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Phytosociology of Mai Dhani Hill Near Muzaffarabad, Azad Kashmir

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Abstract

Seven plant communities viz. *Celtis-Dichanthium-Themeda, Ficus-Dichanthium-Themeda, Ficus-Dodonaea-Themeda, Celtis-Dichanthium-Themeda, Dodonaea-Pinus Themeda, Celtis-Pinus-Dodonaea, Mictorneria-Themeda-Dodonaea,* are recognised at various altitudes of Mai Dhani Hill, Muzaffarabad in April, 1995. Index of diversity and its components decrease from low altitude to high altitude. In *Dodonaea-Pinus-Themeda* community (Alt. 1100 m), species diversity is high (12.5) whereas in *Celtis-Dichanthium-Themeda* community (Alt. 1050 m), species diversity is low (3.7), species richness decreased from low altitude to high altitude. Similarly equitibility also decreased from low altitude to high altitude, but in *Celtis-Dichanthium-Therneda* community it increases. Species maturity also decreases from low altitude to high altitude. In *Celtis-Dichanthium-Themeda* community (Alt. 1050 m), species maturity is the highest (53.36) whereas in *Celtis-Themeda Pinus* community (Alt. 1200 m) species maturity is the lowest (38.32). The soils vary from sandy loam to loam. The pH varies from 7.6 to 8.0. The organic matter differs from 2.0 to 2.65 percent while $CaCO_3$ varies from 15.7 to 23.2 percent. The soil temperature decreases as the altitude increases.

Introduction

Vegetation is an assemblage of plants growing together in a particular location and may be characterised either by its component species or by the combination of structured and functional characters that characterise the appearance or physiognomy of vegetation. Malik and Hussain (1990) reported plant communities from Kotli Hills, Azad Kashmir. Hussain and Shah (1989) and Hussain *et al*. (1992) concluded that the vegetation of Docut Hills, Swat has been changed to scrub-grassland type. Hussain *et al*. (1996) reported the autumn and summer flora of Dabargai Hills, District Swat Pakistan. Hussain and Shah (1989) stated that most of the subtropical vegetation exists in the degraded form. The vegetation hills near Muzaffarabad have been reported by Malik and Hussain (1987, 1988). From these works a clear picture of the vegetation of hills of Muzaffarabad does not emerge. However, no such reference exists on the vegetation of Mai Dhani Hill, near Muzaffarabad. The purpose of this study is to analyse the plant communities on different altitudes and soils of this less explored area, and to gather first-hand information about the vegetation of this unexplored and floristically rich area.

Muzaffarabad is bound on the North by District Gilgit, on the West by the District Manshera, on the South by District Poonch, and on the East by occupied Kashmir. The average maximum temperature varies in between 15°C in January, to 35°C in June while the mean minimum lies between 3.4°C in December, to 22.5°C in August. The average rainfall varies 12.8 mm and snow falls during December.

Materials and Methods

Mai Dhani Hill near Muzaffarabad, Azad Kashmir was chosen for phytosociological study. The hill had two sides viz., sunside and shade side. The sunside altitude varied from 800 to 1250 m (Table 1). The phytosociological study was conducted during April, 1995 at seven randomly selected sites based on physiognomic contrast.

The vegetation was analysed using quadrats of 10x2 m for trees, 5x2 m for shrubs and 0.5x0.5 m for herbs, respectively. Circumference of wood species was recorded at breast height (DBH) and converted to coverage (basal area) using standard tables (Hussain, 1989). A species was recorded in different state due to its age and habit. Frequency, density and canopy coverage of each species was converted to relative values and they were added together gave importance values (IV) for that species (Hussain, 1989). Plant community was named after the three leading dominants with highest importance values. Simpson index of diversity was calculated after Simpson (1949). Species richness, equitibility and degree of maturity index were determined after Pichi-Sermolli (1948) method. Soil was sampled up to a depth of 15 cm. The physico-chemical characteristics of the soil were determined according to the methods given in U.S.D.A Hand-book No.60 (Richards, 1954).

Results and Discussion

The results are summarised in the form of (IV = importance values) and are presented in Table 2. Following seven communities were established on sunside in April, 1995.

***Celtis eriocarpa-Dichanthium annulatum-Themeda anathera* (CDT) community:** The community was present at Mai Dhani Hill at a height of 800 m. It was dominated by *Celtis enocatpa* (IV = 40.46), *Dichanthium annulatum* (IV = 28.26)

Table 1: Physico-chemical analusis of soils at different altitudes of Mai Dhani Hill (sunside).

Alt. m	Clay %	Silt %	Sand %	Textural type	pH	Electrical conductivity EC × 10^3	Soil Temp. °C	$CaCO_3$ %	Organic matter %	Total soluble salts %	N %	P ppm	K ppm
800	7.4	23.2	69.4	Sandy loam	7.9	0.18	15	23.2	2.65	0.058	0.132	16.6	252
900	15.4	45.5	34.4	Loam	7.9	0.15	15	20.2	2.27	0.048	0.113	8.0	360
980	25.4	35.2	39.4	Loam	8.0	0.09	30	16.7	2.17	0.029	0.108	7.04	270
1050	23.4	39.2	37.1	Loam	8.0	0.07	29	17.5	2.00	0.022	0.1	7.36	279
1100	23.4	37.2	39.2	Loam	7.6	0.08	29	20.5	2.13	0.026	0.106	7.36	297
1200	21.4	39.2	39.2	Loam	7.7	0.09	20	15.7	2.38	0.029	0.119	8.64	378
1250	19.4	41.2	39.4	Loam	7.7	0.11	22	20.7	2.10	0.035	0.105	9.6	405

and *Therneda anathera* (IV = 27.76). *Adhatoda zylonica, Carissa opaca, Dodonaea viscosa, Oxalis corniculata* were the co-dominant species. *Olea ferruginea* and *Taraxacurn officinale* were the associated components. Five species were rare (Table 2). The soil was sandy loam rich in $CaCO_3$, organic matter, nitrogen, total soluble salt content and P. The electrical conductivity was the highest of all the communities. The pH was 7.9. The area has the lowest K and soil temperature (Table 1). The high (IV) of *C. eriocarpa* was chiefly contributed by highest relative value of canopy coverage while relative density and frequency were lower than *D. annulatum* and *T. anathera.* The *T. anathera* is a perennial grass and prefers open situation which is provided after the clearing of the woody or shrub layer. It is a fine fodder and seems to have quick regeneration (Malik and Hussain, 1990).

***Ficus palmata-Dichanthium annulatum-Themeda anathera* (FDT) community:** This community was recognised at a height of 900 m. It was dominated by *Ficus palmata,* (IV = 70.78), *Dichanthium annulatum* (IV = 43.04) and *Themeda anathera* (IV = 30). The co-dominants were *Dodonaea viscosa, Carissa opaca, Dodonaea viscosa, Micromeria biflora.* The associated components were *Ficus palmata, Maytenus royleanus, Berberis lycium* and *Olea ferruginea.* Eight species were rare (Table 2). This community established on loam soil with pH of 7.9. The loam soil was rich in P and K while the organic matter was moderate. Electrical conductivity, soil temperature and $CaC0_3$, contents were low (Table 1). The high (IV) of *Ficus palmata was* chiefly contributed by highest relative value of canopy coverage while its relative density and frequency were quite lower than *D. annulatum* and *T. anathera.*

***Ficus palmata-Dodonaea viscose-Themeda anathera* (FDT) community:** This community was recognised at an altitude of 980 m. The dominants were *Ficus palmata* (IV = 58.18), *Dodonaea viscosa* (1V = 45.06), and *Themeda anathera* (IV = 40.04). The co-dominants were *Maytenus royleanus, Euphorbia prostrate, Carissa opaca, Oxalis corniculata* and *Mallotus philippensis.* The associated components were *Pteris* sp., *Cynodon dactylon, Taraxacum officinale* and *Adhatoda* sp. In this community *C. dactylon* and *T. officinale* had the same importance value. Three species were rare (Table 2). The soil was loam and had the highest pH of all sites studied (pH 8), with moderate organic matter. The area has the lowest P while the soil temperature was the highest of all the communities (Table 1). The *D. viscosa* and *T. anathera* were the second and third dominants, but their relative density and frequency were much greater than the first dominant. The high (IV) of *Ficus palmata* was due to its highest relative value of canopy coverage.

***Celtis eriocarpa-Dichanthium annulatum-Them ode anathera* (CDT) community:** Community was harboured at a height

Table 2: Importance values of seven plant communities of Mai Dhani Hill, Muzaffarabad (sunside, April, 1995).

	CDT	FDT	FDT	CDT	DPT	CPD	MTD
Tree Layer							
Bauhinia variegate L.	20.8	-	-	-	-	-	-
Celtrs eriocarpa Decne	40.46	-	-	66.72	-	48.31	-
Dalbergia sissoo Roxb	-	-	-	-	-	-	8.22
Ficus palmate Forssk	-	70.78	58.18	-	-	-	23.98
Pinus roxburghii Sargent	-	-	-	-	34.57	42.19	27.3
Shrub Layer							
Adhatoda zylonica Medic	24.27	12.63	-	-	-	7.02	-
Adhatoda sp.	-	-	7.99	11.34	-	-	12.81
Acacia modesta Wall.	6.06	-	-	-	-	-	-
Berberis lycium Royle	9.1	5.8	-	-	18.83	21.1	12.81
Carissa opaca stapf ex Haines	24.27	8.69	17.02	-	25.09	10.55	9.6
Dodonaea viscose (L.) Jacq	23.7	28.95	45.06	34.03	36.06	37.71	32.05
Ficus palmate Forssk	-	8.69	-	-	-	-	-
Maytenus royleanus (Wall) Cef.	15.16	8.69	28.03	22.69	12.54	10.55	-
Mellows philippensis (Lam.) Muell.	-	-	12.0	-	18.02	-	-
Olea ferruginea Royle	15.16	8.69	-	-	-	-	-
Pinus roxburghii Sargent	-	1.71	-	-	-	-	-
Zanthoxylum alatum Roxb	-	1.71	-	-	-	-	-
Zizyphus jujube Mill	-	5.8	-	-	-	-	-
Herb Layer							
Aristida adscensionis L.	-	-	-	-	-	19.15	15.25
Adiantum capillus-veneris L.	8.57	-	5.21	-	-	4.61	10.18
Berberis lycium Royle	-	1.74	-	-		-	-
Cynodon dactylon (L.) Pers	-	-	9.66	7.55	20.81	7.89	8.42
Dichanthium annulatum (Forssk.) Stapf	28.26	43.04	-	56.59	-	-	-
Dodonaea viscose (L.) Jacq	-	15.38	-	9.83	-	-	-
Euphorbia helioscopia L.	10.08	-	-	-	-	-	-
Euphorbia prostrate Ait	-	-	26.24	-	-	4.61	10.18
Eriophorum comosum (Wall. ex Roxb.) Nees	-	-	-	-	26.51	16.63	13.7
Ficus palmate Forssk.	2.01	-	-	-	-	-	-
Ficus carica L.	-	-	-	4.9	-	-	-
Geranium nepalense Sweet	-	-	7.99	-	-	-	-
Micromeria biflora (Ham.) Bth	-	27.34	-	-	-	8.71	42.73
Oxalis corniculata L.	23.97	3.77	13.21	12.48	15.09	9.24	12.81
Pteris sp.	-	-	-	-	-	-	8.42
Rumex hastatus D.Don	-	-	-	-	-	-	15.25
Trifollum repens L.	-	-	7.99	9.82	16.35	-	-
Taraxacum officinale Weber	20.17	3.77	9.66	12.48	16.61	-	-
Themeda anathera (Nees) Hack	27.76	33.0	40.04	40.05	32.59	-	35.78

CDT = *Celtis-Dichanthium-Themeda* community; FDT = *Ficus-Dichanthium-Themeda* community
FDT = *Ficus-Dodonaea-Themeda* community; CDT = *Celtis-Dichanthium-Themeda* community
DPT = *Dodonaea-Pinus-Themeda* community; CPT = *Celtis-Pinus-Dodonaea* community
MDT = *Micromeria-Themeda-Dodonaea* community

Table 3: Summary of phytosociological data for trees, shrub and herb layers.

	Presence in No. of stands	Importance value			Dominant position in stands		
		Avg	Max	Min	1st	2nd	3rd
Tree Layer							
Bauhinia variegata L.	1	20.8	20.8	20.8	-	-	-
Celtis eriocarpa Decne	3	155.49	66.72	40.46	3	-	-

Dalbergia sissoo Roxb	1	8.22	8.22	8.22	-	-	-
Ficus palmata Forssk	3	136.95	70.78	23.98	2	-	-
Pinus roxburghii Sargent	3	34.68	42.19	34.57	-	1	1
Shrub layer							
Adhatoda zylonica Medic	3	14.64	24.27	7.02	-	-	-
Adhatoda sp.	3	10.71	11.34	7.99	-	-	-
Acacia modesta Wall.	1	6.06	6.06	6.06	-	-	-
Betberis lycium Royle	5	13.53	21.1	5.8	-	-	-
Carissa opaca stapf ex Haines	6	15.87	25.09	8.69	-	-	-
Dodonaea viscose (L.) Jacq	7	30.55	45.06	23.7	1	1	1
Ficus palmata Forssk	1	8.69	8.69	8.69	-	-	-
Maytenus royleanus (Wall) Cef.	6	16.27	28.03	8.69	-	-	-
Mallotus philippensis (Lam.) Muell.	2	21.01	18.02	12.0	-	-	-
Olea ferruginea Royle	2	11.93	15.16	8.69	-	-	-
Pinus roxburghii Sargent	1	1.71	1.71	1.71	-	-	-
Zanthoxylum afatum Roxb	1	1.71	1.71	1.71	-	-	-
Zizyphus jujube Mill	1	5.80	5.8	5.8	-	-	-
Herb Layer							
Aristida adscensionis L.	2	17.2	19.15	15.25	-	-	-
Adiantum capillus-veneris L.	4	7.13	10.18	4.61	-	-	-
Berber's lycium Royle	1	1.74	1.74	1.74	-	-	-
Cynodon dactylon (L.) Pers	5	10.86	20.81	7.55	-	-	-
Dichanthium annulatum (Forssk.) Stapf	3	42.63	56.59	28.26	-	3	-
Dodonaea viscosa (L.) Jacq	2	12.60	15.38	9.83	-	-	-
Euphorbia helioscopia L.	1	10.08	10.08	10.08	-	-	-
Euphorbia prostrate Ait	3	13.67	26.24	4.61	-	-	-
Erio,ohorum comosurn (Wall. ex Roxb.) Nees	3	18.94	26.51	13.7	-	-	-
Ficus palmata Forssk.	1	2.01	2.01	2.01	-	-	-
Ficus carica L.	1	4.9	4.9	4.9	-	-	-
Geranium nepalense Sweet	1	7.99	7.99	7.99	-	-	-
Micromeria biflora (Ham.) Bth	3	26.26	42.73	8.71	-	-	-
Oxalis corniculata L.	7	12.93	23.97	3.77	-	-	-
Pteris sp.	1	8.42	8.42	8.42	-	-	-
Rurnex hastatus D.Don	1	15.25	15.25	15.25	-	-	-
Trifolium repens L.	3	11.38	16.35	7.99	-	-	-
Taraxacum officinale Weber	5	12.53	20.17	33.77	-	-	-
Themeda anarhera (Nees) Hack	6	51.66	40.05	33.0	-	2	5

Table 4: Index cf diversity of plant communities of Mai Dhani Hill (sunside) in April, 1995.

Communities	Simpson index (Diversity)	Species richness	Equitibility	Species maturity
Celtis - Dichanthium - Themeda community	8.33	7.06	1.17	50.43
Ficus - Dichanthium - Themeda community	4.54	5.92	0.76	47.50
Ficus - Dodonaea - Themeda community	6.66	6.30	1.05	39.93
Celtts - Dichanthturn - Themeda community	3.7	4.23	5.11	53.36
Dodonaea - Pinus- Themeda community	12.5	5.28	2.36	53.06
Celtis - Pinus - Dodonaea community	7.14	6.88	1.03	38.32
Micromeria - Themeda - Dodonaea community	6.13	6.66	0.92	40.96

of 1050 m. The dominants were *Celtis eriocarpa* (IV = 66.72), *Dichanthium annulatum* (IV = 56.39) and *Themeda anathera* (IV = 40.05). The co-dominants were *Dodonaea viscose, Adhatoda* sp., *Maytenus royleanus, Taraxacum officinale* and *Oxalis corniculata, Celtis eriocarpa, Trifolium repens, Dodonaea viscosa* and *Cynodon dactylon* were the associated components. *Trifolium repens* and *Dodonaea viscosa* have the same importance value. One species was rare (Table 2). The soil was loam rich in K with the highest (pH = 8), the soil showed the lowest percentage of organic matter, nitrogen, and total soluble salts. The $CaCO_3$ was also low while electrical conductivity was the lowest (EC = 0.07, Table 1) of all the sites studied. The high (IV) of *C. eriocarpa* and *D. annulatum* were chiefly contributed by highest relative values of canopy coverage and frequency. The relative density and frequency of *D. annulatum* was greater than the *C. eriocarpa* and *T. anathera. Cynodon dactylon* do not show the high importance value or dominance in the area. Chaghtai *et al*. (1978) reported that grazing and particularly the soil deficiency of potassium and NO_3 may be held responsible for low importance value of *C. dactylon.* Grazing was observed at Mai Dhani Hill and hence *C. dactylon* was not dominant. Chaghtai *et al.* (1983) also reported considerably low importance values of *C. dactylon* in Belitang and Kohat city stands and this is probably because of its tense competition with other species in general and the sedges in particular.

***Dodonaea viscosa-Pinus roxburghii-Themeda anathera* (DPT) community:** Community was present at an altitude of 1100 m. *Dodonaea viscosa* (IV = 36.06), *Pinus roxburghii* (IV = 34.57) and *Themeda anathera* (IV = 32.59) were the dominants. *Euphorbia prostrate, Eriophorum comosum, Carissa opaca, Cynodon dactylon,* and *Berberis lycium* were the co-dominants. *Mallotus philippensis, Taraxacum officinale, Trifolium repens* and *Oxalis corniculata.* One rare species was present (Table 2). The loam soil showed the low percentage of $CaCO_3$, organic matter and N. The (pH = 7.6) was the lowest of all the sites studied. The electrical conductivity was low while the soil temperature was 29°C (Table 1). *D. viscosa* is a very common plant of dry hills in the sub Himalayan tracts and grows on denuded soils where little else can grown (Stewart, 1958, 1972); quick growth and gregarious habit make it an excellent competitor (Abdulla, 1973). Relative density and frequency of *D. viscosa* were higher than *P. roxburghii* and *T. anathera* and this made *D. viscosa* to remain dominant. *P. roxburghii* showed low relative density with comparatively higher relative canopy coverage suggesting that trees population was low with larger size. *Themeda anathera* showed comparatively higher relative density and frequency. Chaghtai and Ghawas (1976) reported that *T. anathera* got dominance due to less disturbance on North facing lower slopes than the upper slopes in Malakand Pass, N.W.F.P.

***Celtis eriocarpa-Pines roxburghii-Dodonaea viscosa* (CPD) community:** Community was harboured at an altitude of 1200 m. The dominants were *Celtis eriocarpa* (IV = 48.31), *Pinus roxburghii* (42.19) and *Dodonaea viscosa* (IV = 37.71). The co-dominants were *Berberis lycium, Aristida adscensionis, Eriophorum cornosum* and *Maytenus royleanus, Carissa opaca.* Three species were rare. The associated members were *Cynodon dactylon, Micromeria biflora, Oxalis corniculata, Rumex hastatus* (Table 2). The soil was loam rich in K with (pH = 7.7). The organic matter was moderate while the percentage of $CaCO_3$ content the lowest of all the sites studied. The electrical conductivity was low and similar to found at an altitude of 980 m. The soil temperature decreased to 20°C (Table 1). Although *C. eriocarpa* and *P. roxburghii* dominated the community, but the relative density and frequency of *D. viscosa* was grater than the two dominants. The relative canopy coverage of *D. viscosa* was comparatively less as compared to the two dominants.

***Micromeria biflora-Themeda anathera-Dodonaea viscosa* (MTD) community:** Community was recorded at an altitude of 1250 m. It was dominated by *Micromeria biflora* (IV = 42.73), *Themeda anathera* (35.78) *and Dodonaea viscosa* (32.05), The co-dominants were *Pinus roxburghii, Ficus palmate, Rumex hastatus, Aristida adscensionis, Eriophorum comosum. Rumex hastatus* and *A. adscensionis* have the same importance value. *Adhatoda* sp., *Berberis lycium, Oxalis comiculata* and *Euphorbia* sp., were the associated members. The three associated members showed the same importance value while *Euphorbia* sp., has (IV = 10.18). Five species were rare (Table 2). The soil was loam with the highest (K = 405 ppm) of all the communities. The P was slightly higher than the other five communities. The organic matter content was moderate. Electrical conductivity, soil temperature and $CaCO_3$ content were low (Table 1). The high (IV) of *M. biflora* is chiefly contributed by highest relative values of canopy coverage and frequency. *Themeda anathera* showed the lowest relative values of canopy coverage and frequency in this community. *D. viscosa* is highly susceptible to fire (Parker, 1956).

Vegetation, soil, climate, deforestation, grazing are related to each other. Of all if one shows less amount in composition, it causes change. In the investigated area studied in April, 1995 at (Sunside) *Celtis eriocarpa* was reported as first dominant in three stands and *Ficus palmata* in two stands. Hussain *et al*. (1993) observed *Ficus palmata* as the second dominant in the vanishing tropical dry deciduous forest in District Swabi, Pakistan. *Dodonaea viscosa* was dominant in three stands as first, second, and third dominant, respectively. *Pinus roxburghii* took lead as second dominant and third dominant in two stands. Malik and Hussain (1990) reported that protection has helped the return of *Pinus roxburghii* to the dominant status in some

parts of Kotli Hills, Azad Kashmir, where it was first and second dominant in two stands. *Themeda anathera* also took lead as second dominant in one stand and third dominant in five stands (Table 3). Malik and Hussain (1990) reported that *Themeda anathera* was first dominant in two stands and second and third dominant in one stand, recognised in some parts of Kotli Hills. This agrees with our results. Malik and Hussain (1990) found this grass to be one of the most dominant grass in Kotli area. *Dichanthium annulatum* was dominant in three stands as second dominant (Table 3).

The stands dominated by *Celtis eriocarpa* showed complete absence of *Ficus palmata* and *Pinus roxburghii.* The stands dominated *by Ficus palmata* showed complete absence of *C.eriocarpa* and *P. roxburghii.* However, the stands dominated by *Dodonaea viscosa* showed a complete absence of *P. roxburghii* and *Dichanthium annulatum.* The stands dominated by *Themeda anathera* showed a complete presence of *D. viscosa* only and no species showed a complete absence from all the stands which were dominated by *T. anathera.* The stands dominated by *Pinus roxburghii* showed a complete absence of *D. annulatum* and *F. palmata.* The stands dominated by *Dichanthium annulatum showed* a complete presence of *D. viscosa* and *T. anathera* and no species was completely absent. Ahmad (1986) reported similar results from some foothills of Himalayan Range in Pakistan.

The stands in which *Celtis eriocarpa* is the first dominant *D. viscosa, T. anathera* and *D. annulatum* had low (IV). The stands in which *Ficus palmata* is the first dominant, the mean (IV) of *D. viscosa* is lower than *T. anathera* and *D. annulatum.* The stands where *Dodonaea viscosa* is the first, second and third dominant, the maximum (IV) of *D. viscosa* is higher than *T. anathera.* The stands where *T. anathera* is second and third dominant, it had higher (IV) than *D. viscosa,* The stands in which *Pinus roxburghii* is second and third dominant, the mean (IV) of *P. roxburghii* was higher than *D. viscosa.* The stands in which *Dichanthium annulatum* is second dominant, the mean (IV) of it is higher than *D. viscosa* but the value of *T. anathera* is higher than *aannulaturn.*

The *Celtis-Dichanthium-Themeda* community showed the higher diversity and the highest species richness at 800 m while the *Celtis - Dichanthium - Themeda* community showed the lowest diversity and the lowest species richness at 1050 m. The *Dodonaea-Pinus-Themeda* community showed the highest diversity with low species richness (Table 4). Tareen and Qadir (1991) reported that total coverage and species diversity tended to be high in protected areas than un-protected areas of Quetta District. The ecological stability of community is related to species diversity, high species diversity mean higher stability of community. The complexity and stability of community are directly related to species richness and diversity (Odum 1971). The *Dodonaea-Pinus-Themeda* community is more stable at 1100 m than the other communities. The species diversity decreased for the *Ficus-Dichanthium-Themeda*, *Celtis-Dichanthium-Themeda, Micromenia-Themeda-Dodonaea* communities (Table 4). The highest equitibility was recorded for the *Celtis-Dichanthium-Themeda* community while the lowest equitibility for the *Ficus-Dichanthium-Themeda* community. The species maturity ranged from 39.93 to 53.36. The data show that the whole stand was disturbed as it showed the values less than 60. The two communities *Celtis-Dichanthium-Themeda* and *Dodonaea-Pinus-Themeda* alone are near to maturity showed 53.36 and 53.06 values, respectively (Table 4). Chaghtai *et al*. (1983) reported that among cool and comparatively wet sites. Hangu city stand has attained a highest degree of stability and maturity with a maturity index of 44.

The sunside of Mai Dhani Hill may be used to be a sub tropical chir pine forest as indicated by the presence of *Pinus roxburghii* (Hussain and Ilahi, 1991). The sunside of Mai Dhani Hill had a few trees and their (IV) are not too high. At the highest altitude of Mai Dhani Hill the *P. roxburghii* population is extremely low and conditions are not favourable for its establishment and biotic interference has contributed greatly for its degradation. It is also needs protection in the area. Since *P. roxburghii* is still surviving in the area, it might be assumed that this species dominated original vegetation. Plant species e.g., *Dodonaea, Ziziphus, Olea, Carissa, Maytenus* and grasses e.g., *Eriophorum, Aristida* are the indicators of sub-tropical vegetation. Malik *et al*. (1993) reported plant communities around the Bhirnber Hills, Azad Kashmir and found that such habitats have generally *Olea ferruginea as* one of the major components and communities present different degraded stages of sub-tropical forests. Removal of *Pinus* provides vacant niches to grass and sun-loving plants. The shrubs e.g. *D. viscosa* and *B. lycium* were present in herb layer and trees like *P. roxburghii* and *F. palmata* were present in the shrub layer (Table 2). Malik and Hussain (1990) reported similar findings in some parts of Kotli Hills, Azad Kashmir. The *Dodonaea viscosa* prefers dry habitat and leads to the formation of *Dodonaea* scrub (Salim and Shahid, 1973). The *Dodonaea* has always been an important component of the shrub vegetation harbouring low hills. It covers extensive tracts in the drier region (Abdulla, 1973; Brandis, 1911). *Acacia modesta* was a rare species at 800 m of Mai Dhani Hill. It can ascend up to 1000 m in the mountainous regions and associates with *Olea. A. modesta* and *O. ferruginea* have importance values of 6.06 & 15.16, respectively (Table 2) and are very limited species at Mai Dhani Hill and their regular use and deforestation might be one of the reasons for their reduced regeneration. Hussain and Baz (1996) reported that deforestation and overgrazing have suppressed the *Olea ferruginea* to shrubby and deformed habit. *A. modesta* was found on sandy loam soil. Malik and Hussain (1990) reported that *A. modesta* was found on the plains from 650 to 1000 m with sandy loam soil in the Kotli area. This tree is light demanding, drought

resistant species, used for afforestation on poor stony soils in the dry lower hills and plains (Khan, 1958). It needs more protection in this area. Hussain *et al*. (1993) reported that *Acacia modesta* was the most abundant and widely distributed tree species of tropical dry deciduous forest of Swabi District that exhibited high (IV) presumably due to protection as there is hardly any *Acacia* cover in the non orotectecl sites in the same area.

The area needs proper management and protection for the bioresources to survive. A lot of medicinal plants can be protected by conservation programmes and with the help of local inhabitants. The chemical nature of the medicinal plants can be known by the specific field tests if these plants are protected properly.

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