International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Composition and Stratification of Pine Forests of Himalayan Region of North Kashmir

Hind Lal Maurya[1], Javid Ahmad Kak[2], Dr Sonu Rahi[3], Dr Santosh Agnihotri[4]

[1]Research Scholar/ Awadhesh Pratab Singh University/ Rewa (M. P.), India
royalttoolz[at]gmail.com

[2]Research Scholar/ Awadhesh Pratab Singh University/ Rewa (M. P.), India
javidkak[at]gmail.com

[3]Department of Botany Govt. Girls PG College/ Rewa (M. P.), India

[4]Department of Botany Govt. Model Science College/ Rewa (M. P.), India

Abstract: ***Composition and stratification was examined in Gulmarg area of north Himalayan region of Kashmir division, north India. A total of 848 vascular plants were recorded from the all forest stands randomly, showed dominance of silver fir (Abies pindrow) (44-51%) in the community followed by Taxus wallichiana (11-17%), Picea smithiana (11-16%), Pinus wallichiana (7-16%). The presence of different life forms resulted into a four-layered distribution of plant species in the community. Out of the four layers, the woody species were distributed in two distinct layers, i. e., canopy, and understory layer which was followed by shrub and herb layers in the community.***

Keywords: Density, Stratification, Pine forests.

1. Introduction

The natural vegetation of Gulmarg forests is often mistaken for the pine forests. In fact the vanishing pristine forests of Gulmarg are now mostly confined to Biosphere Reserve, Wild Life Sanctuaries, and National parks. Besides acting as a gene pool and providing refuge to a large number of endemic, endangered and threatened species (Jamir & Pandey 2002, 2003), they change ecological services such as source of perennial water, maintain local micro environmental conditions and help in biogeochemical cycles (Upadhaya 2002). Several quantitative measures are employed to describe the structure of plant communities with much ecological precision, qualitative characters such as species richness, life-form spectrum and vertical disposition of species are some of the important parameters to describe community structure. Raunkiaer (1934) demonstrated communities of different climatic zones or phytoclimatic zones of the earth on the basis of life-form spectrum or Biological spectrum. Any change in the life-form composition away from its phytoclimatic zone is regarded as an indicator of alteration in vegetation either due to biotic or abiotic factors or both. However, in recent years man has abused the natural vegetation so much so that often plant communities do not exhibit their natural structural complexities. Excessive utilization of forest resources and overgrazing has resulted in change in the existence of plant communities (Reddy et al.2002; Verma & Shukla 1993). Vegetation profile of the component species indicates the phytoclimatic condition of the area and is employed commonly in community structural description (Ashton & Hall 1992; Chen Wei-Lie 1995; Pignatti 1995; Sahunalu & Dhanmanonda 1995; Unwin 1989; Visalakshi 1995). In the present paper structural composition and stratification in Gulmarg forests have been analyzed.

2. Materials and Methods

Study area and climate

Gulmarg lies in a cup-shaped valley in the Pir Panjal Range of the Himalayas, at an altitude of 2, 650m (8, 694 ft), 56km from Srinagar. The soil in Gulmarg comprises glacial deposits, lacustrine deposits and moraines of Pleistocene age covering shale, limestone, sandstones, schist and other varieties of rocks. The natural meadows of Gulmarg, which are covered with snow in winter, allow the growth of wild flowers such as daisies, forget-me-nots and buttercups during spring and summer. The meadows are interspersed by enclosed parks and small lakes, and surrounded by forests of green pine and fir. Skiing and other winter sports in Gulmarg are carried out on the slopes of Apharwat peak at a height of 4, 267 m (13, 999 ft). Many points on Apharwat peak and Khilanmarg offer a panoramic view of Nanga Parbat and Harmukh mountains.

Owing to its high elevation, Gulmarg has a humid continental climate where the wet winter season sees heavy snowfall, especially for its latitude. Summers are moderate in temperature and length, whereas shoulder seasons are relatively cool.

Methodology

We selected total of 60 sites randomly for both low and high elevations and divided into 60 quadrates randomly for both elevations (total 60 quadrates). To analyze both the elevation, all individual plants ≥ 5cm dbh were measured and tree height was measured with the help of yardstick. For both the chosen provinces, all species present were identified by approaching the plant taxonomist.

Data were also used for computation of analytical features such as density, relative density, frequency, relative frequency, area, relative area and IVI (importance value

index) of important pine species given by Curtis & McIntosh (1950). IVI for the species was investigated as the sum of the relative density, relative frequency and relative area (Curtis 1959).

Plant diversity was investigated following Simson's index (1949):

$$Ds = 1 - \frac{\Sigma n_i(n-1)}{N(N-1)}$$

Ds = index of diversity
ni= Number of ith species
N =Number of all individuals.

3. Results

A total of 848 vascular plants were recorded from both the elevations of all 60 quadrates. In all the stands Abies pindrow were dominant life forms in canopy and understory layers at both the elevations. Highest IVI was found for Abies pindrow for the whole forest stand and low for Pinus wallichiana. At low elevation Species density was recorded greater for Abies pindrow compared to high elevation. Total density was recorded 13.75 at low elevation and 13.06 at high elevation for all pine species. Tree diversity was high (0.95), shrub diversity (0.97) and herb diversity (0.99) at high elevation. Tree diversity was 0.07, for shrubs 0.21 and for herbs 0.06 at low elevation. We found that both forest stands were made up of four forest strata viz; canopy, understory, shrub and herb layers.15 species of herb layer belonging to 12 families which has also been recorded are shown in the appendix

4. Discussion

Anthropogenic exercises lead to Forest Island and manmade disruptions also alter tree species diversity (Cayuela et al.2006). Gulmarg forest region shows different disruptions which effect the composition of plants at both the elevations. The study area was found to have four vertical strata which are as; canopy, understory, shrub and herb layers. Canopy was apparent with Abies pindrow, understory with young Abies pindrow and Picea smithiana, shrub layer with shrubs and seedlings of Picea smithiana where Abies pindrow density was low. Herb layer density was found high in places where Abies pindrow density was low compared to Picea smithiana in understory strata, whereas it was low in dense canopy layer. Sapling and seedling density of all pine species found high were all tall plant species density was low. Our study clearly revealed that apart from anthropogenic activities density and strata also impacts the plant population to a great extant Javid & Singh (2020).

Appendix

S. No.	Taxon name	Local name	Family
1	Amebia benthami	Kehzaban	Boriginaceae
2	Abies pindrow	Sal	Pinaceae
3	Atropa acumniata	Chella lubbar	Solanaceae
4	Berginia ligulata	Zakhmi hayat	Saxifraceae
5	Cannabis sativa	Bhang	Cannabinnaceae
6	Cedrus deodara	Divdar	Pinaceae
7	Euphorbia wallichia	Guri-dud	Euphorbiaceae
8	Lavetera kashmeriana	Sozposh	Malvaceae
9	Oxalis corniculata	Tsok-tsen	Malvaceae
10	Podophyllum hexandrum	Banwangun	Berberidaceae
11	Pinus roxiburghii	Chad	Pinaceae
12	Prunella vulgaris	Kalwauth	Lamiaceae
13	Sasseria costus	Kuth	Asteraceae
14	Trillium govanianum	Tripiter	Melanthiaceae
15	Utrica dioca	Soi	Utricaceae

References

[1] Ashton, P. S. & P. Hall.1992. Comparison of structure among mixed dipterocarp forest of north-western Borneo. Journal of Ecology 80: 459-481.
[2] Chen, Wei-Lie.1995. Subtropical montane deciduous forests in southern China. pp.317-323. In: E. O. Box, R. K. Peet, T. Masuzawa, I. Yamada, K. Fujiwara & P. F. Maycock (eds.) Vegetation Science in Forestry. Kluwer Academic Publishers, Dordretch, Netherlands.
[3] Curtis, J. T.1959. The vegetation of Wisconsin: an ordination of plant communities
[4] Jamir, S. A. & H. N. Pandey.2002. Status of biodiversity in the sacred groves of Jaintia hills, Meghalaya. The Indian Forester 128: 738-744. Jamir, S. A. & H. N. Pandey.2003. Vascular plant diversity in the sacred groves of Jaintia hills in northeast India. Biodiversity and Conservation 12: 1497-1510.
[5] Kak, J. A. & Singh, A. P.2020. Effect of Canopy Cover on the Species Diversity and Regeneration of Pine Species in Doodhganga Forests, Budgam (J&K). SSRN eLibrary, Elsevier.
[6] Pignatti, S.1995. Land use and human influences in the evergreen broad leaved forest regions of East Asia, the Mediterranean and Australia. pp.199-210. In: E. O. Box, R. K. Peet, T. Masuzawa, Yamada, K. Fujiwara & P. F. Maycock (eds.) Vegetation Science in Forestry. Kluwer Academic Publisher, Dordrecht, Netherlands.
[7] Raunkiar, C.1934. The Life Forms of Plants and Statistical Plant Geography. Clarendon Press, Oxford, England.
[8] Reddy, K. N., C. H. Jadhav, S. Reddy & V. S. Raju.2002. Life forms and biological spectrum of Marriguda Reserve Forest, Khammam District, Andhra Pradesh. The Indian Forester 128: 151-156.
[9] Sahunalu, P. & P. Dhanmanonda.1995. Structure and dynamics of dry dipterocarp forest, Sakaerat, NorthEastern Thailand. pp.465-494. In: E. O. Box, R. K. Peet, T. Masuzawa, I. Yamada, K. Fujiwara & P. F. Maycock (eds.) Vegetation Science in Forestry. Kluwer Academic Publications, Dordretch, Netherlands.
[10] Simpson, E. H.1949. Measurement of diversity. Nature 163: 688.
[11] Unwin, G. L.1989. Structure and composition of the abrupt rainforest boundary in the Herberton highland, North Queensland. Australian Journal of Botany 37: 413-428.
[12] Upadhaya, K.2002. Study on Plant Diversity and Ecosystem Function in Sacred Groves of Meghalaya. Ph. D. Thesis. North Eastern Hill University, Shillong, India.
[13] Verma, B. K. & G. Shukla.1993. Life forms and biological spectrum of the flora of Jalaun District. Journal of Indian Botanical Society 72: 67-68

[14] Visalakshi, N.1995. Vegetation analysis of two tropical dry evergreen forests in Southern India. Tropical Ecology 36: 117-127.