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

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Abstract: The nanophanerophytes and hemicryptophytes increase as the altitude increases while the megaphanerophytes decrease. The tree layer is very sparse and the total number of plant species decreased in December as compared to plant species found in April, 1995. The maximum index of similarity was observed between *Dodonaea-Otostegie-Taraxacum* and *Dodonaea-Themeda-Maflatus* communities while the lowest value was obtained for *Dodonaea-Maytenus-Dodonaea* and *Phoenix-Cynodon-Micromeria* communities.

Key words: Mai Dhani Hill, Biological spectrum, coefficient of communities, six communities

Introduction

Life-form is primarily determined by heredity selection; it may be regarded as an adjustment of the vegetative plant body and life history to the habitat. Under some circumstances, however, the environment directly influences life-form (Packham and Harding, 1982). A community with high diversity of life-forms is highly complex and stratified due to presence of varied morphological forms. Similarly, coefficient of community or similarity quantitatively determines the similarity or dissimilarity between the communities. The coefficient depends upon the number of common species in both the communities (Hussain and Malook, 1984). Malik *et al*. (1990) calculated the index of similarity for plant communities of Sund Galli near Muzaffarabad, Azad Kashmir. Malik and Hussain (1990) worked out the biological spectrum of plant communities of some parts of Kotli Hills, Azad Kashmir. Hussain and Malook (1984) studied the biological spectrum and comparison of coefficient of communities between plant communities at Karamar Hills, District Maiden, Pakistan.

The object of the present study is to compare biological spectrum and the similarity or dissimilarity between the communities studied in April, 1995. Life form spectra may show some changes and it may indicate that the number of species decreased or increased at the higher elevations of Mai Dhani Hill, Muzaffarabad in December, 1995.

Materials and Methods

The biological spectrum and coefficient of communities between plant communities harbouring Mai Dhani Hill near Muzaffarabad. Azad Kashmir were calculated and compared (Table 1).

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

Results and Discussion

The biological spectrum is presented in Table 2. The *Themeda-Dodonaea-Maytenus* community showed that 40 percent were nanophanerophytes followed by 33.33 percent megaphanerophytes, 13.33 percent hemicryptophytes. The least contribution was made by therophytes and geophytes while chamaephytes were absent. In *Dodonaea-Maytenus-Dodonaea* community both nano and megaphanerophytes contributed 30.76 percent each followed by 23.07 percent hemicryptophytes and 15.3 percent therophytes. Chamaephytes and geophytes were absent. In *Phoenix-Cynodon-Micromeria* community hemicryptophytes were 38.88 percent, followed by 27.77 percent nanophanerophytes. Qadir and Tareen (1987) reported that hemicryptophytes 42.5 percent, therophytes 36.25 percent and cryptophtes 10 percent were significantly higher at Quetta district. Megaphanerophytes, therophytes and geophytes contributed 11.11 percent each while chamaephytes were absent, Maximum number of species were found in this community (Table 2). In *Dodonaea-Otostegia-Taraxacum* community, nanophanerophytes were 41.66 percent, megaphanerophytes 25 percent, therophytes 16.66 percent while the least contribution was made by hemicryptophytes and geophytes 8.33 percent each, while chamaephytes were absent. In *Dodonaea-Themeda-Mallotus* community the nanophanerophytes had a major share of 42.85 percent, followed by hemicryptophytes 21.42 percent. Megaphanerophytes and therophytes had an equal share of 14.28 percent each; geophytes were 7.14 percent, while chamaephytes were absent. In *Pinus-Hypodematium-Dodonaea* community the maximum contribution was made by nanophanerophytes having 50 percent followed by megaphanerophytes and hemicryptophytes contributed 30 percent each. Therophytes, chamaephytes and geophytes were absent in this community. The lowest number of species were found in this community (Table 2). As a whole nanophanerophytes were 40.96 percent, followed by hemicryptophytes 22.89 percent, megaphanerophytes 18.07 percent, therophytes and 3.61 percent geophytes 13.25 percent. Dastagir *et al*. (1999) reported that vegetation of Mai Dhani Hill, Muzaffarabad (AJK) was dominated by nanophanerophytes followed by hemicryptophytes studied in April, 1995. The Table 2 shows that nanophanerophytes and hemicryptophytes increase as the altitude increases while the megaphanerophytes were found to decrease at higher altitudes. Ashby (1963) reported that in desert climates (El Golea) nanophanerophytes taking the form of the characteristic grey spiny bushers, are more numerous while during the brief rainy seasons therophytes spring up and colour the whole landscape. Therophytes are more or less similar at 800 to 1050 m elevations and they slightly increased at higher altitudes while geophytes also showed the same trend. Tareen and Qadir (1993) reported that phanerophytes decrease from lower elevation 44 percent to higher elevation 30 percent. Nanophanerophytes were high at 980 and 1050 m elevations, respectively while hemicryptophytes were found to be high at 970 m elevation. The geophytes were few at different altitudes of Mai Dhani Hill in December, 1995. Dastagir *et al*. (1999) reported few geophytes from plant communities of Mai Dhani Hill, Muzaffarabad (AJK). The total number of plant species

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

Species	Life-form	TDM	DMD	PCM	DOT	DTM	PHD
Acacia modesta Wall	MP	-	+	-	+	-	-
Adiantum capillus-veneris L.	G	+	-	-	+	+	-
Berberis lycium Royle	NP	+	-	-	-	-	-
Cannabis sativa L.	Th	-	-	+	-	-	-
Cynodon dactylon (L.) Pers	H	-	-	+	-	-	-
Dalbergia sissoo Roxb.	MP	-	+	-	-	-	-
Dodonaea viscose (L.) Jacq.	NP	+	+	+	+	+	+
Heteropogon contortus (L.) P. Beauv. ex Roem & Schult.	H	-	+	-	-	-	-
Hypodematium crenatum (Forssk) Kuhn	NP	-	-	-	-	-	+
Justkia adhatoda L.	NP	+	+	-	-	-	-
Mallotus philippensis (Lam.) Muell	MP	+	+	-	+	+	+
Maytenus royleanus (Wall) Cef.	NP	+	+	+	+	+	+
Menthe longifolia (L.) Huds.	H	-	-	+	-	-	-
Micromeria biflora (Ham.) Bth.	Th	+	+	+	+	+	-
Olea ferruginea Royle	MP	+	-	+	-	-	-
Otostegia limbata (Bth.) Boiss	NP	-	-	+	+	-	+
Oxalis comiculate L.	H	+	+	-	-	+	-
Phoenix sylvestris Roxb.	MP	-	-	+	-	-	-
Pinus roxburghii Sargent	MP	+	-	-	-	-	+
Precis cretica L.	G	-	-	+	-	-	-
Punica granatum L.	MP	-	-	-	+	+	-
Quercus incana Roxb.	MP	+	+	-	-	-	+
Rabdosia rugosa Roxb.	NP	-	-	+	-	-	+
Sonchus asper (L.) Hill	Th	-	+	-	+	+	-
Taraxacum officinale. Weber	H	+	-	+	-	-	-
Themeda anathera (Nees) Hack	H	+	-	+	+	+	+

Key: TDM = *Themeda-Dodonaea-Maytenus* community (800 m); DMD = *Dodonaea-Maytenus-Dodonaea* community 900 m); PCM = *Pima-Cynodon-Micromeria* community (970 m); DOT = *Dodonaea-Otostegia-Taraxacum* community (980 m); DTM = *Dodonaea-Themeda-Mallotus* community (1050); PHD = *Pinus-Hypodematium-Dodonaea* community (1100 m); MP = Megaphanerophytes; NP = Nanophanerophytes; TH = Therophytes; CH = Chamaephytes; H = Hemicryptophytes; G = Geophytes; + = Present; - = Absent

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

Communities	Species No	Alt m.	MP		NP		TH		H		CH		G	
			No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Themeda-Dodonaea-Maytenus	15	800	5	33.33	6	40.0	1	6.66	2	13.33	-	-	1	6.66
Dodonaea-Maytenus-Dodonaea	13	900	4	30.76	4	30.76	2	15.3	3	23.07	-	-	-	-
Phoenix-Cynodon-Micromeria	18	970	2	11.11	5	27.77	2	11.11	7	38.88	-	-	2	11.11
Dodonaea-Otostegia-Taraxacum	12	980	3	25.00	5	41.66	2	16.66	1	8.33	-	-	1	8.33
Dodonaea-Themeda-Mallotus	14	1050	2	14.28	6	42.85	2	14.28	3	21.42	-	-	1	7.14
Pinus-Hypodematium-Dodonaea	10	1100	3	30.0	5	50.0	-	-	2	30.0	-	-	-	-
Total	82		19	18.07	31	40.96	9	13.25	18	22.89	-	-	5	3.61

Table 3: Matrix of indices of dissimilarity (ID) and similarity (IS) for 6 plant communities of Mai Dhani Hill in December, 1995

Plant Communities	Plant Communities					
	TDM	DMD	PCM	DOT	DTM	PHD
TOM	-	51.83	64.3	46.90	47.37	71.96
DMD	48.17	-	83.15	54.84	56.57	65.96
PCM	35.7	16.85	-	76.28	52.54	80.20
DOT	53.1	45.16	23.72	-	36.82	68.20
DTM	52.63	43.43	47.46	63.18	-	63.47
PHD	28.04	34.04	19.80	31.80	36.53	-

decreased in December as compared to found in April, 1995. Chamaephytes were completely absent in all the communities recognized in December, 1995 (Table 2). Dastagir *et al*. (1999) reported 2.77 percent chamaephytes in April, 1995 which showed the peculiar climatic features. Tareen and Qadir (1993) reported that chamaephytes increase gradually from lower elevation to higher elevation and were found to be high in upper most zone of Harnai, Sinjawi to Duki regions.

Indices of similarity and dissimilarity: The maximum index of similarity was observed between *Dodonaea-Otostegia-Taraxacum* (DOT) and *Dodonaea-Themeda Mallotus* (DTM) communities which showed the highest value of 63.18. Dastagir *et al*. (1999) reported highest index of similarity 63.60 percent between *Dodonaea-Pinus-Themeda* (DPD) and *Celtis-Pinus-Dodonaea* (CPD) communities recognized at Mai Dhani Hill, Muzaffarabad (AJK) in April, 1995. The lowest value obtained for *Dodonaea-*

Maytenus-Dodonaea (DMD) and *Phoenix-Cynodon Micromeria* (PCM) communities was 16.85 percent (Table 3). Kayani *et al*. (1984) reported low values of similarity between six different plant communities recognized in wasteland of Quetta, Pishin districts.

***Themeda-Dodonaea-Maytenus* (TDM) and *Dodonaea-Themeda-Mallotus* (DTM) communities:** A value of 52.63 was recorded for both the communities (Table 3). There were 29 species in both the communities. *Dodonaea* and *Themeda* were the major dominants in both the communities. Dastagir *et al*. (1999) reported the same results in April, 1995 at Mai Dhani Hill, Muzaffarabad. *Themeda-Dodonaea-Maytenus* (TDM) community was composed of 15 species and it shared 5 species with the compared community having 14 species. Both the communities shared 2.85 percent similarity with each other.

***Themeda-Dodonaea-Maytenus* (TDM) and *Dodonaea-Otostegia-Taraxacum* (DOT) communities:** A value of 53.1 was recorded for both the communities (Table 3). There were 27 species in both the communities. *Dodonaea* was a major dominant in both the communities. *Themeda Dodonaea-Maytenus* (TDM) community was composed of 15 species and 6 species were common to both the communities. *Dodonaea-Otostegia-Taraxacurn* (DOT) community had 12 species and both communities shared 10 percent with each other.

***Dodonaea-Otostegia-Taraxacum* (DOT) and *Dodonaea-Themeda-Mallotus* (DTM) communities:** The highest value was recorded for these two communities 63.18 (Table 3). Hussain *et al*. (1997) reported high similarity values between plant communities found on slopes with the same aspect at Girbanr Hills, Swat district. *Dodonaea* dominated the two communities. There were 26 species and 12 species belonged to *Dodonaea-Otostegia-Taraxacum* (DOT) community while 14 belonged to *Dodonaea-Themeda-Mallotus* (DTM) community and 9 species were common to both the communities. They shared 10.7 percent similarity with each other. The index of similarity among three communities varied from 53.1 to 63.18 and variability was less. *Phoenix sylvestris* and *Pinus roxburghii* were the dominant trees and their average importance value (IV) was 34.12 and 60.9, respectively. *Dodonaea viscosa, Maytenus royleanus, Mallotus philippensis, Micromeria biflora* and *Themeda anathera* were present in all the communities studied. Dastagir *et al*. (1999) reported that *D. viscosa, M. royleanus* and *T. anathera* were present in all the communities studied in April, 1995 at Mai Dhani Hill, Muzaffarabad. The communities having maximum 32 species showed the lowest share of 2.85 percent while communities having 26 species showed the highest share of 10.71 percent with each other. These results are contrary to observed in April, 1995 (Dastagir *et al*. 1999). The different life-forms were reported from six different plant communities which were recognized at various altitudes of Mai Dhani Hill that ranged from 800 to 1100 m elevations (Table 1). Some plant species regardless of their dominance or importance value were exclusively confined to one of the community. *Phoenix sylvestris* and *Pinus roxburghii* (from the tree layer) were found only at 970 and 1100 m elevations, respectively. From the shrub layer *Berberis lycium* at 800 m elevation and *Dalbergia sissoo* at 900 m elevation were found. *Justicia adhatoda* (from the herb layer) was restricted to an altitude of 800 m while *Berberis lycium, Cannabis sativa, Cynodon dactylon, Menthe longifolia* and *Pteris cretica* were exclusively confined to an altitude of 970 m. *Otostegia limbata* was found at 980 m elevation, *Maytenus royleanus* and *Rabdosia rugosa* at 1050 m elevation, *Eriophorum comosum* and *Hypodematium crenatum* were found at an altitude of 1100 m (Table 1). The results obtained in April, 1995, showed that those plant species confined to only one community were not dominant while the results obtained in December, 1995, showed that plant species confined to one community were dominant e.g., *P. sylvestris*, *P. roxburghll*, *D. viscosa*, *M. royleanus*, *M. philippensis, O. limbata, C. dactylon, H. crenatum, M. biflora* and *T. anathera*. The intermediate index of similarity was recorded for TDM and DMD, PCM and DTM, MDM and DOT, DMD and DTM communities having 48.7, 47.46, 45.16 and 43.43 percent, respectively. The lowest index of similarity 16.85 percent was recorded for *Dodonaea-Maytenus-Dodonaea* (DMD) and *Phoenix-Cynodon-Micromeria* (PCM) communities which showed that 4 species were common to these two communities (Table 3). This suggested that more the number of common species to both the communities, higher will be the index of similarity and vice versa. The other intermediate index of similarities ranged between 19.8 to 36,53 percent (Table 3). Dastagir *et al*. (1999) reported lowest index of similarity 28.04 percent between *Ficus-Dichanthium-Themeda* (FDT) and *Micromeria-Themeda-Dodonaea* (MTD) communities established at Mai Dhani Hill, Muzaffarabad (AJK), in April, 1995. The vegetation of the Mai Dhani Hill has been reduced due to deferstation and overgrazing. The differences among the communinities established at various altitudes of Mai Dhani Hill are primarily due to human activities. Tree layer is disappearing and few economically important trees still need the attention of environmentalists, foresters, ethnobotanists and ecologists. A system of education must be developed by government to make the local people of the area aware of the importance of conserving the existing vegetation. The area needs attention so that the vegetation could be restored.

References

Ashby, M., 1963. Introduction to Plant Ecology. Macmillan and Co. Ltd., New York, pp: 93.

Dastagir, G., Imtiaz-ul-Haq and Z.H. Malik, 1999. Biological spectrum and comparison of coefficient of communities between plant communities harbouring Mai Dhani Hill, Muzaffarabad, (AJK). Pak. J. Biol. Sci., 2: 352-356.

Hussain, F. and S.T. Malook, 1984. Biological spectrum and comparison of the coefficient of communities between the plant communities of Karamar hill, district Mardan. J. Sci. Technol., 8: 53-59.

Hussain, F., 1989. Field and Laboratory Manual of Plant Ecology. University Grants Commission, Islamabad, Pakistan, Pages: 422.

Hussain, F., M. Ilyas and S. Takatsuki, 1997. Plant communities of Girbanr hills, Swat district, Northwestern Pakistan. Ecol. Rev., 23: 247-260.

Kayani, S.A., A.K. Achakzai and S.A. Qidar, 1984. Phyto sociological studies in wastelands of Quetta-Pishin districts, Baluchistan, Pakistan. Pak. J. Bot., 16: 255-265.

Malik, Z.H. and F. Hussain, 1990. Phytosociology of some parts of Kotli hills, Azad Kashmir. J. Sci. Technol., 14: 117-123.

Malik, Z.H., A.A. Awan, G. Murtaza and F. Hussain, 1990. Phytosociology of Sund Galli near Muzaffarabad, Azad Kashmir. J. Sci. Technol., 14: 111-116.

Packham, J.R. and D.J.L. Harding, 1982. Ecology of Woodland Processes Contemporary Biology. Edward Arnold Publisher Ltd., London, pp: 24-55.

Qadir, S.A. and R.B. Tareen, 1987. Life form and leaf size spectra of the flora of Quetta district. Mod. Trends Plant Sci. Res. Pak., 1: 59-62.

Raunkiaer, C., 1934. The Life-forms of Plants and Statistical Plant Geography. 1st Edn., Clarendon Press, Oxford, UK., pp: 632.

Stewart, R.R., 1972. Flora of West Pakistan. Annotated Catalogue of Vascular Plants of West Pakistan and Kashmir, Karachi.

Tareen, R.B. and S.A. Qadir, 1993. Life form and leaf size spectra of the plant communities of diverse areas ranging from Harnai, Sinjawi to Duki regions of Pakistan. Pak. J. Bot., 25: 83-92.