

Impact of Biotic Interferences on Yousmarg Forest Ecosystem, Kashmir

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ABSTRACT— The present investigation of forest ecosystem was undertaken during May 2010 to Dec 2010. The main aim of the study was to analyze the impact of biotic interferences on Yousmarg forest ecosystem. The cumulative effect of the biotic interferences was significantly seen in the reduction of vegetation cover. The present study revealed that the prominent factor for the exploitation of the vegetation cover of the study area at herbaceous level is simply the overgrazing. The increasing disturbances not only disturb the plant species diversity, richness and evenness significantly but various plant species have been got completely eliminated from grazing area by different kinds of interferences like overgrazing, deforestation, forest fire, tourist impacts etc. It has been observed that about 10 species were absent in the grazing area where as all species were present in the fenced (protected) area .Most of the species have medicinal value like *Achillea millefolium*, *Fragaria nubicola*, *Taraxacum officinale*, *Prunella vulgaris*, *Potentilla reptans*, *Rumex hastatus*, etc. The data showed that the importance value index (IVI) of *Pinus wallichiana* at all the three sites like Nabrepathar, Mashid Nar and Chota Yous of Yousmarg area, gets constantly decrease from protected site to unprotected site while as there is over all decrease in the IVI of other two species like *Picea smithana* (spruce) and *Abies pindrow* (fir).

KEY WORDS- Yousmarg forest, ecosystem, biotic interferences, vegetation analysis, medicinal plants, vegetation cover and exploitation



1 INTRODUCTION

The vast and varied natural resources of the earth are essential for the sustenance and well being of mankind. Among the natural resources, the forest resources occupy a unique positioning as much as they play an important role in the development of society by providing a wide range of goods and services. Besides the economic amenities, the forests have diverse ecological roles as the forests are the primary source to regenerate productivity of land through recycling of nutrients, which may change the physicochemical features of soil favourable for plant growth [1]. Despite their economical and ecological importance, forests are facing multitude of impacts which have not only reduced their overall cover but have also lead to the extinction of some important species of both plants and animals. The degradation of forests is chiefly due to various anthropogenic pressures [2]. Overgrazing reduces plant leaf areas, which reduces interception of sunlight and plant growth. Plants become weakened and have reduced root length, and the pasture sod weakens. The reduced root length makes the plants more susceptible to death during dry weather. The weakened sod allows weed seeds to germinate and grow. If the weeds are unpalatable or poisonous, major problems can result [3].

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2 STUDY AREA-YOUSHMARG



Yousmarg is an emerging destination for tourist spot, which is completely raw, pristine and still unspoiled forest ecosystem lying in the Budgam district of Kashmir valley, India. It lies between the geographical co-ordinates: 33°49'42"N, and 74° 39'59"E and at an elevation of 2712 m (a.s.l.). Yousmarg is about 30 kms from Budgam and about 47 km from Srinagar. Yousmarg is bandied by lush green grasslands, rivers and the backdrop of snow capped mountains could leave the travellers spellbound for a few seconds Yousmarg mesmerizes tourists with its scenic meadows, a sparkling reservoir and mountains comparable to European Alps. It has some of the highest peaks in Pir-Panjal range like Tatakoti 4725m, Romesh Thong 5000m and Sunset Peak 4746 m. The mighty river Doodh Ganga rises from these peaks and distributaries of the same flows into the reservoir (Named Sardemouj reservoir) the mighty river Doodhganga makes this destination more thrilling.

Nabrepathar site. This site is just half kilometer away from the Yousmarg main bowl and is to the west side of the main bowl

and lies between geographical coordinates. N 33° 50' 00.8'' E 074° 40' 03.4 and at an altitude 2439m (a.s.l)

Mashid Nar site. This site is also half kilometer away from the Yousmarg main bowl and is to the East side of the main bowl and lies between geographical coordinates of N 33° 49' 25.9'' E 074° 40' 10.3''

Chota You s site. This site is one kilometer away from the Yousmarg main bowl and nearer to the settlement village Nagabal, south side and lies between geographical coordinates of N 33° 48', 33.7''E 074° 41', 13.3'' and at an altitude 2309m(a.s.l)

3 METHODS

Survey data was collected from May 2010 – Dec 2010. The findings in this study are related to various aspects like human habitation, grazing pressure, erosion, deforestation etc. in Yousmarg forest areas were simply based on:

Vegetation analysis or community structure is an important aspect of ecology and enables us to understand as to how a community formed by organisms control the organism and influence their behavior and life history [4]. A community is a component as well as factor of environment. The vegetal analysis provides information regarding the interaction among species in a particular community as well as about the organization of the species within the community. Vegetation analysis was conducted during May 2010-Dec.2011 for all the three layers of the forest i.e. trees, shrubs and herbs. The species were identified by the Taxonomy Department of Kashmir University. The tree layer was analyzed by sampling 10 quadrates of 10 x 10 m size at each site. The size and

number of samples were determined using the method of [4],[5]. The abundance, density and frequency were calculated for the species. IVI was determined as the sum of the relative frequency, relative density and relative dominance for tree layer and Herb layer only. The shrub and herbs layers were analyzed by randomly placing 20 quadrates of 5 x 5m size and 1 x 1m size respectively at each site during the summer season. The diversity index at each site was computed by using Shannon- Wiener information function [6] and concentration of dominance by Simpson's index [7], evenness and richness index following [8],[9] respectively. Similarity between the grazing site and Protected (Fenced) site for Herbs was determined using Sorenson's index of similarity [10].

4 RESULTS

4.1 Phytosociological analysis

During the present study some 29 species of plants were collected among which 24 were identified as herbs, 2 as shrubs and 3 as trees (Table 1)

4.2 Herbs

In the first set of vegetation analysis frequency, density, abundance and IVI was compared between the protected and unprotected plots at each site so, to determine the intensity of impact of biotic factors. One site was selected where extensive grazing taking place. A total number of twenty random quadrates of 1x1m [4], were laid for herb analysis at grazing plot and fenced plot (protected area)

A total of 24 species were identified by taxonomy department of Kashmir University, among them only 14 species were present in grazing area and all the species were present in the fenced area. A perusal of data shows that in the Yousmarg forest division, the total frequency (1980), density (248.72) and abundance (271.87) are more at fenced area than the degraded or grazed plot (968, 162.5 and 191.5) (Figure 1 and 2). The importance value index (IVI) at the grazing area ranges from 72.19 for *Cyanodon* sp. to 6.54 for *Medicago* sp. While as it ranges from 40.39 again for *Cyanodon* sp to 3.98 for *Ranunculus* sp. at Fenced area (protected plot), (Figure 1 and 2).

The species diversity is more at fenced area (2.97) as compared to grazing area (2.33), similarly species richness (5.75) and evenness index (2.15) are in higher values. So far as deforestation is concerned the values of frequency, density and abundance gets decrease from protected site to degraded area. The frequency range at the three protected Nabrepathar, Mashid Nar and Chota Yous is 75 to 100, 50 to 75 (Nabrepathar and Mashid Nar) and 25 to 100 (Chota Yous) at degraded areas. The density at protected site Nabrepathar ranges from 1.75 to 3.25, at site Mashid Nar, 1.25 to 2.75 and at site Chota Yous, it is 1.66 to 6.5, while as at degraded sites the values are 0.75 to 1.75, 0.75 to 1.25 and 0.25 to 2.75 in the respective sites. Similarly the values of abundance at protected sites are 2.00 to 3.25, 1.66 to 2.75 and 1.66 to 6.5. While at degraded areas these values range from 1.50 to 2.33, 1.00 to 1.66 and 1.00 to 2.75, in the respective sites (Table 3). The data showed that in the

as compared to the grazing areas 3.70 and 2.03 in respective indices. While as the dominance index at grazing area was 0.88 as it is highest 0.93 at the fenced (protected) site. So far as similarity index is concerned, Sorenson index shows only 57.42% similarity between the two sites (Table 2)

4.3 Shrubs

One site was selected (site 2) having a good coverage of shrub vegetation was the focus of present investigation while the other two sites had scanty shrub vegetation. Comparison of shrubs at protected site and degraded site on the basis of frequency, density and abundance shows a decline of values from degraded to protected site as given in the Figure 3.

4.4 Trees

Nabrepathar site of Yousmarg forest, the IVI for the protected site was 74.85 for *Pinus wallichiana*, 118.91 for *Picea smithana* and 74.85 for *Abies pindrow* as against the values of 69.47, 121.15 and 109.30 for the degraded areas in the respective spp. While as in the Mashid Nar site IVI in the protected site came to be 76.52 for *Pinus wallichiana*, 118.45 for *Picea smithana* and 110.99 for *Abies pindrow* as against the values 75.00, 104.08 and 120.00 in the degraded areas in the respective sp. Similar is the case with Chota Yous site, where IVI in the protected site was 152.41 for *Pinus wallichiana*, 94.38 for *Picea smithana* and 53.17 for *Abies pindrow* while as in degraded areas these values were 112.00, 153.00 in the respective sp. (Fig.4,5 and 6)

5 DISCUSSION

The present study revealed that the prominent factor for the exploitation of the vegetation cover of the Yousmarg forest study area at herbaceous level is simply the overgrazing. This not only become the cause for the destruction of herbaceous cover but also becomes the secondary biotic factor for the soil erosion, as sometimes grazers root out herbs and exposed the soil which ultimately gets eroded during the rainy season and the forest area generally located at some slope, thus slope becomes the catalyst in the process of soil erosion. Overgrazing can increase soil erosion, reduced soil depth, soil organic matter, and soil fertility, hurt the land's future productivity. Soil fertility can be corrected by applying the appropriate lime and fertilizers. However, the loss of soil depth and organic matter takes years to correct. Their loss is critical in determining the soil's water-holding capacity and how well pasture plants do during dry weather similar concepts were discussed by [3].

It has been observed that about 10 species were absent in the grazing area where as all species were present in the fenced (protected) area (Fig.1 and 2) Most of the species have medicinal value like *Achillea millefolium*, *Fragaria nubicola*, *Taraxacum officinale*, *Prunella vulgaris*, *Potentilla reptans*, *Rumex hastatus*, etc. The striking feature of the present study is that the total frequency, density and abundance gets decrease from fenced area to grazing area and some species especially medicinal species were totally absent in the grazing area (Fig. 1 and 2). This shows a serious concern of the overgrazing. However,

the values of IVI is not just maximum at fenced plot (protected) for some species but also in grazed plot (unprotected) (Figure 1 and 2), Similar observations have also been reported by other authors elsewhere [11], [12], [13]. The IVI of the *Cyanodon dactylon* (Fig. 1 and 2) should be higher in the fenced area as it is the dominant species not only at the study area but also in the Kashmir valley (common observation) but showed a reverse trend, the reason may be attributed to competition among various herbaceous species on a limited area on the account of nutrient availability, moisture content of soil, space and light in the fenced area. It has been observed that similarity Sorenson index shows only 57.42% similarity between the two sites. (Table 1) while as all the indices like dominance index, species diversity, species richness and evenness index are in higher values as compared to the grazing areas (Table 2). So the striking feature of this study at herbaceous level is that anthropogenic interference decreases the species richness or species diversity or evenness index or dominance index, similar observation was made by [12], [14], [15].

So far as deforestation is concerned the values of frequency, density and abundance gets decrease from protected site to degraded area (Table 3). Similar results were also obtained by [2], [16], [17], [18]. The present data shows some variation in the three tree species present in the Yousmarg area (Fig.4, 5 and 6). The concept of Importance Value Index has been used extensively as a means of assessing the biological contribution of species to the forest community [19]. The data showed that the importance value index (IVI) of *Pinus*

wallichiana at all the three sites like Nabrepathar, Mashid Nar and Chota Yous of Yousmarg area, gets constantly decrease from protected site to unprotected site while as there is overall decrease in the IVI of other two species like *Picea smithana* (spruce) and *Abies pindrow* (fir) (Fig.4, 5 and 6). According to the local people of the Yousmarg area *Pinus wallichiana* (local name "Kayur") is most vulnerable for cutting as it is good for construction, While as *Picea smithana* (local name "Kachul") and *Abies pindrow* (local name "Rayul") collective name of both species is "Budul" used for mainly fire wood. Illicit cutting and removal of timber has now become a prevalent practice, which impacts the regeneration potential of the study sites. The problem with these forms of forest disturbances is that the plants often do not have time to recover adequately and thus, these impacts affect the ecosystem succession of the communities [20]. The IVI also indicates that *Picea smithana* and *Abies species* is dominant at higher altitudes (2440m) both at protected as well as degraded areas but the dominant species at lower altitude (2309m) is *Pinus wallichiana* (blue-pine) at protected site (Fig.4,5 and 6). So the results revealed that two trends are being observed at the Yousmarg forest area. At higher altitudes *Picea* species and *Abies* species are dominant while as *Pinus* species is dominant at lower altitudes. Hence, the

CONCLUSION

The study reveals that the grazing pressure is prime factor for the vegetation loss at herbaceous level. The most prospective loss is in the form of medicinal plants .The tree

results obtained in the present were found to be in consonance with the results obtained by [21].

The density and abundance of shrubs at degraded area are more than the protected areas (Fig.3). The most striking features were an abrupt decline in the number of primary forest regenerative species, especially *Pinus wallichiana*, and a dominant growth of shrubs, typical of open habitat in the degraded forest site. Degradation of forests after logging or human-induced activities, especially cutting of trees, grazing practices, and incendiary forest fires often promotes colonization and dominance by perennial shrubs like *Viburnum* species and *Sambucas* species. Increased colonization of these aggressive weedy species may be responsible for affecting germination of seed falls and survival and establishment of primary forest species, due to intense competition for resources in the degraded forest site. Similar concept was given by [22]. Loss of organic matter by water erosion, accelerated oxidation and trampling of grazing animals probably account for the higher compaction, decreased porosity and poor structural stability of soils under the degraded forest site [23], [24]. Soil compaction generally affects growth and development of plant roots and restricts water and nutrient availability to plants [25]. [26].

community is under the high pressure of locals for their greedy requirements. The most vulnerable tree species in Yousmarg forest area is the *Pinus wallichiana* (common name blue-pine) (local name "Kayur").

Table 1
 Species Composition of Forest Vegetation

Herbs			
<i>Acheilia millefolium</i>	<i>Leucanthemum vulgare</i>	<i>Medicago sp.</i>	
<i>Alchemilla sp.</i>	<i>Plantago lanceolata</i>	<i>Rumex sp.</i>	
<i>Barbarea sp.</i>	<i>Poa sp.</i>	<i>Veronica sp.</i>	
<i>Cerastium ceratoides</i>	<i>Trifolium sp.</i>	<i>Lenontopodium sp.</i>	
<i>Polygonium sp.</i>	<i>Potentilla sp.</i>	<i>Prunella sp.</i>	<i>Taraxacum sp.</i>
<i>Cyanodon dactylon</i>	<i>Polygonum hydropiper</i>	<i>Geranium sp.</i>	<i>Geum sp.</i>
<i>Euthrasia officinale</i>	<i>Thymus sp.</i>	<i>Ranunculus sp.</i>	<i>Fragaria sp.</i>
Shrubs			
<i>Sambuca sp.</i>		<i>Viburnum sp.</i>	
Trees			
<i>Pinus wallichiana</i>		<i>Picea smithiana</i>	<i>Abies pindrow</i>

Table 2

Spatial variation in various plant species indices at the two sites protected and grazing area of
 Yousmarg main bowl Nabrepathar

HERBS	Species	Dominance	Species	Evenness	Similarity
AT :	Diversity	(Simpson	Richness(Margal	Index(Pielo	Index
	Index H'	Index)	ef Index)	u Index)	(Sorenson
					Index)
PROTECTED	2.97	0.97	5.75	0.93	57.42
SITE.					
GRAZING	2.33	0.87	3.70	0.88	
SITE.					

Table 3

Comparison of tree species on the basis of Frequency (F), Density (D) and Abundance (A) from protected and degraded forest area

NABREPATHER SITE						
	PROTECRED AREA			DEGRADED AREA		
Species	F	D	A	F	D	A
<i>Pinus wallichiana</i>	75	1.75	2.00	50	0.75	1.50
<i>Picea smithana</i>	100	3.25	3.25	75	1.75	2.33
<i>Abies pindrow</i>	100	2.75	2.75	75	1.5	2.00
MASHID NAR SITE						
	PROTECRED AREA			DEGRADED AREA		
Species	F	D	A	F	D	A
<i>Pinus wallichiana</i>	75	1.25	1.66	50	0.75	1.00
<i>Picea smithana</i>	100	2.75	2.75	75	1.00	1.33
<i>Abies pindrow</i>	100	2.50	2.50	75	1.25	1.66
CHOTA YOUS SITE						
	PROTECRED AREA			DEGRADED AREA		
Species	F	D	A	F	D	A
<i>Pinus wallichiana</i>	100	6.5	6.5	75	1.75	2.33
<i>Picea smithana</i>	100	3.25	3.25	100	2.75	2.75
<i>Abies pindrow</i>	75	1.25	1.66	25	0.25	1.00

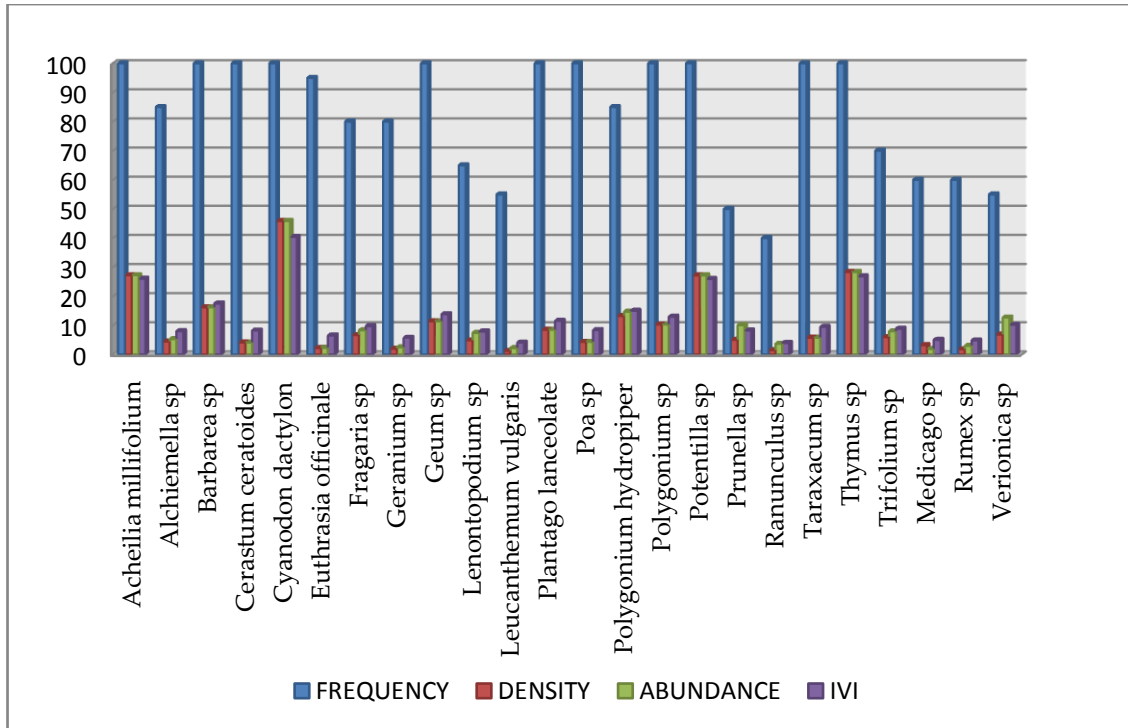


Fig 1: Frequency, density, abundance and IVI of the herbs at fenced site Yousmarg main bowl.

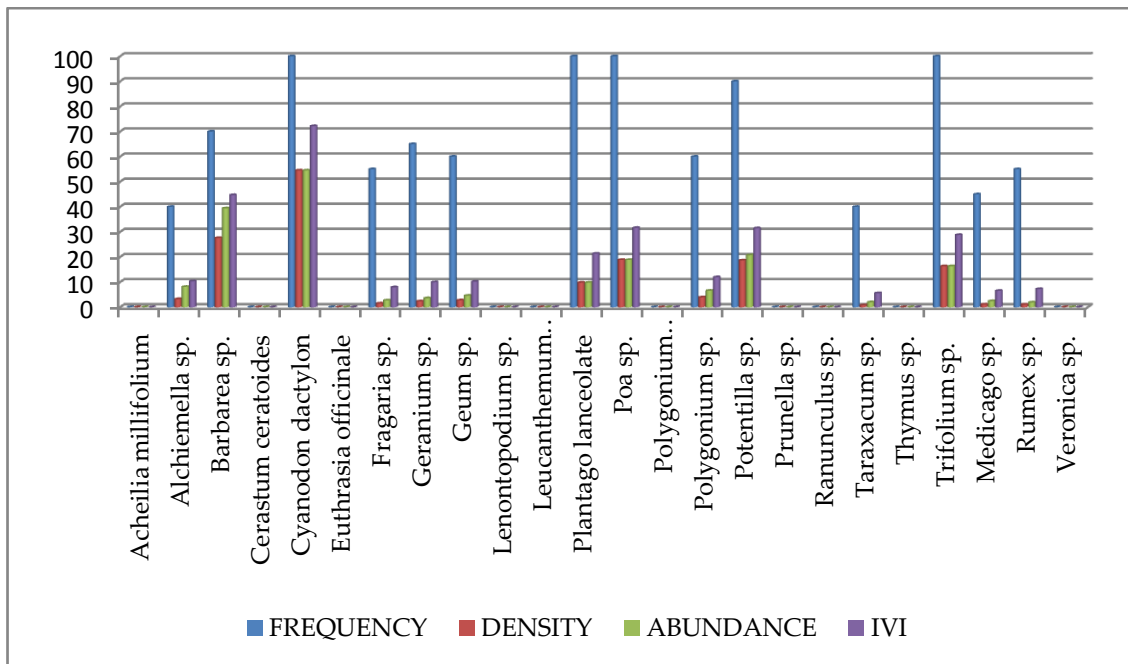


Fig 2: Frequency, density, abundance and IVI of the herbs at grazing site Yousmarg main bowl.

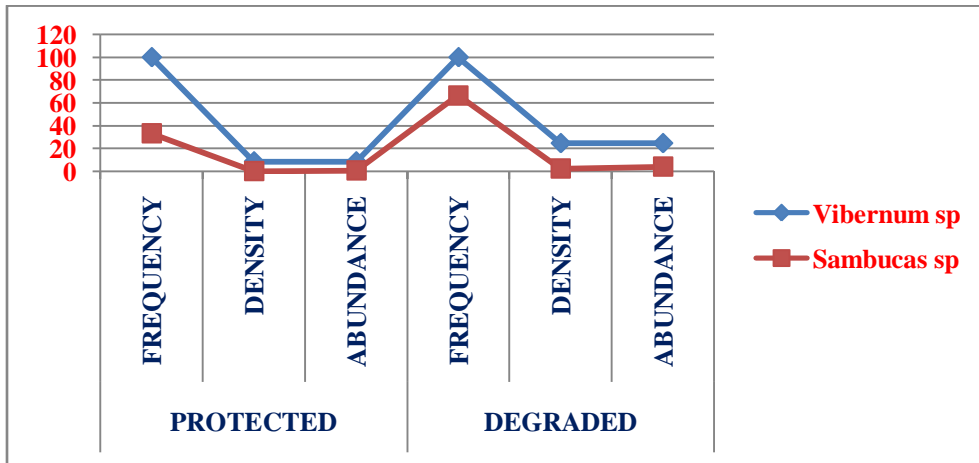


Fig 3: comparison of shrubs at protected site and degraded site on the basis of frequency, density and abundance.

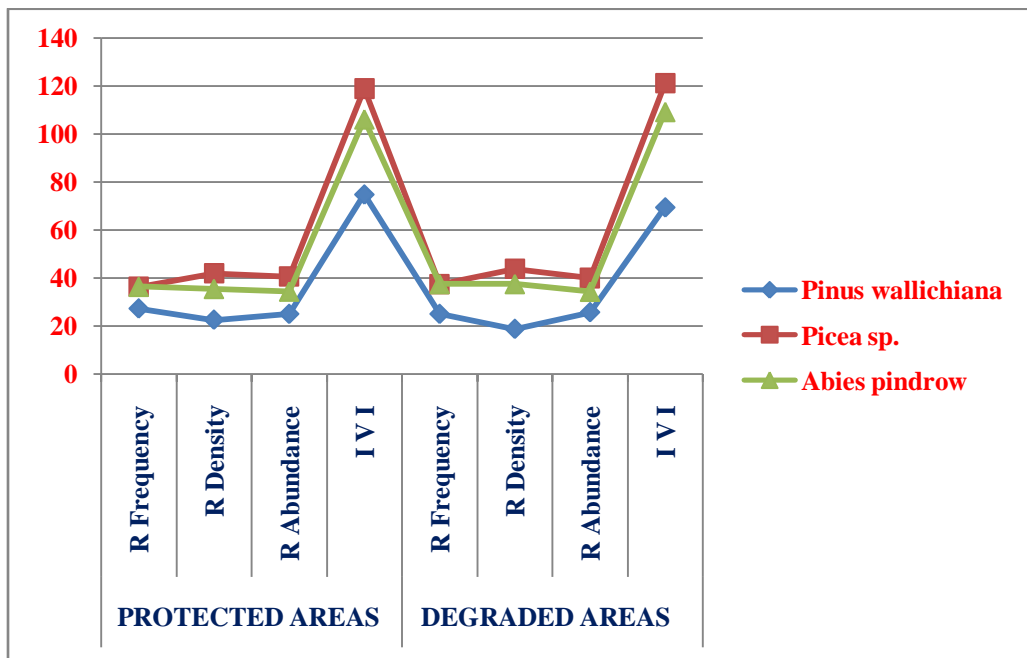


Fig 4: Comparison of tree species on the basis of importance value index (IVI) in protected and degraded forest area, Nabrepathar site

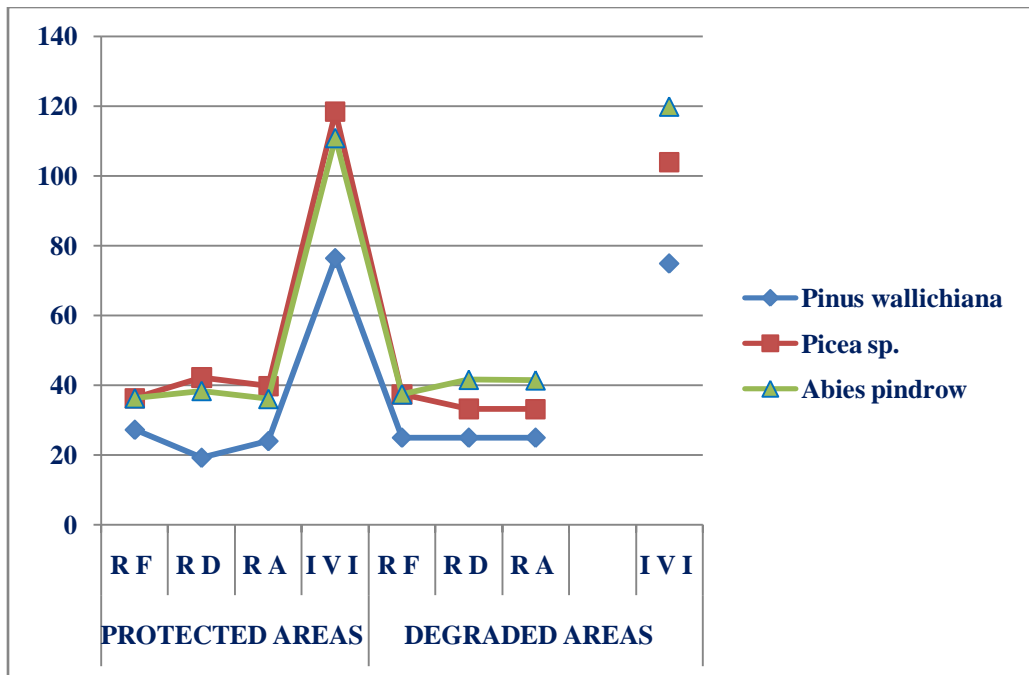


Fig 5: Comparison of tree species on the basis of importance value index (IVI) in protected and degraded forest area, Mashid Nar.

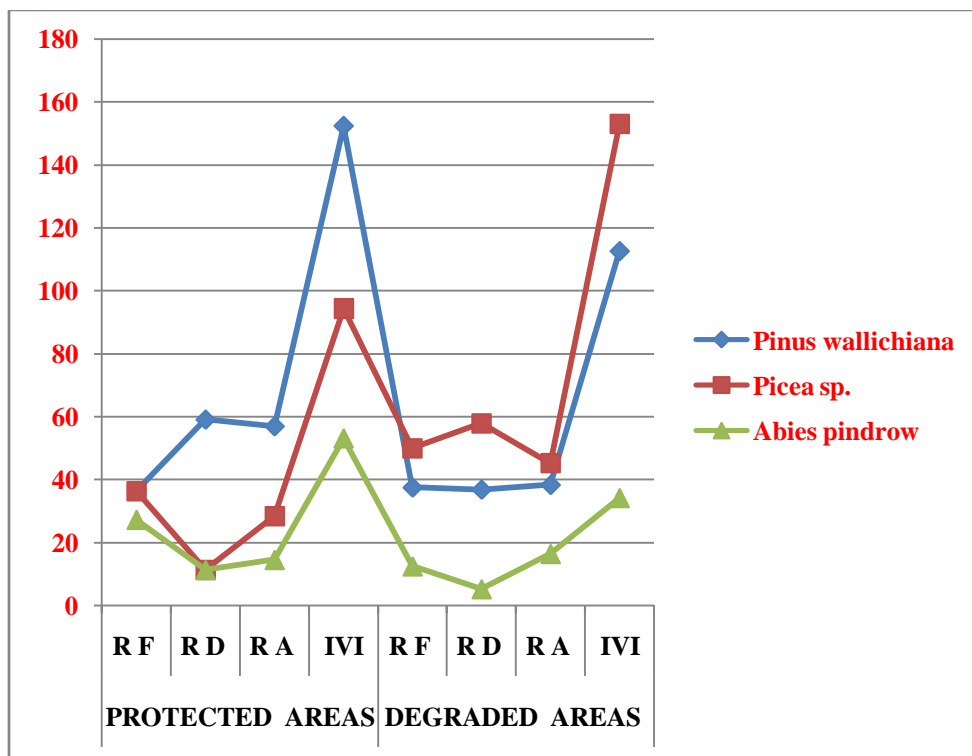


Fig 6: Comparison of tree species on the basis of importance value index (IVI) in protected and degraded forest area at Chota Yous

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