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Biological Spectrum and Comparison of Coefficient of Communities Between Plant Communities Harbouring Mai Dhani Hill, Muzaffarabad, (AJK)

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Abstract

The vegetation of Mai Dhani Hill, is dominated by nanophanerophytes followed by hemicryptophytes. Chamaephytes and geophytes are rare. Thirty species are found in the seven communities established at various altitudes. Nanophanerophytes and rnegaphanerophytes decrease as the altitude increases. The highest index of similarity is observed between *Dodonaea Pinus-Themeda* and *Celtis-Themeda-Pinus* communities while the lowest index of similarity is observed between *Ficus Dichanthium-Themeda* and *Micromeria- Themeda-Dodonaea* communities.

Introduction

The vegetation studied so far in various parts of Pakistan is experiencing severe biotic interference due to which the vegetation has enormously reduced and degradation has resulted. It is important to know, what type of plant life-form has been reduced at Mai Dhani Hill, Muzaffarabad, Azad Kashmir. Grazing, deforestation and erosion has also been noted at various hills of Muzaffarabad. Life-form spectrum can also show the peculiar climatic features of the study area. The abundance of a particular type of He-form can tell about the habitat condition in which the plants grow.

The objective of the present study is to construct biological spectrum and to study the coefficient of communities between plant communities harbouring Mai Dhani Hill near Mumffarabad. Biological spectrum exhibits the size, structure and stratification of the vegetation types. Each community is given characteristic out-look by the dominating life-form. Coefficient of community or similarity quantitatively determines the similarity or dissimilarity between the communities. No previous work has been done on life-form and coefficient of communities in the study area. This study would further help understanding the vegetation dynamics and biotic pressure in the study area. Malik *et al*. (1990) calculated the index of similarity for the plant communities of Sund Galli, Muzaffarabad. Hussain and Malook (1984) reported the biological spectrum and coefficient of communities for plant communities of Karamar Hills, District Mardan, Pakistan. Therophytes dominated the sarsoon fields of Babozai-Shamozai, District Mardan while others like geophytes and hemicryptophytes were low in the area. The present communication is based upon our previous study carried out on the vegetation of Mai Dhani Hill near Muzaffarabad. It will help further to know about the biotic pressure and adaptability of the particular species in particular time of a year.

Materials and Methods

The life-form of the species was determined after Hussain (1989) and Raunkiaer (1934). This work was done during April, 1995. Sorenson's index of similarity as given in Hussain (1989) was used for determining similarity beta the plant communities. Nomenclature followed here is of Stewart (1972).

Results and Discussion

Biological spectrum: The biological spectrum is present Table 1 and 2. *Celtis-Dichanthium-Themeda* community showed that 37.5 percent were megaphanerophytes which were followed by 31.25 percent, nanophanerophytes 18.75 percent hemicryptophytes, 6.25 percent chamaephytes and 6.25 percent geophytes. The left contribution, of 6.25 percent was made both chamaephytes and geophytes while therophytes was absent. In *Ficus-Dichanthium-Themeda* community major contribution was made by nanophanerophytes 36.84 percent, followed by 31.57 percent megaphanerophytes and 21.05 percent hemicryptophytes. The left contribution of 5.26 percent was made both by therophytes and chamaephytes while the geophytes were absent. In *Ficus-Dodonaea-Themeda* community, the contributors were nanophanerophytes 33.33 percent, hemicryptophytes 33.33 percent, followed by 20 percent therophytes. The least contribution of 6.66 percent was made by megaphanerophytes and geophytes while chamaephytes were absent. In *Celtis-Dichanthium-Themeda* community the nanophanerophytes and hemicryptophyta contributed equally of 30.76 percent, followed by megaphanerophytes 23.07 percent. The least share done by therophytes and chamaephytes equally 7.69 percent while geophytes were absent in this community. *Dodonaea-Pinus-Themeda* community hemicryptophytes had a major share of 38.46 percent, follow nanophanerophytes 30.76 percent, megaphanerophytes 23.07 percent, while therophytes, chamaephytes and geophytes were absent. In *Celtis-Pinus-Dodonael* community nanophanerophytes had a major share of 33.33 percent, followed by 26.6 percent hemicryptophytes 20 percent therophytes and

Table 1: Alphabetical list of species found in the seven communities of Mai Dhani Hill and their life-forms

Species	Life-form	CDT	FDT	FDT	CDT	DPT	CPD	MDT
Adhatoda zylonica Medic	NP	+	+	-	-	-	+	-
Adhatoda spp.	NP	-	-	+	+	-	-	+
Aristide adscensionis L.	Th	-	-	-	-	-	+	+
Adiantum capillus-veneris L.	G	+	-	+	-	-	+	+
Bauhinia variegate L.	MP	+	-	-	-	-	-	-
Berberis lycium Royle	NP	+	+	-	-	+	+	+
Gets eriocarpa Dene	MP	+	-	-	+	-	+	-
Carissa opaca stapf ex Haines	NP	+	+	+	-	+	+	+
Cynodon dactylon (L.) Pers	H	-	-	+	+	+	+	+
Dalbergia sissoo Roxb	MP	-	-	-	-	-	-	+
Dodonaea viscose (L.) Jacq	NP	+	+	+	+	+	+	+
Dfichanthrum annulat um (Forssic) Slapf	Ch	+	+	-	+	-	-	-
Euphorbia helioscopia L.	MP	+	-	-	-	-	-	-
Evphorbia prostrata Ait	H	-	+	-	-	+	-	-
Euphorbia spp.	H	-	-	+	-	-	+	-
Enophorum comosum (Wall. ex Roxb.) Nees	H	-	-	-	-	-	+	+
Ficus palmate Forssk.	MP	-	+	+	-	-	-	-
Flan carica L.	MP	-	-	-	+	-	-	-
Geranium nepa/ense Sweet	Th	-	-	+	-	-	-	-
Maytenus royleanus (Wall) Cef.	NP	+	+	+	+	+	+	-
Mallows phifippensis (Lam.) Muell.	MP	-	-	+	-	+	-	-
Micromeria biflora (Ham.) Bth	Th	-	-	-	-	-	+	-
Olea ferruginea Royle	MP	+	+	-	-	-	-	-
Oxalis comiculata L.	H	+	+	-	+	+	+	+
Pinus mxburghii Sargent	MP	-	-	-	-	+	+	+
Pteris sp.	G	-	-	+	-	-	-	-
Rumex hastatus D.Don	H	-	-	-	-	-	+	+
Trifolium repens L.	H	-	-	+	+	+	-	-
Taraxacum officinale Weber	H	+	+	+	+	+	-	-
Themeda anathera (Nees) Hack (Nees) Hack	H	+	+	+	+	+	+	+

Table 2: Biological spectrum of plant communities of Mai Dhani Hill, April 1995

Communities	Species #	Alt. M.	MP		NP		TH		H		CH		G	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Celtis-Dichanthium-Themeda	16	800	6	37.5	5	31.25	-	18.75	1	6.25	1	6.25	1	6.25
Ficus-Dishanthium-Themeda	19	900	6	31.57	7	36.84	1	5.26	4	21.05	1	5.26	-	-
Ficus-Dodonaea Themeda	15	980	1	6.66	5	33.33	3	20.00	5	33.33	-	6.66	1	6.66
Celtis-Dichanthium-Themeda	13	1050	3	23.07	4	30.76	1	7.69	4	30.76	1	7.69	-	-
Dodnaea-Pinus-Themeda	13	1100	3	23.07	4	30.76	-	-	5	38.46	-	-	-	-
Celtis-Dodonaea	15	1200	2	13.33	5	33.33	3	20.00	4	26.6	-	-	1	6.66
Dicromeria-Themeda-Dodunaea	17	1250		17.64	4	23.52	2	11.76	6	35.29	-	-	2	11.76
Tots!	108		24	19.44	34	33.33	10	12.96	31	26.85	3	2.77	5	4.76

CDT = *Celtis-Dichanthium-Themeda* community. FDT = *Ficus-Dichanthium-Themeda* community. FDT = *Ficus-Dodonaeae-Themeda* community. CDT = *Celtis-Dichanthium-Themeda* community. DPT = *Dodonaea-Pinus-Themeda* community.
CPD = *Celtis-Pinus-Dodonaea* community. MTD = *Micromeria-Themeda-Dodonaea* community.
MP = Megaphanerophyte ; G = Geophyte; NP = Nanophanerophyte; H = Hemicryptophyte; CH = Chamaephyte; P = Present; TH = Therophyte; - = Absent

Table 3: Matrix of indices of dissimilarity (ID) and similarity (IS) percent for the seven plant communities of Mai Dhani hi April, 1995

Plant Communities	Plant Communities						
	CDT	FDT	FDT	CDT	DPT	CPD	MTD
CDT	-	58.16	69.47	54.49	59.93	59.20	58.61
FDT	41.84	-	52.87	70.58	66.50	65.43	71.96
FDT	30.53	47.13	-	56.66	55.55	63.23	60.74
CDT	45.51	29.42	43.34	-	60.27	66.24	66.90
DPT	40.07	33.50	44.45	39.93	-	36.40	49.09
CPD	40.80	34.57	36.77	33.76	63.60	-	39.78
MTD	41.39	28.04	39.26	33,10	50.91	60.22	-

13.33 percent megaphanerophytes. It was reported that therophytes were dominant followed by nanophanerophytes. Chamaephytes and micro-phanerophytes had low occurrence at Pirdhar Hills, South Waziristan, Pakistan. The least contribution was made by geophytes 6.66 percent. The chamaephytes were absent. In *Micromeria-Themeda-Dodonaca* community, the major share was of hemicryptophytes 35.29 percent, followed by 23.52 percent nanophanerophytes, 17.64 percent megaphanerophytes. The least contributors were hemicryptophytes and geophytes contributed 11.76 percent each. Chamaephytes were absent (Table 2). As a whole the vegetation of Mai Dhani Hill was dominated by nanophanerophytes 33.33 percent and hemicryptophytes 26.85 percent (Table 2). Hussain *et al*. (1997) reported that the abundance of therophytes and nanophanerophytes indicates that the habitat is disturbed, a condition which has resulted through human activities such as deforestation, overgrazing and uprooting. Chamaephytes and geophytes were rare. Hussain *et al*. (1997) reported that as a whole the plant communities of Girbanr Hills, Swat District, Northwestern Pakistan were composed of many therophytes and few geophytes. The abundance of therophytes and nanophanerophytes indicates that the habitat is disturbed, a condition which has resulted through human activities such as deforestation, over grazing and uprooting. A sum total of 30 species were recorded in the seven communities of Mai Dhani Hill (Table 2). The vegetation on the whole is tri-stratified upper stratum is composed of sparse megaphanerophytes, followed by nanophanerophytes making the second layer, and the third layer is composed of therophytes, hemicryptophytes, geophytes and chamaephytes. Malik *et al*. (1990) found at Sund Gali, Muzaffarabad that therophytes dominated the vegetation while phanerophytes, chamaephytes and hemicryptophytes had almost equal share. Tareen and Qadir (1993) reported the phanerophytes decrease from lower elevation 44 percent to higher elevation 30 percent, in some zones they remained constant around 30 percent. Qadir and Shetvy (1986) considered chamaephytes and therophytes are the indicators of unfavourable environment. Table 2 shows that with increasing elevation from 800 to 1250 m the nano-phanerophytes have not decreased significantly and megaphanerophytes decreased from 37.5 percent to 6.66 percent. The therophytic percentage was different at various altitudes and therophytes show consistency with regard to change in altitude. The hemicryptophytes increased at an altitude of 1100 and 1250 m, respectively while the chamaephytes were at low the lower altitudes and remained absent at the high altitudes (Table 2). Tareen and Qadir (1993) reported chamaephytes increase gradually from lower elevation to higher elevation and found to be high in upper most zone Harnai, Sinjawi to Duki regions. According to Cain and de Oliveira Castro (1959) and Shimwell (1971) hemicryptophytes characteristics of temperate regions and therophytes characteristics of deserts climate. Braun-Blanquet (1932) discussed that in the Alps the vegetation on snowley ridges consisted of two thirds of chamaephytes and one third of hemicryptophytes, while the adjoining and covered ridges contained 64 percent hemicryptophytes and only 30 percent chamaephytes. Chamaephytes indicators of high altitudes and high latitudes (Cain, 1950; Cain and de Oliveira Castro, 1959). Geophytes are more or constant around 6.66 percent but slightly increased 11.76 percent at an altitude of 1250 m. The r obtained in this study reveal that nanophanerophytes hemicryptophytes are the largest life form in the flor study area. Qadir and Tareen (1987) also reported percentage of hemicryptophytes and therophytes for the flora of Quetta District. Chamaephytes were found to lower in Quetta District and were also found rarely at Dhani Hill, Muzaffarabad. Sapru *et al*. (1975) stated chamaephytes are able to flourish in areas which are subjected to heavy disturbance especially grazing animals.

Indices of similarity and dissimilarity: The maximum incidence of similarity was observed between *Dodonea-Pinus-Therneda* (DPT) and Celtis-Pinus Dodonaea (CPD) communities which exhibited the highest value of 63.6 lowest value 28.04 was obtained for *Ficus-Dishanthium-Themeda* (FDT) and *Micromeria-Themeda-Dodonaea* communities (Table 3). Kayani *et al*. (1984) reported values of similarity between 6 different plant Gomm recognised in wasteland of Quetta-Pishin Districts.

Monaea-Pinus-Themeda (DPT) and *Micromeria-Themeda-Dodunea* (MTD) communities. A value of 50.91 was recorded for both the communities (Table 3). There were 30 species in both the communities. *Dodonaea and Themeda* there the two major dominants in both the communities bushed at various altitudes. *Dodonaea-Pinus-Themeda* community is composed of 13 species and it shared 6 species with compared community having 17 species. Both communities share with each other; thus sharing 10.86 percent with each other.

***Celtis-Pinus-Dodonaea* (CPD) and *Micromeria-Themeda-Dodunaea* (MTD) communities.** A value of 60.22 was recorded for both the communities (Table 3). There were 32 species and *Themeda* was the second dominant in both communities. *Celtis-Pinus-Dodonaea* community was composed of 15 species and 11 species were common to both communities. *Micromeria-Themeda-Dodonaea* had species and both communities share 26.67 percent with each other. Khattak and Ahmed (1990) reported that number of species unique to the north and south facing apes of Margalla range were 4 and 31, respectively while se common to both the slopes were 30. Index of similarity becomes 46 percent.

***Dodonaea-Pinus-Themeda* (DTP) and *Celtis-Pinus-Dodonaea* (CPD) communities.** The highest index of similarity 63.6 between these two communities (Table 3). Hussain *et al*. (1997) reported high similarity values between plant communities found on slops with the same aspect, while similarity values were recorded between plant communities of north and south facing slopes of Girbanr Swat District. *Pinus roxburghii* and *Themeda anathera* mated the two communities. The index of similarity among three communities varied from 50.91 to 63.6 and variation is not too much. *Carissa opaca*, *Dodonaea viscose, Maytenus rovleanus, Cynodon dactylon, Oxalis comiculata*, *Taraxacum afficinale*, and *Themeda anathera* are present in almost all the communities. *Celtis Dodonaea*, *Ficus palmate* and *Pinus roxburghii* were the dominating trees on the sunside of the Mai Dhani Hill in 1995. Hussain and Malook (1984) reported that it requires relatively mild environmental conditions which they receive on the northern slopes of Karamar Hills. *Dodonea-Pinus-Themeda* (DPT) community was composed *Pinus Dodonea* species and it shared 28 species with the *Celtis-Pinus-Dodonea* (CPD) community having 15 species; thus shared percent with each other. The two communities having species had the maximum share of 26.67 percent while communities having 28 species had minimum shares of percent. The plant communities were established at the elevations ranged from 800 to 1250 m. Some of species irrespective of their dominance or importance were confined exclusively to one of the communities. Among them *Pinus roxburghii* shrub layer; *Zanthoxylum alaturn*, *Ziziphus jujaba* at 900 m elevation. *Bauhinia variegate* and *Acacia modesta, Euphorbia helioscopia*, *Ficus palmate* at 800 m elevation. *Ficus carica* at 1050 m elevation, Geranium nepalense at 980 m elevation. None of these species was found to be dominant. The intermediate index of similarity was recorded for communities FDT & FDT, CDT & CDT, FDT & OPT, FDT & CDT, CDT & FDT, CDT & MTD, CDT & CPD, CDT & DPT having 47.13, 45.51, 44.45, 43.34, 41.84, 41.39, 40.8 and 40.07 percent, respectively. The lowest index of similarity was recorded for *Ficus-Dichanthium-Therneda*, (FDT) and *Micromeria-Themeda-Dodonaea* (MTD) communities (Table 3).

The Mai Dhani Hill is experiencing a severe biotic pressure and erosion which caused the removal of the plant species particularly the medicinal and economic plants from the area. Clearing of the trees paved the way to an increase in the population of wild grazing animals as if the population has not been kept in check and therefore enough seedlings have not been survived to maintain regeneration. The differences among the various communities were due primarily to human interferences. The presence of *Pinus* and other associated members or species indicate the remnants of tropical pine forests that might have been existed in the area sometime in the past. It is therefore suggested, that area still needs attention and protection. The biotic pressure can be reduced by awareness and participation of the local inhabitants.

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