Fallen lichens, study sites, distribution pattern, Garhwal Himalaya

Introduction

The Himalayan Mountain (27´38 º N latitude and 72´98 º E longitude) is the youngest, largest, highest and most complex mountain system in the world covering east to west (Gupta, 1963). On the basis of altitudinal variation the Himalayan ranges are divided into sub-tropical, temperate and alpine zone representing a variety of forest types.

Garhwal Himalaya is extremely rich in lichen diversity, it is about 69% of the Uttarakhand and 35% of the Himalayas and more than 16% of Indian lichen diversity (Kumar, 2008), and its climate factors, temperature variations, rainfall pattern, soil support, strong fauna and flora. Kumar (2008) reported 106 species of lichens from the area and also reported ten regularly fallen lichen species. Studies of the Northwest Pacific forests indicate that lichens are important component of food chain, and they play a significant role in forest nutrient cycling (Pike 1978; Maser et al. 1985).

In this article author describe the diversity of fallen lichen genera and their distribution pattern in different forest sites of a brown oak (*Quercus semecarpifolia*) forest.

MATERIALS AND METHODS

Study area Chopta was located at altitude between 2500-3500m elevations of Garhwal Himalayas India. Altitudinally Chopta is located in temperate zone. For the detailed study of fallen lichen (fall from trees) diversity, the area was divided into eleven different sites. All the sites broadly have similar major tree species. *Quercus semecarpifolia* and *Rhododendron arboretum* trees was the major tree species present in all the eleven investigated sites. In all the sites the forest cover were recorded between 32-58% (Kumar, 2008).

The phytosociological analysis of the fallen lichen vegetation was done by sampling of 40, $2M^2$ ground quadrats on each site. All the individuals of fallen lichen genera were recorded carefully in each sampled quadrat. The collected lichen samples were identified in the Lichen Laboratory, IBRI Lucknow.

The data on fallen lichen vegetation were quantitatively analyzed for abundance, density, and frequency and A/F ratio by the following formulas given by Curtis and Mc Intosh (1950).

$$\text{Abundance} = \frac{\text{Total number of individuals}}{\text{Number of quadrat occurrence}}$$

$$\text{Density} = \frac{\text{Total number of individuals}}{\text{Total number of quadrats studied}}$$

$$\text{Frequency (\%)} = \frac{\text{Number of quadrats occurrence X 100}}{\text{Total number of quadrats studied}}$$

Distribution of population: The ratio of abundance to frequency is a relative measure to present the distribution of fallen lichen vegetation in a community. Curtis and Cottam (1956) suggested the following for regular (less than 0.025), contagious (0.025-.05) and random (more than 0.05) distribution of the population.

RESULTS

Quantitative analysis of fallen lichen vegetation at different study sites are given in Table 1. A total of 10 fallen lichen genera were recorded from the study area. The density of fallen lichen genera was recorded to be maximum 13175 individuals of *Everniasteru* ha¹ at site 1st and 3rd and the minimum density 125 individuals of *Everniastrum* ha¹ was recorded at site 9th. Among the lichen vegetation maximum density was recorded for 26900 individuals of lichen ha¹ was recorded for site 1st, and the minimum density also recorded 6350 individuals of lichen ha¹ at site 6th (Table 1). *Everniastrum* was the most dominantly fallen lichen in all the eleven investigated sites followed by species of *Usnea*. The other common fallen lichen genera of the study area were *Parmotrema* spp, *Cetrariopsis* spp, *Heterodermia* spp, *Ramalina* spp, *Leptogium* spp, *Parmelia* spp, *Lobaria* spp and *Cladonia* spp.

There was 6.06% fallen lichens displayed regular distribution pattern in the study area as maximum lichens genera (56.06%) displayed their random distribution pattern at different sites and 37.87% genera of fallen lichens contagious distribution pattern at different sites of the study area.

Table 1: Vegetational parameters for fallen lichens at different forest sites

Forest sites	Fallen lichen taxa	Frequency (%)	Density (Ind ha⁻¹)	Abundance (Ind ha⁻¹)	A/F
1	*Usnea*	85	575	2.7	0.031
	Everniastrum	92.5	13175	5.7	0.061
	Parmotrema	62.5	5675	3.64	0.058
	Cetrariopsis	42.5	1375	1.29	0.03
	Heterodermia	32.5	925	1.15	0.035
2	*Usnea*	42.5	3300	3.11	0.073
	Everniastrum	67.5	6500	3.85	0.057
	Parmotrema	57.5	2875	2	0.034
	Heterodermia	17.5	675	1.57	0.089
	Cetrariopsis	15	425	1.16	0.077
3	*Usnea*	55	4300	3.13	0.056
	Everniastrum	87.5	13175	6.02	0.068
	Parmotrema	72.5	5000	2.28	0.031
	Heterodermia	0.35	1175	1.35	3.857

	Cetrariopsis	0.35	1050	1.21	3.457
4	*Usnea*	70	4000	2.28	0.032
	Everniastrum	90	8300	3.69	0.041
	Parmotrema	47.5	2050	1.73	0.036
	Cetrariopsis	37.5	1175	1.26	0.033
	Heterodermia	27.5	750	1.09	0.039
	Ramalina	25	675	1.1	0.044
5	*Usnea*	40	1425	1.43	0.035
	Everniastrum	72.5	6125	3.37	0.046
	Parmotrema	67.5	3125	1.85	0.027
	Ramalina	17.5	425	1	0.057
	Heterodermia	10	650	1	0.1
	Cetrariopsis	12.5	300	1	0.08
	Leptogium	12.5	375	1.2	0.096
	Parmelia	10	2500	1	0.1
6	*Usnea*	22.5	1500	2.66	0.118
	Everniastrum	32.5	2750	3.38	0.104
	Parmotrema	22.5	925	1.66	0.073
	Ramalina	12.5	425	1.4	0.112
	Cetrariopsis	7.5	375	2	0.266
	Heterodermia	12.5	375	1.2	0.096
7	*Usnea*	50	5925	4.75	0.095
	Ramalina	55	1375	1.46	0.026
	Parmotrema	32.5	1625	2	0.061
	Everniastrum	70	7000	4	0.057
	Heterodermia	32.5	1050	1.3	0.04
	Cetrariopsis	22.5	1300	2.33	0.103
8	*Usnea*	50	5625	4.5	0.09
	Everniastrum	85	11750	5.52	0.064
	Parmotrema	35	4050	4.64	0.132
	Ramalina	22.5	1175	2.11	0.093
	Cetrariopsis	10	500	2	0.2
9	*Usnea*	42.5	2125	2	0.047
	Everniastrum	52.5	5925	4.52	0.086
	Parmotrema	40	2000	2	0.05
	Heterodermia	10	500	2	0.2
	Cetrariopsis	5	125	1	0.2
	Ramalina	7.5	250	1.33	0.177
10	*Usnea*	67.5	3050	1.81	0.026
	Everniastrum	82.5	8300	4.03	0.048
	Parmotrema	82.5	4500	2.18	0.026
	Heterodermia	17.5	625	1.42	0.081
	Cetrariopsis	22.5	675	1.22	0.054
	Ramalina	22.5	750	1.33	0.059
	Lobaria	10	300	1.25	0.125
	Leptogium	15	625	1.66	0.11
11	*Usnea*	47.5	2925	2.47	0.052

	Everniastrum	65	5875	3.61	0.055
	Parmotrema	70	5425	3.1	0.044
	Heterodermia	32.5	1175	1.46	0.044
	Cladonia	7.5	250	1.33	0.177
	Ramalina	25	750	1.2	0.048

DISCUSSION

Lichen fall is a relatively more continuous process in the temperate oak forest of the Garhwal Himalaya. In the Central Himalayan forests, water stress and extremes of temperature are probably not the dominant causal factors of wood fall. The abscission of wood is promoted by higher temperatures in the annual cycle (summer and rainy seasons) although abscission continues, though irregularly, through out the year as a mechanism of canopy-clearing by self-pruning (Singh and Singh, 1992). According to the concept of Stone (1989) allogenic factors caused by outward growth of oak canopy, including changes in microclimate and thickening and sloughing of bark, appear to be far more important to most species than changes brought on by the epiphytic species. However, within the framework of the allogenic tree canopy factors, the same sorts of interspecific interactions take place as more found in autogenic type of succession.

The fallen density depends on the forest cover and tree density, site 5^{th} & 10^{th} represented by 8 fallen lichen genera followed of 6 at site 4^{th}, 6^{th}, 7^{th}, 9^{th} & 11^{th}, and 5 genera at 1^{st}, 2^{nd}, 3^{rd} & 8^{th}. Lichen genera *Parmelia*, *Leptogium* and *Stcta* of the study area were found rare.

According to Kumar (2008) the lichen fall in a particular area may be affected by a number of climatic factors and activities of the inhabitants of the area. The common factors responsible for lichen fall in the study area were type of fauna (jumping of Languor's from one tree to other), birds, heavy snow fall, hails, heavy rainfall, human activities and wind condition, direction.

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REFERENCES

Curtis, J.T. and Mc Intosh, R.P. The interrelation of certain analytic and synthetic phytosociological characters. *Ecology* (1950), 434-455.

Curtis, J.T. and Cottam, G. The use of distance measure in phytosociological sampling. *Ecology* (1956), 37:151-160.

Gupta, A.C., 1963. Annual precipitation and the vegrtion of the dry temperate coniferous region of North-West Himalaya. *Jour. Inl. Bot. Soc.* (1963), 42 (2).

Kumar, B. Lichen diversity of Baniyakund-Chopta region of region of Garhwal Himalaya, India. *A national seminar on globalwarming* (2008), SMJN College Haridwar. p 46.

Kumar, B. Lichen species distribution, cover and fall in a *Quercus semecarpifolia* (J E Smith) forest of Garhwal Himalaya, Ph. D. Thesis (2008), HNB Garhwal University, Srinagar (Garhwal), India.

Maser, Z., Maser, C. and Trappe, J.M. Food habits of the northern flying squirrels (*Glaucomys sabrinus*) in Oregon. *Canadian Journal of Zoology* (1985) **63**: 1085-88.

Pike, L.H. The importance of epiphytic lichens in mineral cycling. *The Bryologist* (1978) **81**(2): 247-57.

Singh, J.S. and Singh, S.P. Forest of Himalaya: Structure, Functioning and impact of Man. Gyonodaya Prakashan, Nainital (India) (1992).

Stone, D.F. 1989. Epiphytic succession on *Quercus garryana* branches in Willamette valley of western Qregon. *Bryologist* (1989) **92:** 81-94.

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