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Diversity of herbaceous plant species in Yusmarg Kashmir-a tourist destination

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ABSTRACT

The present research was conducted at Yusmarg area- a tourist destination of Kashmir region, aimedto study the diversity of herbaceous plant and to study human impact to the herb community. The study was based on three study sites with markeddifferences in their physical and biotic features. During the study period, 41 herb speciesbelonging to 20 different families were observed.Shanon-Weaver diversity index showed small variation in all the three study sites. The results showed that there is lowgrazing pressure and moderate human impact on normal distribution of herb species whichmay cause reduction in herbaceous community in next few decades in the forest ecosystem.

Keywords: **Cynadon dactylon*; Trifolium pretense*; *Polygonaceae;Herb; Shanon-Weaver index Yusmarg***

I INTRODUCTION

Biodiversity encompasses the whole of the floristic, faunal and microbial diversity present on the earth (Dar and Farooq, 1997), which provides basis for the existence of life (Pandey, 1995).Unfortunately, this precious biological wealth has had been eroded to an alarming level by ruthless anthropogenic activities (Kushwah and Kumar, 2001). Vegetation is a key factor in determining the structure of an ecosystem. It determines many ecological parameters within a plant community such as microclimate, energy budget, photosynthesis, water regimes, surface runoff and soil temperature. The number of species reflectsthe gene pool and adaptation potential of the community (Odum, 1963). Quantitative analysis of vegetation helps in understanding the structure, composition and tropic organization of any community. Species composition and diversity vary from habitat to habitat within the communities exposing identical physiognomic characteristics (Nautiyal *et al*., 1999). Likewise, the life forms of species represent the adjustment of perennating organs and plant life history to environmental conditions (Nautiyal *et al*., 2000). It is an important characteristic in describing vegetation that offers a preliminary picture of the ecological character of the vegetation (Kershaw, 1973). Plant species diversity in the under storey strata is an important component in ecosystem functioning (Host and Register, 1991; Brakenhielm and Lui, 1998). In general, plant species diversity in the under storey is sensitive to ecosystem conditions (Pregitzer and Barnes, 1982; Mitchell *et al*., 1998) as well as to disturbance such as canopy removal (Duffy and Meier, 1992) and grazing (Hadar *et al*., 1999). The characterization of community response to any given disturbance, in terms of functional response types, appears to be a promising tool for analyzing the effects of disturbances on plant species diversity and community structure (Lavorel *et al*., 1999).

The forest floor vegetation plays an important role in nutrient cycling, habitat conservation and regeneration of tree shrubs. The herbaceous floor vegetation has been reported to show high nutrient content and rapid turnover rates as influenced by climatic conditions (Spain, 1984) and vegetation characteristics (Vogt and Vogt, 1986).The forest herbs, which play important role for rural communities for example, the livestock totally dependent on them for fodder and as traditional medicines, have been hardly studied from diversity standpoint (Singh andSingh, 1987). Plants enact as producers in the ecosystem functioning; therefore, the study of floristic diversity assumes much pre-eminence (Bilgrami, 1995). Kashmir Valley in our country harbours a rich repository of diverse flora due to its varied topography and spatial heterogeneity (Dar *et al*., 2001).

II MATERIAL AND METHODS

Three different sites*viz.* site 1, site 2 and site 3 were selected for the study. Site 1 is 2,436 m above mean sea level and situated at 33°50′00.6″N 74°40′08.6″E. The site is dominated with coniferous tree species like *Picea simthiana, Abies pindrow and Pinus waluchiana,* while the dominant shrubs were *Vibernum grangiflorum* and *Sumbucus wightiana*. Site 2 is located 150m away from site 1 and situated at 33° 50′ 08.3″N 74° 40′ 57.2″E and 2,445 mabove mean sea level. The site is more slopy and rough in topography than Site 1. The coniferous tree species were not dense as compared to Site I. Herbaceous flora was more in diverse than Site I.Site 3is located 175m away from Site 2 along same side of forest and situated at 33° 50′16.2″N 74° 39′43.9″E and 2,400 m above mean sea level. The site is dominated by dense coniferous forests while herbaceous plant diversity was rich. The understorey herbaceous flora is dominated with species like *Cynodon dactylon, Fragaria nubicola* and *VIOLA ODORATA.*

III SAMPLING AND COLLECTION

During the first phase of the study periodic surveys were conducted and the Phytosociological analysis of herbaceous vegetation was carried out on the monthly basis. The plants were collected along with undeground portion with the help of trowel.In the Second Phase 0.5m X 0.2m ($1m^2$) Daubenmireframes or quadrats were laid randomly at 3 different sites. The third phase of methodology comprised the identification of the collected plant species from the study sites. The identification of plants was done in the Center of Plant Taxonomy, University Of Kashmir. Further diversity indices like Shannon-Weaver Index (Ĥ), Evenness Index (e) and Simpson's Index (c) were calculated by the following formulae:

Shannon-Weaver Index (Ĥ)= $- \Sigma[(n_i /N)\ln(n_i /N)]$

$= -\Sigma P_i \log P_i$

Simpson's Index= $\Sigma(n_{i/N})^2$

where

n_i = important value for each species

N = total of importance value

$$\textbf{Evenness Index} = \frac{\hat{H}}{\ln S}$$

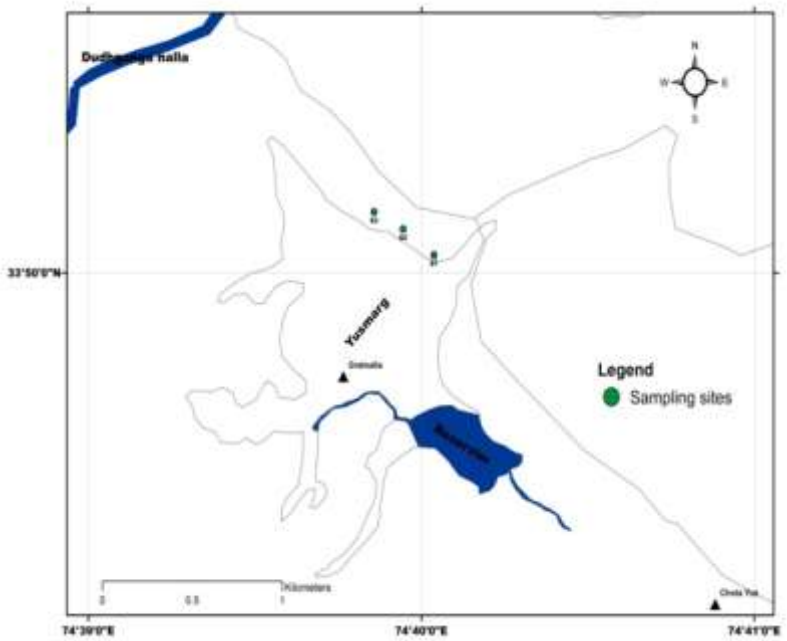

Fig.: GPS sampling points of the study area

IV RESULT AND DISCUSSION

A maximum of 41 herb species were recorded from the study sites during present investigation belonging to 20 families (Table 1). Polygonaceaewas represented by 5 species ,followed byAsteraceae and Lamiaceae4 species each,3 species were each from the families Poaceae, Fabaceae and Rosaceae and 2 species were each from the families Plantiganaceae, Caryophyllaceae, Oxiladaceae Boraginaceae and Primulaceaeand remaining 9 families were represented by one species each (Table 2).

Asteraceae was the dominant family with 4 genera, followed by Poaceae, Fabaceae, Rosaceae and Lamiaceae with 3 genera each , Boraginaceae , Caryophyllaceae and Polygonaceae with 2 genera each and remaining 12 families were represented by single genus only(Table 2).The dicots outnumbered the monocots at all the sites. 38 species were dicots belonging to 19 families and 3 species were monocots belonging to 1 family (Table 4). Out of total identified species 13 species were reported as perennials belonging to8 genera and 7 families whileas, 28 species were reported as annuals which belong to 26 genera and 16 families (Table 5).

Table 1: List of herbaceous plants with families recorded at three different sites

S.No.	Species	Family
01	*Anagallis arvensis*	Myrsinaceae
02	*Astragalus* sp	Fabaceae
03	*Cerastium cerastoides*	Caryophyllaceae
04	*Chenopodium album*	Amaranthaceae
05	*Cirsium falcornei*	Asteraceae
06	*Convolvulus* sp	Convolvulaceae
07	*Conyza Canadensis*	Asteraceae
08	*Cynodon dactylon*	Poaceae
09	*Cynoglossum* sp	Boraginaceae
10	*Epilobium laxum*	Onagraceae
11	*Fragaria nubicola*	Rosaceae
12	*Geum* sp	Rosaceae
13	*Lespedeza* sp	Fabaceae
14	*Leucantemum vulgare*	Asteraceae
15	*Lolium perenne*	Poaceae
16	*Mentha* sp	Lamiaceae
17	*Myosotis arvensis*	Boraginaceae
18	*Nepeta Cataria*	Lamiaceae
19	*Nepeta* sp	Lamiaceae
20	*Oxalis acetosa*	Oxiladaceae
21	*Oxalis corniculata*	Oxiladaceae
22	*Plantago lanceolata*	Plantaginaceae
23	*Plantago major*	Plantaginaceae
24	*Polygonum hydropiper*	Polygonaceae
25	*Poa* sp	Poaceae
26	*Podophyllum hexandrum*	Berberidaceae
27	*Potentilla* sp	Rosaceae
28	*Primula denticulate*	Primulaceae

29	*Primula* sp	Primulaceae
30	*Ranunculus laetus*	Ranunculaceae
31	*Rumex acetosa*	Polygonaceae
32	*Rumex hastatus*	Polygonaceae
33	*Rumex nepalensis*	Polygonaceae
34	*Rumex patientia*	Polygonaceae
35	*Salvia moorcroftiana*	Lamiaceae
36	*Sambucus wightiana*	Adoxaceae
37	*Stellaria media*	Caryophyllaceae
38	*Taraxacum officinale*	Asteraceae
39	*Trifolium pratense*	Fabaceae
40	*Veronica beccabunga*	Scrophulariaceae
41	*Viola Odorata*	Violaceae

Table 2: List of herbaceous families with Species number and Genera recorded at three study sites

S.No.	Family	No. of Genera	No. of Species
01	Asteraceae	4	4
02	Lamiaceae	3	4
03	Rosaceae	3	3
04	Poaceae	3	3
05	Fabaceae	3	3
06	Polygonaceae	2	5
07	Caryophyllaceae	2	2
08	Plantaginaceae	1	2
09	Boraginaceae	2	2
10	Primulaceae	1	2
11	Oxiladaceae	1	2
12	Ranunculaceae	1	1
13	Amaranthaceae	1	1

14	Violaceae	1	1
15	Myrsinaceae	1	1
16	Onagraceae	1	1
17	Convolvulaceae	1	1
18	Adoxaceae	1	1
19	Scrophulariaceae	1	1
20	Berberidaceae	1	1

Table 3- List of Genera with Species number and family recorded from study area

S.No.	Genera	No. of Species	Family
01	*Anagallis*	1	Myrsinaceae
02	*Astragalus*	1	Fabaceae
03	*Cerastium*	1	Caryophyllaceae
04	*Chenopodium*	1	Amaranthaceae
05	*Cirsium*	1	Asteraceae
06	*Convolvulus*	1	Convolvulaceae
07	*Conyza*	1	Asteraceae
08	*Cynodon*	1	Poaceae
09	*Cynoglossum*	1	Boraginaceae
10	*Epilobium*	1	Onagraceae
11	*Fragaria*	1	Rosaceae
12	*Geum*	1	Rosaceae
13	*Lespedeza*	1	Fabaceae
14	*Leucantemum*	1	Asteraceae
15	*Lolium*	1	Poaceae
16	*Mentha*	1	Lamiaceae
17	*Myosotis*	1	Boraginaceae
18	*Nepeta*	2	Lamiaceae
19	*Oxalis*	2	Oxiladaceae

20	*Plantago*	2	Plantagaceae
21	*Polygonum*	1	Polygonaceae
22	*Poa*	1	Poaceae
23	*Podophyllum*	1	Berberidaceae
24	*Potentilla*	1	Rosaceae
25	*Primula*	2	Primulaceae
26	*Ranunculus*	1	Ranunculaceae
27	*Rumex*	4	Polygonaceae
28	*Salvia*	1	Lamiaceae
29	*Sambucus*	1	Adoxaceae
30	*Stellaria*	1	Caryophyllaceae
31	*Taraxacum*	1	Asteraceae
32	*Trifolium*	1	Fabaceae
33	*Veronica*	1	Scrophulariaceae
34	*Viola*	1	Violaceae

Table 4 - Number of dicots and monocots recorded at different sites

Plant Group	**Species**	**Genera**	**Families**
Dicotyledons	38	31	19
Monocotyledons	3	3	1
Total	41	34	20

Table 5 - Number of annuals and perennials recorded at 3 different sites

Life Form	**Species**	**Genera**	**Families**
Perennials	13	8	7
Annuals	28	26	16

Table 6 - Diversity indices of the study area

Sites	Shanon-Weaver Index(Ĥ)	EvennessIndex (E)	Simpson Index (C)
Site 1	2.51	0.78	0.14
Site 2	2.70	0.80	0.11
Site 3	2.749	0.81	0.10

The research analysis of data revealed that a maximum of 41 herb species were recorded from the study sites belonging to 20 families. Polygonaceaewas represented by maximum species, followed byAsteraceae and Lamiaceae. All the three sites were dominated by *Cynodon dactylon.* Each species of a community plays specific role and there is a definite quantitative relationship between abundant and rare species (Bhandari *et al*., 1997).

The changes in topography, altitude, precipitation, temperature and soil conditions contribute to the diverse bioclimate that results in a mosaic of biotic communities at various spatial and organizational levels. Diversity represents the number of species, their relative abundance, composition, interaction among species and temporal and spatial variation in their properties. Where richness and evenness coincide, i.e., a high proportion of plant species in the vegetation are restricted, community of that area is supposed to have evolved through a long period of environmental stability. The observation in the present study showed that the site 3was more diverse in comparison to the site 1 and site 2.

Asteraceae was the dominant family in terms of number of Genera. This may be because most of the species of the family are primary successionals and have different types of growth forms. This family showed basal as well as erect forms in which basal forms emerged near the ground-level with welldeveloped petioles and formed a short-umbrella (Mehrotra, 1998). They can tolerate cool temperatures to high irradiances with low density of herb cover. Moreover, basal forms of Violaceae showed affinity to mesic and cold conditions under the three Sites. Few species are able to tolerate the entire spectrum of environment and range throughout the gradient (Brown, 2001).

The present study showed that perennials gained dominance over annuals at the three sites. Perennial have ability to conserve soil and with their extensive root systems of perennial grasses they also add more organic matter to the soil than annuals which can be more favourable for plant growth. Singh and Singh (1987) observed that annuals colonize and dominate the early stages of succession. Annuals to perennials species ratio are higher at primary successional site than climax stage. Species richness generally increases during secondary succession when environmental and edaphic conditions are favourable with low fluctuations.

The dicots outnumbered the monocots at all the sites. It may be on account of fact that most of the monocots, especially grasses are surface feeders (Sharma and Upadhyaya, 2002).

Structure of communities is the outcome of the habitat, environmental conditions and existing vegetation types (Malik *et al*., 2007). Human interaction moulds the shape and course of succession of a community. Amongst major factors that influence vegetation structure are human disturbance, extensive grazing, trampling and soil erosion (Grubb, 1987).

V CONCLUSION

The study concluded that Yusmarg has a rich herbaceous diversity bestowed with many diverse plant species. The herbaceous diversity of the study area represented by 41 plant species belonging to 34 Genera under 20 families.The area is predominately covered by herbaceous flora and being less represented in terms of number of species. Among dicotyledons, the Polygonaceae was the largest family comprising 5 species and for monocotyledons the Poaceae was found to be the only family with 3 plant species. Polygonaceae was the largest family registered with 5 plant species followed by Asteraceae and Lamiaceae with 4 plant species each. Out of 20 families 9 families were represented by single species, that is, they are monotypic. Furthermore, *Cynodon dactylon*emerged as dominant species of the ecosystem.

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