

VERTICAL STRATIFICATION OF WOODY PLANT SPECIES OF DOODHGANGA FOREST BUDGAM (J&K) WITH SPECIAL REFERENCE TO ITS CONSERVATION STATUS

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Abstract: Forest vegetation is one of the main priorities of modern man nowadays to preserve, conserve and sustain to its future generations. Day by day the greenish vegetation is becoming limited due to the pressure created by various anthropogenic activities. A comprehensive study was held in the Doodhpathri hills of Jammu and Kashmir Himalaya to study the greenish vegetation there. A large area was studied there by taking various field trips in the year 2018. To know the presence-absence of all species the area was studied by taking various quadrates in different elevations there. To study the vertical structure we analyzed distribution, height and diameter at breast height (DBH). Density, frequency, relative abundance, and IVI were calculated. The values of Shannon's index and Pielou's index showed variations from bottom to upper layers. The species diversity was lower in upper elevation than in the lower elevation. The present vegetation shows that the area was occupied by different plants like *Taxcus wallichinia*, *Taxcus baccata* and large number of other herbaceous plants. We found a total of 56 species, among them 40 were herbs, 4 were shrubs and 12 were tree species. A large section of the people of the local area was also interviewed to get knowledge about local vegetation of the region. It was noted that the present vegetation is under constant threat from various agencies and the ground efforts for the conservation and management strategies are insufficient there. We observed that the number of herbs and shrubs were less present towards closed stratification.

Keywords: DBH, Doodhganga forest Budgam, Quadrate, Vertical stratification, Woody species

Introduction

The climatic and altitudinal variations and the different ecological habitats of the Kashmir region have contributed to the development of immensely rich vegetation which provides an important source of materials for medicine, wood for building construction and grazing. The vegetation Experiences the anthropogenic as well as natural hazards. The increasing demand of plants creating a constant pressure on existing resources, leading to continuous depletion of some of the species in the forests, and at the same time forest land is losing its natural flora. People like Gujjars and Bakarwals meet their daily requirements like fuel, fodder, medicine, wild edibles by exploiting the bio-resources of the region. These people are exploring these resources from years and now in this modern world they collect the herbs which have medicinal values and are selling herbs to get money. They also sell the precious tree like pine and deodar illegally. Himalayan cover is decreasing continuously. A total of 27% (821×10^3 ha) lose of forest cover was recorded in Jammu and Kashmir by using satellite imagery from 1970 to 2000 (Valdiya, 2002).

Forest diversity patterns and anthropogenic variables in the Himalayan subtropical region have been studied in the past by Todoria *et al.*, 2010; Kharakwal *et al.*, 2009; Gairola, 2008; Ahmed *et al.*, 2006; Kunwar & Sharma, 2004. Himalayan vegetation is considered to be among the globe's most depleted forests (Duke, 1994; Schickhoff, 1995; Shaheen *et al.*, 2011). Existence of elevations is also responsible for the distribution of vegetation due to variation in solar radiations (Bray and Barham 1964). Pandey *et al.* in 1996 revealed that the vegetation is affected by difference in microclimate, aspect and altitude. Sorenson Forrel in 1979 analyzed that the biotic and abiotic factors affect the survival and growth of seedling and sprouts. Arora in 1993 analyzed that precipitation and altitudinal difference are responsible for the vegetation patterns.

Vertical stratification appears to be good indicator index of conservation for the diversity of tree species (Koop 1989, Neumann and Starlinger 2001, Faroz and Hagihara 2008).

The main objectives of our study were (1) to determine the vertical stratification and (2) to determine the composition and diversity of species with the help of vertical stratification.

Materials and Methods

Description of the study area

This study was carried out in Doodhganga forest, Budgam. Doodhpathri (Doodhganga) in Kashmiri means valley of milk lies in the district Budgam of Jammu and Kashmir state, India. Doodhganga (Doodhpathri) forest region comes in Pirpanjal Forest range. The geolocation of the study area is $33^{\circ} 52'$ and $33^{\circ} 40'$ North Latitude and $74^{\circ} 30'$ and $74^{\circ} 43'$ East Longitude. The total area of the Doodhganga forest is about 141 km^2 . The elevation ranges from 1500m to 4800m. It is one of the unique and beautiful valley in Budgam district. Its altitude is 8957 ft from the sea level and is situated at a distance of 43 km from srinagar and 22 km from main city Budgam. Baramulla surrounds the Doodhpathri valley towards north side and pulwama district surrounds it towards the southern side, karewas as foothills separates it from the Chenab valley and the Jammu region.

The climate of the Doodhganga region of district Budgam is mild and temperate There is slight change in the climate with altitude in Doodhganga forest region. The temperature of slops decreases upto $2\text{-}3^{\circ} \text{C}$. On the bases of temperature and rainfall the entire Kashmir valley experience four seasons viz; winter (Dec-Feb.), spring (March-May), summer (June-August) and autumn (Sep.-Nov.). Kashmir recognize its own seasons in a year namely sonth(Spring) mid March to mid May, Grishm mid May to mid July, Waharat (rainy season) mid July to mid September, Hurud (autumn) mid September to mid November, Wand (winter) mid November to mid January and Sheshur (Sever winter) mid January to mid March. The climate of the entire study area is influenced by monsoon pattern of precipitation as well. The climatic data (mean of the year 2018) is given in the table 1 & 2 below. Doodhganga region has a lot of precipitation during the year. This is true notwithstanding for the driest month. This type of climate is viewed as Cfa as per the Köppen-Geiger climate order. In Doodhganga region, the normal yearly temperature (average temperature) was 13.6°C . July was the hottest month with an average temperature of 24°C and the lowest average temperature of 1.7°C was recorded in the month of January. In a year, the normal average precipitation was 743 mm. November experienced the lowest precipitation and it was recorded highest in the month of March. In November the average rainfall was 25 mm and it was 122 mm in the month of March as provided by the Metrological Department of Jammu and Kashmir

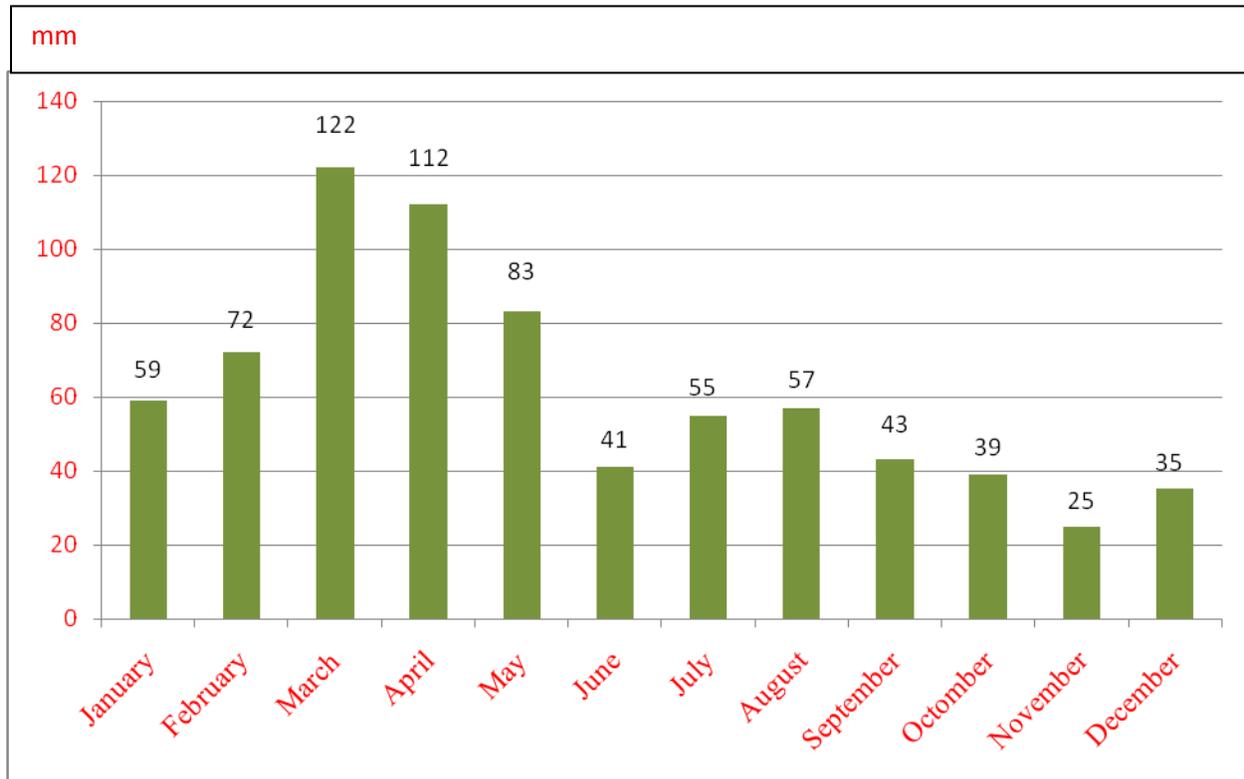


Table 1. Rainfall was lowest in the month of November with an average of 25 mm and the highest rainfall was recorded in the month of March with an average of 122 mm.

	Jan.	Feb.	March	April	May	June	July	Aug	Sept.	Oct.	Nov.	Dec.
Avg. Temp.	1.7	3.9	8.8	13.7	18.3	21.9	24.1	23.4	20.5	14.7	8.5	4.1
Min. Temp.	-1.7	-0.3	4	8.2	11.9	15	18.4	17.9	13.4	7	1.1	-1.1
Max Temp.	5.1	8.2	13.6	19.3	24.8	28.8	29.9	29	27.6	22.5	15.9	9.3
Avg. Temp.	35.1	39.0	47.8	56.7	64.9	71.4	75.4	74.1	68.9	58.5	47.3	39.4
Min. Temp.	28.9	31.5	39.2	46.8	53.4	59.0	65.1	64.2	56.1	44.6	34.0	30.0

Table 2 . During the year the average temperature vary by 22.4⁰C as shown by the above table.

Methology

The data was collected from May to Sep. 2018. A total of 80 quadrats randomly were laid down. We analyzed trees in 10 x 10 m, shrub in 5 x 5 m and herb in 1 x 1 m plots. Quadrate data were used for computation of analytical features such as density, frequency, abundance, A/F ratio, basal cover and importance value index (IVI) given by Curtis & McIntosh (1950). Diameter at breast height (DBH at 1.37 m from the ground) of all the trees with >30 cm circumference in each quadrat was measured and recorded for each species. The importance value index (IVI) for the tree species was determined as the sum of the relative density, relative frequency and relative dominance (Curtis 1959). The ratio of abundance to frequency for different species was determined for eliciting the distribution patterns (Curtis & Cottom 1956). The tree species diversity was determined by using Shannon-Wiener information function (H') (Shannon & Wiener 1963). Pielou's J' index (Pielou, 1969) was used for woody species evenness or equitability. To study the vertical structure we analyzed distribution of trees and species with help of height and DBH. We also conducted interviews to get the knowledge about anthropogenic activities. We also identified the species with local names as well as scientific names.





Result and Discussion

Doodhganga flora revealed that among 56 species recorded the dominant tree species of the Doodhganga forest region from low and high elevations indicates that *Picea smithiana* (Spruce) (Kachul) was the dominant tree species followed by *Taxcus wallichiana* (yew) (pustule), *Taxcus baccata* (sougul), *Abies pindrow* (Silver fir) (budul) and *Abies spectebilis* (web fir) (reia budul). *Pinus wallichiana* (blue pine) (yaari kul) was seen in both the elevations. *Pinus helepensis* (Allepo pine) has also been recorded. Among All the 56 species we found that Pinaceae, Asteraceae, Apiaceae, Ranunculaceae, Solanaceae, Polygonaceae, Malvaceae, plantaginaceae, Berberidaceae, Taxaceae, Lamiaceae and Fabaceae were the most dominant families. The other tree species that were found only in low elevations are; Birch, Willow, Bird cherry, popular, Elm (Brenn), Mulberry, *Celtisaustralis* (Nettle) (Brimji in kashmiri), and *Robinia pseudoacacia* (Kiker)

We approached the local people of the study area and came to know that smuggling and grazing is the main factor responsible for forest degradation as compared to organic factors. Smuggling of precious trees for building constructions is the main cause of deforestation of the Doodhganga forest. Local people use herbs for medicinal purposes and they also sell the medicinal plants like roots, rhizomes, tubers, leaves, whole plant, bark, fruit, seeds, resin and stem. Interviews with shepherds revealed that they were caretakers but not owners. The owners were from main villages of the Budgam district. Observation on the average distribution of the species across both the elevations showed that among the tree species

Picea smithiana to be most frequent (66.66%), followed by Taxcus wallichiana (40%), Taxcus baccata (35%), Abies pindrow (19%), Abies spectebilis (17%) Pinus helepensis (11%), Pinus wallichiana (8%) Other tree species that were found there are shown in the table A

Table A Phytosociological Parameters of some tree species at low and high elevations at Doodhgangaga forests.

Scientific Name	Density (plants/m ²)	Relative density(RD)	Frequency (%)	Relative frequency(RF)	Important value index(IVI)(%)
Picea Smithiana	1.73	0.41	66.66%	0.38	0.90
Taxcus wallichiana	1.2	0.28	40%	0.23	0.59
Taxcus baccata	0.56	0.13	35%	0.13	0.31
Abies pindrow	0.36	0.08	19%	0.11	0.30
Abies spectebilis	0.16	0.03	17%	0.07	0.21
Pinus helepensis	0.13	0.03	11%	0.05	0.14
Pinus wallichiana	0.13	0.01	8%	0.03	0.9

The diameters of the trees were measured at the breast height and recorded in classes of 5 cm. We measured DBH of trees ranging from 1 to 1.4 m . Results showed the Picea smithiana and Taxcus wallichiana (19.11 m height average) located in over story and has major effect in this forest. Abies pindrow (60 m average height), Abies spectebilis (50 m average height), Pinus wallichiana (45 m average

height) *Taxcus baccata* (18 m height average) are in understory layer. The overall results showed that forest have two story layers

Conclusion:

The forest of Doodhganga forest of Pir Panchal region of Budgam district of Jammu and Kashmir witnesses various disturbances which influence the distribution and composition of species in both the elevations. Low elevations witnesses the continuous disturbance in the form of removal of seedling through grazing and cutting of grasses of almost all species. Percentage of common tree species was maximum in high elevation and the percentage of common herbs was found maximum in in open canopy and low elevation were tree density was low. In the present study, the total number of species reported was 56 out of which 40 were herbs, 4 shrubs and 12 trees. Diverse ecological conditions like soil, topography and climate favour the greater number of species in the area but the present condition showed that anthropogenic activities causes the deforestation very fast. Thus, our main objectives were to identify the various disturbances and to observe the conservation statuts in Doodhganga forest which comes in Pir Panjal range of Himalaya. The Himalayan biodiversity is severely threatened by natural and anthropogenic means (Kumar and Ram 2005). The various disturbances present in the study area are eroding this rich biological diversity day to day. To conclude, the anthropogenic disturbances may increase the degradation of these forests and effect the species richness, composition and biodiversity. Therefore, these forests need to be monitored for these parameters for a longer period to maintain biodiversity.

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