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VEGETATION STRUCTURE, EDAPHALOGY AND ETHNOBOTANY OF MAHABAN AND MALKA (DISTRICT BUNER) KPK, PAKISTAN

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Abstract

The vegetation structure and soil analysis of Mahaban and Malka of District Buner (KPK) Pakistan were studied in four consecutive years from 2011-2014. On the basis of important value index the dominated plant community was *Pinus roxburghii, Quercus incanna* and *Rhodendron arboreum* (PQR). A total of 91 species were collected belonging to 80 genera distributed in 44 families. The dominated life form classes were Hemicryptophyte and Therophyte shared (24.4%) of species, while the dominant classes based on the leaf size spectrum were Microphyll (34.4%), followed by Nanophyll (26.6%). The soil was mostly sandy with acidic pH, low organic matter and water content, further more the soil had low concentrations of $CaCo_3$ and K. *Mucuna nigricans* was collected first time from the District Buner. The ethnobotanical knowledge was also gained by interviewing the Hakeems and local elders.

Key words: Vegetation, Soil, Ethnobotany, Life form, Leaf size, Buner

Introduction

Pakistan has great diversity of flowering plants due to its varied climatic and edaphic factors. Nearly 6000 vascular plant species occur in Pakistan, among them four monotypic genera viz., *Douepia, Suleimania, Spiroseris, Wendelboa* and about 7.8% flora which mean 400 plant species are endemic to Pakistan (Shinwari & Shinwari, 2010). Many plant species are under threat of extinction due to over exploitation and once a species becomes extinct, it can never be restored (Rambo, 1989). Today ecological trends are of great concern in Pakistan due to different pressures, includes unplanned urbanization, deforestation and over exploitation of natural resources (Shinwari & Khan, 1999; Alam & Ali, 2009; Ali *et al*., 2012). The loss and degradation of natural forests decline the species number and genetic diversity of population (Afzal *et al*., 2001). Due to increase in population and high unemployment rate, local peoples are forced to use the forest resources for their needs, particularly the medicinal plants are extensively collected because they are not only used by themselves, but also sold in the local markets to earn their bread.

District Buner (KPK) had thick forests in the past, but due to over exploitation of natural resources the area is facing the same situation of losing economically important plant species by the activities of locals. Fast depletion of a rich diversity of plants due to urbanization, deforestation, overgrazing and over exploitation will lead to the ultimate loss of certain important plant species, the most common example in this regard is *Pinus roxburghii*, used for different purposes and apart from *Pinus* species several economically important plants of this area are continuously losing their abundance. To tackle this issue is not only to document the flora of entire district, but also to take safety measures for the conservation of those economically important plant species which were over exploited by anthropogenic activities and under threatening conditions.

Introduction to study area: The district Buner is enriched with unique Phyto-diversity due to its particular climate, geographical and geological conditions and highly varied altitudes range from 600 to 3000m. The whole region is surrounded by hills having pine trees. Locally Mahaban mean huge or dense forest which seems to be true, because the whole area is covered by thick forest. Mahaban & Malka are one of the beautiful mountainous sites of the district, mostly covered by green pine forests all around. The altitutde range from 800 to 2500m while the location of the study area is 34°-11 to 34°-34N latitude and 72°-13 to 72°-45 E longitudes. The study area falls in moist temperate zone. The climate is very moderate in summer and very harsh in winter, the average temperature in summer remains around 10-15°C for about 7 months of the year, while in winter the temperature is well below freezing. The climate is pleasant in summer and very harsh in winter. Wheat, Maize, Tobacco, Barley and Pulses are the major crops of the area, while the production of vegetables is low. Most people grow vegetables like a lady finger, tomato, potato, bean, onion, etc., on a small land for their personal use or some time sold in local markets. The common fruits of this area are apple, apricot, mulberry, fig and plum, while among dry fruits walnut and chilghoza are common. Phyto-geographically Buner is a part of Sino-Japanese region with unique flora (Fig. 1).

Materials and Methods

The study was conducted in the years 2011-2014. Point centered quarter method was used on slopes and peaks for the study of vegetation, while in the foothills and semi plain areas simple quadrat method was used to evaluate the vegetation structure. 15-20 random points were selected depending on the slope and exposure. For herbs quadrat size 2x4 ft was used in plain and gentle slopes while for shrubs 4x6 ft size was enough to evaluate the vegetation. 8 study sites were selected to find out the vegetation structure based on plain, slope, exposure, peak and vegetation distribution. The life form and leaf size spectrum were mostly noted in the field. For soil analysis depending on the area 10-15 cm deep samples were collected and stored in a labeled polythene bag. After removing the gravel, those samples were studied for textural class, sand, silt & clay proportion in terms of percentage, further more the soil was chemically analyzed for water content, organic matter, pH, Calcium carbonate and potassium concentration. All the species were identified using flora of Pakistan (Nasir & Ali, 1970-1979; Nasir & Ali, 1980-1989; Ali & Nasir, 1989-1992; Ali & Qaiser, 1993 till to date).

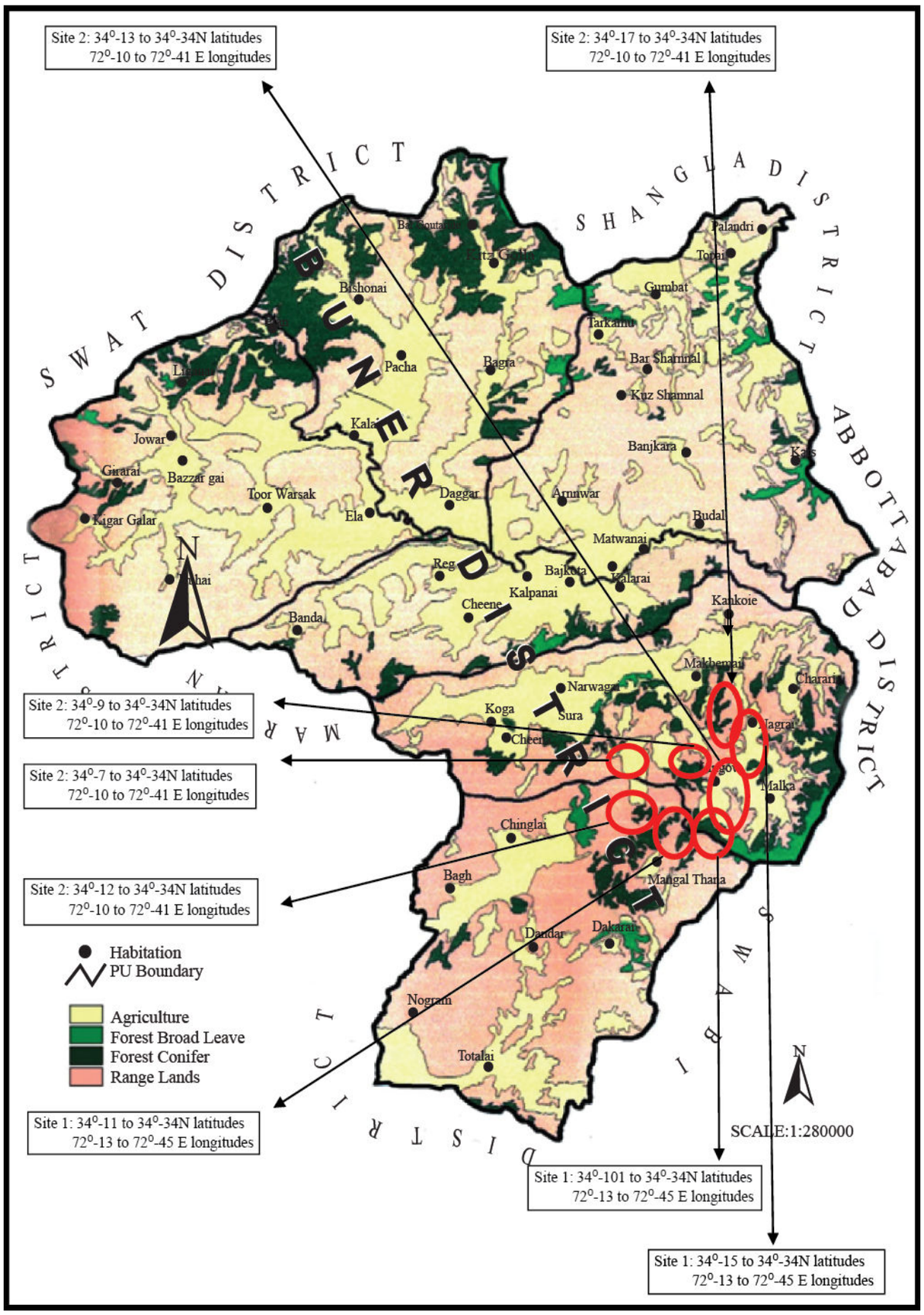

Fig. 1. Map of District Buner (KPK) Pakistan showing study sites.

Observation and Results

***Pinus roxburghii*, *Quercus incanna* and *Rhodendron arboreum* community (PQR):** It is the most fascinating community in mid Buner dominated by *Pinus roxburghii* (100.2) in dense forest form, under pine stories *Quercus incanna* (58.44) and *Rhododendron arboreum* (46.14) (Table 1).

Anthropogenic activities: Perhaps this is the only locality in mid Buner, which is remained undisturbed because the approach is still not easy due to less urbanization and roads. However, there are few sites where local inhabitants have disturbed the natural ecosystem in terms of illegal cutting of trees for fuel, construction and timber. There is a quota system applied by the forest department of Buner for cutting of appropriate number of trees for local consumption, but the timber mafia is very active in illegal cutting, moreover the locals are hired by the Hakeems from Punjab for the collection of medicinally important species to earn money.

Life forms classification of the collected species from Mahaban and Malka: On the basis of life form the collected species were classified into 08 classes. The most dominant classes were Hemicryptophyte and Therophyte shared (24.4%) fallowed by Nanophanerophyte (15.5%), Geophyte (14.4%), Phanerophyte (13.3%) and Chaemophyte (5.55%). The least represented classes were Megaphanerophyte and Mesophyte shared (1.11%), (Fig. 2)

Leaf size classification of the collected species from Mahaban and Malka: Based on leaf size the collected species were categorized into 5 classes. The largest class was Microphyll (34.4%), followed by Nanophyll (26.6%), Mesophyll had (21.1%), Leptophyll (14.4%) and the smallest class Macrophyll which was represented by (3.33%) only, (Fig. 3).

Ethnobotany of the collected species from Mahaban and Malka: Buner is a remote area of Khyber Pakhton Khwa Pakistan. The local population is usually dependent on herbal medicines and herbalists (Hakeems). However, the dependency on Hakeems in the District is reduced by the introduction of allopathic medicines. But still there are many areas where the plants are used by the locals as medicines. From the flora of Mahaban and Malka 86 species were reported as ethnobotanically important. In the past ethnobotanical studies in Buner on few localities were conducted by different workers on few localities. Khan *et al*. (2003) studied Gokand valley ethnobotanicaly, and reported about 138 species including 40 cultivated species, among 138 species 50 were used as fodder, 46 as fuel, 17 as vegetables, 17 as a medicine while the remaining as timber, fish poisoning and bee attractant. Humayun *et al*. (2006) explored Buner regarding utilization of medicinal herbs and traditional knowledge, they enlisted 70 species as medicinal herbs. The ethnobotanical study of Chagharzai valley was carried out by (Sher *et al*., 2011), total 216 species were reported, out of which 138 were listed as medicinal, 66 fodder, 51 species as fuel, 36 as vegetables & fruits, while the remaining were considered as timber, thatching and construction material.

This is the first attempt to analyze the ethnobotany of Mahaban and Malka of district Buner. During the study many elderly locals were interviewed to understand the medicinal application and also the exact local name of the medicinal plants (Table 2).

Edaphalogy: 3 Soil samples were collected from the study site, these samples were analyzed physically and chemically. The study revealed that in all the three samples the percentage of clay particles was more, the maximum value (71%) was recorded in sample 1 while the minimum value in sample 3, likewise the maximum value of sand particles was 39.2% in sample 3 and minimum 12.9% in sample 1, the silt particles were lower with a maximum 28 % in sample 2 and minimum 16.1% noted in sample 1. The soil textural class is variable, it was clay loam to loam or sandy loam. The organic matter was quite low, range from 10.2% to 15.1%, while the water content was maximum up to 35.4% in sample 1 and minimum 19.7% in sample 3. The pH was mostly acidic ranging from 6.8 to 7.3 the percentage of calcium carbonate was 25.9% to 32.3%, respectively, while potassium ranges from minimum100 to a maximum 190meq/l (Table 3).

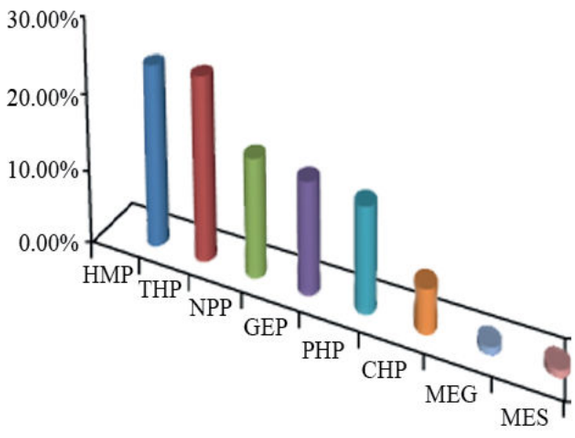

Fig. 2. Life form classes of the flora of Mahaban and Malka.

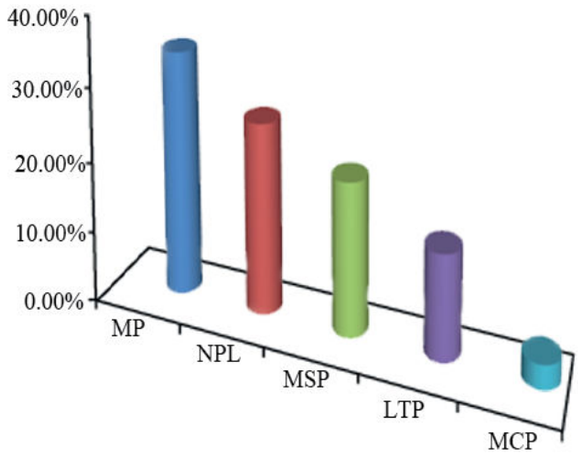

Fig. 3. Leaf size classes of flora of Mahaban and Malka.

Table 1. Quantitative Phytosociological attributes, habitat, life form and leaf size of the collected species from Mahaban and Malka.

S. No.	Species name	Family	Habitat	Life form	Leaf size	A.D	A.F	A.C	R. D	R.F	R.C	IVI
	Tree layer											
01.	*Aesculus indica* (Wall ex Camb.) Hk.f.	Hippocastanaceae	Gental slopy area	PHP	MSP	2.00	37.0	4.30	1.85	2.15	0.92	4.92
02.	*Ehretia laevis* Roxb.	Boraginaceae	Rocky shaded slopes	NPP	MIP	1.85	50.0	4.35	2.20	3.12	0.50	5.82
03.	*Elaeagnus umbellata* Thunb.	Elaeagnaceae	Moist slope	NPP	MIP	3.20	37.0	7.50	3.82	2.34	0.85	7.11
04.	*Ficus racemosa* L.	Moraceae	Misty canyon steep slope	PHP	MSP	12.8	66.0	2.70	3.30	4.82	2.55	10.67
05.	*Pinus roxburghii* Sargent	Pinaceae	Grassy, misty Steep slopes	MGP	LTP	10.0	100	1574	9.45	4.68	87.7	100.2
06.	*Quercus incanna* Roxb.	Fagaceae	Steep grassy slope	PHP	MSP	15.2	75.0	180.9	14.2	4.35	40.4	58.44
07.	*Rhodendron arboreum* Smith	Ericaceae	Moist shaded slopes	PHP	MSP	8.35	87.0	149.2	7.89	5.20	33.5	46.14
08.	*Rhus javanica* L.	Anacardiaceae	Field edges	PHP	MSP	9.35	37.0	4.30	11.0	2.93	0.55	14.48
09.	*Ziziphus jujuba* Mill.	Rhamnaceae	Dry rocky road side	NPP	MIP	6.10	50.0	7.50	5.80	2.90	1.65	10.35
10.	*Ziziphus nummularia* (Brum.f) Wight &Arn.	Rhamnaceae	Dry rocky slope, plain	NPP	MIP	2.30	30.5	2.10	3.00	2.40	1.90	6.90
	Shrub layer											
11.	*Asparagus adsundens* Roxb.	Asparagaceae	Rocky slope	GEP	LTP	10.5	60.5	4.35	9.40	2.90	0.23	12.53
12.	*Berberis lycium* Royle.	Berberidaceae	Shaded slope	NPP	NPL	1.50	50.0	4.35	1.91	2.43	2.84	7.18
14.	*Buxus wallichiana* Baill	Buxaceae	Moist rocky cliffs & moist canyon	PHP	NPL	2.20	50.0	2.50	2.62	3.12	0.82	6.48
15.	*Clematis grata* Wall.	Ranunculaceae	rocky slope	NPP	MSP	2.00	37.0	7.50	3.82	2.34	0.86	7.20
16.	*Colebrookea oppositifolia* Smith	Lamiaceae	Dry Rocky slope	NPP	MSP	0.85	37.0	1.85	1.00	2.34	0.20	3.54
17.	*Debregescia salicifolia* (D. Don.) Rendle.	Urticacreae	Rocky slopes, stream bank	NPP	MIP	2.20	37.0	3.70	2.64	2.32	0.41	5.37
18.	*Dodonea viscosa* (L.) Jacq.	Sapindaceae	Dry rocky slopes	PHP	MIP	2.20	50.0	2.70	2.63	3.12	0.29	6.10
19.	*Ficus sarmentosa* Ham.ex Smith.	Moraceae	Shaded rock cervices	PHP	MSP	3.00	66.0	5.50	3.50	4.80	5.20	13.5
20.	*Hedera nepalensis* K. Koch.	Araliaceae	Shaded slope, plain	MSP	MSP	9.35	37.0	4.30	11.0	2.93	0.55	14.48
21.	*Indigofera atropurpurea* Buch-Ham. ex Horn.	Papilionaceae	Dry grassy slope	NPP	LTP	1.30	55.0	3,87	1.31	3.40	0.72	5.43
22.	*Jasminum humile* (D. Don) Grhmn.	Oleaceae	Moist shaded slope, plain	NPP	MIP	5.50	66.0	11.0	5.55	4.00	2.12	11.67
23.	*Lespedeza juncea* (L. F.) Person.	Papilionaceae	Misty slope	THP	MIP	0.10	10.0	1.29	0.10	0.65	0.22	0.97
24.	*Mallotus philippensis* (Lam.) Mull.	Euphorbiaceae	Dry slopes, grassy slopes	PHP	MSP	12.5	75.0	16.5	12.0	4.30	3.70	20.0
25.	*Monotheca buxifolia* (Falc.) A. DC.	Sapotaceae	Dry rocky slope	PHP	MIP	10.2	50.0	5.00	8.25	2.35	7.33	17.93
26.	*Mucuna nagricans* (Lour.) Steud.	Papilionaceae	Shade slope	HMP	MCP	170	62.0	3.70	2.20	4.05	3.45	9.70
27.	*Reinwardtia trigyna* (Roxb.) Planch.	Linaceae	Forest floor	GEP	MSP	3.20	37.0	7.50	3.82	2.34	0.85	7.11
28.	*Sarcococca salinga* (D. Don) Muell.	Buxaceae	Moist steep slope	PHP	MIP	6.61	100	13.8	5.80	4.80	0.80	11.4
29.	*Strobilanthes wallichii* Ness.	Acanthaceae	Dry slope	NPP	MSP	5.50	66.0	11.0	5.55	4.00	2.12	11.67
30.	*Viburnum grandiflorum* Wall. ex DC.	Caprifoliaceae	Stream bank	PHP	NPL	5.10	50.0	9.40	4.90	2.88	2.03	9.81
	Herb layer											
31.	*Achillea millefolium* L.	Asteraceae	Forest foothill	HMP	LTP	0.60	50.0	1.33	0.51	2.32	0.06	2.89
32.	*Actaea spicata* L.	Ranunculaceae	Shaded slope	THP	MIP	2.85	33.5	6.85	2.80	2.02	1.32	6.14
33.	*Adiantum capillus veneris* L.	Adiantaceae	Crevices of shaded moist rocks	HMP	770m	0.70	50.0	3.70	0.60	2.90	0.81	4.31
34.	*Adiantum raddianum* L.	Adiantaceae	Shaded rocks	HMP	NPL	6.70	62.0	3.30	6.30	3.56	0.69	10.55
35.	*Aegopodium alpestre* Ledb.	Apiaceae	Misty slope	THP	MIP	1.00	50.0	5.00	0.90	2.90	1.00	4.80
36.	*Ajuga bracteosa* Wall.ex. Benth.	Lamiaceae	Grassy peak plain	THP	MIP	0.20	20.0	1.20	0.20	1.40	0.25	1.85
37.	*Ajuga parviflora* Benth.	Lamiaceae	Misty rocky area	THP	MIP	0.50	37.0	4.35	1.82	2.00	0.75	4.57
38.	*Allium tripterum* E. Nasir.	Alliaceae	Foothill	GEP	MIP	1.20	37.0	3.10	0.97	2.02	0.52	3.51
39.	*Alternanthera pungens* Kunth.	Amaranthaceae	Foothill	CHP	MIP	2.85	50.0	1.73	1.41	2.71	0.30	4.42
40.	*Anagallis arvensis* L.	Primulaceae	Moist shaded places	THP	LTP	4.20	60.5	8.50	3.45	3.35	1.50	8.30
41.	*Anaphalis margaritacea* (L.) Benth.	Asteraceae	Moist roadside	HMP	NPL	1.35	37.0	3.70	4.10	3.30	4.10	11.59
42.	*Apluda mutica* L.	Poaceae	Dry foot hills	HMP	NPL	2.00	37.0	4.30	1.88	2.16	0.93	4.97
43.	*Aquilegia moorcroftiana* Wall. ex Royle	Lamiaceae	Grassy gentle slope	HMP	MIP	2.80	33.0	6.80	2.80	2.02	1.31	6.13
44.	*Arisaema jacquemontii* Blume	Araceae	Steep grassy slope	GEP	MSP	1.30	55.0	3.85	1.33	3.40	0.74	5.47
45.	*Aristida adscensionis* L.	Poaceae	Shaded wasteland	HMP	NPL	3.85	37.0	5.00	3.15	2.02	0.85	6.00
46.	*Artemisia scoparia* Waldst & Kit.	Asteraceae	Dry rocky slope	CHP	MIP	0.85	37.0	0.05	0.70	2.00	0.02	2.72

Table 1. (Cont'd.).

S. No.	Species name	Family	Habitat	Life form	Leaf size	A.D	A.F	A.C	R. D	R.F	R.C	IVI
47.	*Artemisia vulgaris* L.	Asteraceae	Dry grassy slope	CHP	MIP	170	62.0	3.70	2.20	4.05	3.45	9.70
48.	*Asparagus filicinus* D. Don.	Asparagaceae	Moist canyon area	GEP	LTP	5.00	75.0	10.0	4.30	3.50	0.54	8.34
49.	*Asparagus officinalis* L.	Asparagaceae	Rocky shaded area	GEP	LTP	1.70	87.0	4.00	1.50	4.10	0.20	5.80
50.	*Asplenium cetarch* L.	Aspleniaceae	Under shaded rocks	HMP	LTP	2.30	30.5	2.10	3.00	2.40	1.90	6.90
51.	*Asplenium trichomanes* L.	Aspleniaceae	Shaded moist places	HMP	LTP	1.80	60.0	2.35	2.40	2.04	2.15	6.59
52.	*Barleria cristata* L.	Acanthaceae	Rocky slope	CHP	NPL	2.50	75.0	6.20	3.20	4.90	5.80	13.9
53.	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae	Cliffs cervices	HMP	MSP	5.50	66.0	11.0	5.55	4.00	2.12	11.67
54.	*Bistorta amplexicaulis var. amplexicaulis* (D.) Don	Polygonaceae	Sloppy forest floor	THP	MSP	7.60	75.0	15.0	7.75	3.61	2.85	14.21
55.	*Cenchrus ciliaris* L.	Poaceae	Wheat field	HMP	NPL	2.20	37.0	1.20	2.60	2.32	0.12	5.40
56.	*Chrysopogon aucheri* (Boiss.) Stapff	Poaceae	Dry rocky exposed slope	HMP	NPL	3.85	62.0	1.50	4.53	3.90	0.50	8.93
57.	*Conyza bonariensis* (L.) Cronquist	Asteraceae	Foothill	THP	NPL	2.20	50.0	2.70	2.61	3.11	0.29	6.10
58.	*Cirsium falconeri* Mill.	Asteraceae	Disturbed land	THP	NPL	2.60	37.0	1.87	3.00	2.34	0.20	5.54
59.	*Cyperus rotundus* L.	Cyperaceae	Near stream	HMP	LTP	3.80	62.0	4.40	4.55	3.90	0.50	8.95
60.	*Dicliptera verticillata* (Forssk.) Christens.	Acanthaceae	Stream bank	CHP	NPL	3.85	37.0	1.50	4.55	2.34	0.16	7.50
61.	*Dryopteris felix mas* (L.) Schott.	Pteridaceae	Moist forest floor	HMP	NPL	3.85	37.0	1.50	4.55	2.35	0.16	7.60
62.	*Duchesnea indica* (Andrews.) Focke.	Rosaceae	Shaded stream beds	HMP	NPL	0.85	25.0	1.85	1.00	1.55	0.20	2.75
63.	*Duthiea bromoides* Hack.	Poaceae	Road side	HMP	NPL	1.85	50.0	4.35	2.20	3.12	0.50	5.82
64.	*Echium plantagineum* L.	Boraginaceae	Peak top	THP	MIP	2.00	62.0	11,80	2.25	3.90	1.35	7.50
65.	*Eulaliopsis binata* (Retz.) C. E. Hubbard	Poaceae	Rock cervices near stream	HMP	NPL	1.70	50.0	1.70	1.40	2.70	0.20	4.30
66.	*Gallium aparine* L.	Rubiaceae	Filed edges in bushe	THP	NPL	0.70	33.0	1.80	0.85	2.40	1.70	4.95
67.	*Geranium lucidum* L.	Geraniaceae	Moist shaded foothill	HMP	MIP	2.80	62.0	5.20	3.70	4.05	4.85	12.5
68.	*Geum elatum* Wall. ex G. Don	Rosaceae	Shaded stream	HMP	MIP	2.50	50.0	9.70	2.92	3.90	1.26	8.80
69.	*Heracleum canescens* Lindl.	Apiaceae	Forest foot	THP	MIP	0.50	25.0	1.24	0.40	1.35	0.20	1.95
70.	*Hypericum perforatum* L.	Guttiferae	Wasteland	HMP	LTP	0.10	10.0	1.20	0.10	0.65	0.22	0.97
71.	*Hypodemaatium crenatum* Forsk.	Pteridaceae	Stream bank	GEP	LTP	3.50	50.5	6.65	3.57	3.40	1.30	8.27
72.	*Imperata cylindrica* L.	Poaceae	Dry rocky slope	GEP	NPL	7.00	44.0	33.0	7.00	2.70	0.60	10.3
73.	*Indigofera heterantha var. heterantha* (Brandis.) Baker	Papilionaceae	Dry rocky slope	NPP	LTP	4.20	77.0	8.50	4.20	4.75	1.61	10.56
74.	*Lamium album* L.	Lamiaceae	Grassy gentle slope	THP	MIP	0.65	55.0	2.30	0.62	3.40	0.40	4.41
75.	*Malva verticillata* var. *verticillata* L.	Malvaceae	Moist foothill	THP	MIP	3.35	75.0	85.0	3,40	3.60	16.0	23.0
76.	*Mentha longifolia* (L.) Huds.	Lamiaceae	Shaded stream beds	GEP	MIP	1.60	50.0	3.35	1.62	2.40	0.61	4.63
77.	*Origanum vulgare* L.	Lamiacae	Dry slope	HMP	MCP	10.5	60.5	4.35	9.40	2.90	0.23	12.53
78.	*Paeonia emodi* Wall.ex Royle	Paeoniaceae	Misty forest floor	GEP	MSP	5.00	75.0	10.0	4.30	3.50	0.54	8.34
79.	*Plantago major* L.	Plantaginaceae	Wheat field	GEP	MSP	1.70	87.0	4.00	1.50	4.10	0.20	5.80
80.	*Poa infirma* L.	Poaceae	Wet fields	THP	NPL	1.80	60.0	2.35	2.40	2.04	2.15	6.59
81.	*Potentilla argentea* L.	Rosaceae	Moist slope	THP	NPL	2.30	30.5	2.10	3.00	2.40	1.90	6.90
82.	*Potentilla nepalensis* Hook.	Rosaceae	Moist grassy peak	THP	NPL	2.50	75.0	6.20	3.20	4.90	5.80	13.9
83.	*Pteridium aquilinium* (L.) Kuhn.	Pteridaceae	Stream bank	GEP	MIP	3.50	50.5	6.65	3.57	3.40	1.30	8.27
84.	*Ranunculus sceleratus* L	Ranunculaceae	Stream bank	THP	MSP	1.85	50.0	4.35	2.20	3.12	0.50	5.82
85.	*Rumex dentatus* L.	Polygonaceae	Dry rocky slope, rock cervices	THP	MIP	2.30	30.5	2.10	3.00	2.40	1.90	6.90
86.	*Skimmia laureola* (Candolle) Sieb.& Zuk. ex Walp.	Rutaceae	*Pinus* forest floor	NPP	MSP	1.50	50.0	4.35	1.91	2.43	2.84	7.18
87.	*Tragopogon gracilis* D. Don	Asteraceae	Moist rocky surface in moss	THP	MIP	3.60	33.0	3.30	1.75	1.61	0.85	4.19
88.	*Tussilago farfara* L.	Asteraceae	Shaded slope	NPP	MCP	2.00	35.5	3.50	1.71	1.75	0.20	3.66
89.	*Valeriana jatamansi* Jones	Valerianaceae	Shaded forest floor	GEP	MIP	5.00	75.0	10.0	4.40	3.50	0.54	8.44
90.	*Verbena bonariensis* L.	Verbenaceae	Moist land, pasture	THP	NPL	5.00	75.0	10.0	4.30	3.50	0.54	8.34
91.	*Viola canescens* Wall ex. Roxb.	Violaceae	Moist shaded slopes, rocks, stream bank	THP	MIP	1.20	75.0	1.60	1.03	4.00	0.10	5.13

Key: HMP: Hemicryptophyte, THP: Therophyte, PHP: Phanerophyte, GEP: Geophyte, NPP: Nanophanerophyte, CHP: Chaemophyte, MGP: Megaphanerophyte, LTP: Leptophyll, MIP: Microphyll, NPL: Nanophyll, MSP: Mesophyll, MCP: Macrophyll, A.D: Absolute density, A.F: Absolute frequency, A.C: Absolute cover, R.D: Relative density, R.F: Relative frequency, R.C: Relative cover., IVI: important value insex.

Table 2. Ethnobotany of the collected species form Mahaban and Malka of district Buner.

S. No.	Binomial	Family	Local name	Part used	Ethnobotany
1.	*Achillea millefolium* L.	Asteraceae	Jarai	Leaves	Juice of leaves is effective in fever, indigestion, blood pressure and healing wounds, also used in women's diseases
2.	*Actaea spicata* L.	Ranunculaceae	Kaya	Fruit	Fruits used in asthma
3.	*Adiantum capillus veneris* L.	Adiantaceae	Sumbal	Leaves	Past of leaves used as antidote, antiasthma and as a shampoo as well
4.	*Adiantum raddianum* L.	Adiantaceae	Sumbal	Leaves	Paste of leaves used as antidote in snake bite
5.	*Aegopodium alpestre* Ledb.	Apiaceae	Kamasla	Whole plant	Convert milk into curd also used as fodder
6.	*Aesculus indica* (Wall ex Camb.) Hk.f.	Hippocastanaceae	Jawaz	Whole plant	The fruits are effective in colic pain in domestic animals, timber, handles for agricultural tools and construction
7.	*Ajuga bracteosa* Wall.ex. Benth.	Lamiaceae	Khwaga botay	Whole plant	Leaf decoction used in kidney pain, powder form used against ulcer and jaundice, juice of boiled leaves used in abdomen pain, blood purification, cooling agent and stomach disorders
8.	*Ajuga parviflora* Benth.	Lamiaceae	Tarkha botay	Whole plant	Juice of leaves effective in ulcer, throat infection, also helpful in jaundice
9.	*Alternanthera pungens* Kunth.	Amaranthaceae	Unknown	Whole plant	Plant used as fodder
10.	*Anagallis arvensis* L.	Primulaceae	Udi guly	Whole plant	Paste of leaves used in skin disorders and healing wounds and inflammation
11.	*Anaphalis margaritacea* (L.) Benth.	Asteraceae	Unknown	Whole plant	Used as fodder
12.	*Apluda mutica* L.	Poaceae	Wakha	Whole plant	Used as fodder
13.	*Aquilegia moorcroftiana* Wall. ex Royle	Lamiaceae	Udi guly	Whole plant	Juice is used in asthma, cough, stimulant and in jaundice
14.	*Arisaema jacquemontii* Blume.	Araceae	Marjarai	Rhizome	Poisonous but some time tiny piece of bulb is put in sweets or bread and engulf to decrease the sugar level very effectively
15.	*Aristida adscensionis* L.	Poaceae	Wakha	Unknown	Used as fodder
16.	*Artemisia scoparia* Waldst & Kit.	Asteraceae	Tarkha boty	Leaves	Juice of leaves used for skin disorders, the juice is also used in fever and skin disorders
17.	*Artemisia vulgaris* L.	Asteraceae	Tarkha	Leaves	Leaves juice is used in skin irritation and decoction used as anthelmentic.
18.	*Asparagus adsundens* Roxb.	Asparagaceae	Shin lakhty	Root	Root is used both in powder and fresh form in Epilepsy and also improves breast size in women
19.	*Asparagus filicinus* D. Don	Asparagaceae	Shin lahkty	Shoots	Fresh shoots used as vegetable
20.	*Asparagus officinalis* L.	Asparagaceae	Shal gutte	Rhizome	Rhizome is well known as laxative, diuretic, juice of rhizome used for dysentery and diarrhea, also as tonic
21.	*Asplenium cetarch* L.	Aspleniaceae	Unknown	Whole plant	Ornamental
22.	*Asplenium trichomanes* L.	Aspleniaceae	Unknown	Whole plant	Ornamental
23.	*Barleria cristata* L.	Acanthaceae	Azghaky	Leaves	Juice of leaves used in fever
24.	*Berberis lycium* Royle	Berberidaceae	Ziyar largay	Whole plant	Whole plant before spring is uprooted the yellow roots are dried and converted into powder form some time mixed with butter and honey, used as an excellent pain killer and tied over fractures, healing all kinds of wounds, bark is effective in ulcer and carminative as well
25.	*Bergenia ciliata* (Haw.) Sternb.	Saxifragaceae	Ghata panra	Root	Dried roots are powdered and used for muscles pain, also antidiabetic, as tonic, expectorant and paste of powder as sun block cream
26.	*Bistorta amplexicaulis* (D. Don) Green var. *amplexicaulis*	Polygonaceae	Tarwa panra	Rhizome	Tea is made from rhizome to cure fever, powdered rhizome is effective in gout and rheumatism and cure ulcer
27.	*Buxus wallichiana* Baill.	Buxaceae	Ladar	Branches	Branches are used as packing material for fresh fruits
28.	*Cenchrus ciliaris* L.	Poaceae	Pesholakay	Culms	Fresh and dried grass are used as fodder
29.	*Chrysopogon aucheri* (Boiss.) Stafp	Poaceae	Barwaza	Fresh leaves	Fresh leaves are dried and spread inside room floor to keep the room warm in winter
30.	*Clematis grata* Wall.	Ranunculaceae	Zelaye	Leaves	Juice made from leaves is used in jaundice, ulcer, also used as insect killer, against cough and febrifuge
31.	*Colebrookea oppositifolia* Smith.	Lamiaceae	Banasa	Roots, leaves	Paste of fresh leaves tide on wounds, while roots decoction is effective in epilepsy.
32.	*Conyza bonariensis* (L.) Cronquist	Asteraceae	Malooch	Whole plant	Used as fodder
33.	*Cirsium falconeri* Mill.	Asteraceae	Bangi	Seeds, leaves	Leaves juice used as diuretic, tonic, extract of seeds effective in liver disorders, also edible as vegetable.
34.	*Cyperus rotundus* L.	Cyperaceae	Deela	Rhizome	A powder made from the rhizome is effective in chest infection, cold, cough and women's issues in menstrual
35.	*Debregescia salicifolia* (D. Don.) Rendle.	Urticaceae	Ajalai	Whole plant	Fruits are used in stomach pain, fodder and fuel wood
36.	*Dicliptera verticillata* (Forssk.) Christens	Acanthaceae	Kirachy	Shoot	Shoot is used as tonic and also fodder
37.	*Dodonea viscosa* (L.) Jacq.	Sapindaceae	Ghwarasky	Whole plant	Paste of fresh leaves applied on cuts and wounds for quick healing, also as major source of fuel, used also as fencing and on roofs of houses made from mud
38.	*Dryopteris felix mas* (L.) Schott.	Pteridaceae	Gunjaye	Fronds	Fresh fronds used as vegetable
39.	*Duchesnea indica* (Andrews.) Focke.	Rosaceae	Shahtoot	Fruit	Fruits are eaten as a laxative
40.	*Duthiea bromoides* Hack.	Poaceae	Wakha	Culms	Used as fodder
41.	*Echium plantagineum* L.	Boraginaceae	Unknown	Unknown	No usage reported
42.	*Ehretia laevis* Roxb.	Boraginaceae	Ghada boty	Whole plant	Leaves extract is used in throat infections, as tooth paste, root powder is used in menstruation days of women
43.	*Elaeagnus umbellata* Thunb.	Elaeagnaceae	Silvery	Fruits	Fruit is used as cardiac stimulator
44.	*Eulaliopsis binata* (Retz.) C.E. Hubbard	Poaceae	Wakha	Culms	Used as fodder both fresh and in stored form

Table 2. (Cont'd.).

S. No.	Binomial	Family	Local name	Part used	Ethnobotany
45.	*Ficus racemosa* L.	Moraceae	Enzar	Figs	Figs very effective in digestion, bark is used in bile and also promotes spermatogenesis
46.	*Ficus sarmentosa* Ham.ex Smith.	Moraceae	Enzar	Shoot	Used as fodder
47.	*Gallium aparine* L.	Rubiaceae	Jishay	Shoot	The Juice made from a herb is used on cuts, wounds and eczema
48.	*Geranium lucidum* L	Geraniaceae	Sorr boty	Whole plant	An extract of the plant is used in dysentery and diarrhea
49.	*Geum elatum* Wall. ex G. Don	Rosaceae	Toktoko	Whole plant	Paste of plant is used in skin burning
50.	*Hedera nepalensis* K. Koch.	Araliaceae	Lopay panra	Leaves	Leaf juice is used as stimulant, in abdominal pain and purgative, fruit juice also used in high blood pressure
51.	*Heracleum canescens* Lindl.	Apiaceae	The ghar Dhanya	Whole plant	Decoction used in nervous problems and sexual disorders, plant is used as fodder as well
52.	*Hypericum perforatum* L.	Hypericaceae	Shin chai	Leaves, flower	Plant leaves are effective astringent and strong diuretic, flower paste is used in piles and uterus contraction
53.	*Imperata cylindrica* L.	Poaceae	Kahay	Culms	Powder made from rhizome used is as diuretic and febrifuge, also used as fodder.
54.	*Indigofera atropurpurea* Buch-Ham. ex Horn.	Papilionaceae	Ghouraja	Whole plant	Some time cultivated for beautification
55.	*Indigofera heterantha* var. *heterantha* (Brandis.) Baker	Papilionaceae	Ghouraja	Leaves wood	Leaves are used as antiseptic, wood ash is also used as snuff
56.	*Jasminum humile* (D. Don) Grhmn.	Oleaceae	Rambail Chambail	Shoot	Young shoots are used to make herbal tea effective in depression and against ring worms
57.	*Lamium album* L.	Lamiaceae	Unknown	Leaves	Leaf juice is used in liver disorders
58.	*Lespedeza juncea* (L. F.) Person.	Papilionaceae	Oormary	Leaves	Past of leaves as an antiseptic and a decoction is used against ring worms
59.	*Mallotus philippensis* (Lam.) Mull.	Euphorbiaceae	Kambella	Whole plant	Powder of roots is used as antibacterial, anthelmintic, also used extensively as fuel wood
60.	*Malva verticillata* var. *verticillata* L.	Malvaceae	Panirak	Leaves	Fresh leaves are used as a laxative and vegetable
61.	*Mentha longifolia* (L.) Huds.	Lamiaceae	Waylany	whole plant	Dried leaves mixed with curd used for constipation, indigestion, pain, leaves used as condiment, also herbal tea made from leaves is digestive and control vomiting
62.	*Monotheca buxifolia* (Falc.) A. DC.	Sapotaceae	Ladara	Whole plant	Fruit is edible, also used as fencing and fuel wood
63.	*Origanum vulgare* L.	Lamiaceae	Shmakay	Shoot	The juice of leaves and young shoots is very effectively used against malaria and also as antiseptic
64.	*Paeonia emodi* Wall. ex H. K. f.	Paeoniaceae	Mamekh	Rhizome	Paste of rhizome is effective in backache, also removes weakness, boiled juice is used in blood purification
65.	*Pinus roxburghii* Sargent		Nkhtatar	Whole plant	Gum is collected to make medicines for women after delivery , Seeds are eaten, and wood is used in furniture, fuel, needles are used in thatching, also cultivated as ornamental
66.	*Plantago major* L.	Plantaginaceae	Jabai	Leaves, seeds	Paste of leaves is used in healing wounds, juice of leaves is astringent and also used in constipation with curd
67.	*Poa infirma* L.	Poaceae	Shamokha	Whole plant	Important fodder for domestic cattles
68.	*Potentilla argentea* L.	Rosaceae	Kunchi	Root	Root powder is used for blood purification and paste is used as cosmetics as well
69.	*Potentilla nepalensis* Hook.f.	Rosaceae	Kunchi	Fruit	The fruit is edible and digestive
70.	*Pteridium aquilinium* (L.) Kuhn.	Pteridaceae	Hatoye	Fronds	Fresh fronds are cooked as digestive vegetable and old one are used as a thatching material
71.	*Quercus incanna* Roxb.	Fagaceae	Spin banj	Wood	Wood is used as timber and fuel
72.	*Ranunculus sceleratus* L.	Ranunculaceae	Jaghagha	Leaves	Poisonous but leaves are used as purgative
73.	*Reinwardtia trigyna* (Roxb.) Planch.	Linaceae	Basnt	Leaves	Fresh leaves tide on wounds in domestic animals
74.	*Rhododendron arboreum* Smith	Ericaceae	Gul Namer	Whole plant	Flowers are collected for nectar, wood is used as fuel and also cultivated for beautification.
75.	*Rhus javanica* L.	Anacardiaceae	Titray	Fruit	The fruit is edible and laxative.
76.	*Rumex dentatus* L.	Polygonaceae	Shalkhay	Leaves, shoot	Leaves are effective astringent and diuretic, very helpful in irritation and allergies.
77.	*Sarcococca saligna* (D. Don) Muell.	Buxaceae	Lodanar	Leaves, flower	The Juice of leaves is good laxative and blood purifier, paste of flowers used against muscles pain
78.	*Skimmia laureola* (Candolle.) Sieb.& Zuk. ex Walp.	Rutaceae	Nazar panra	Leaves	Leaf paste is effective in smallpox, generally smoke is used to avoid the devils
79.	*Tragopogon gracilis* D. Don	Asteraceae	Unknown	Capitula	Powder made from capitula mixed with milk to form used as cosmetics
80.	*Tussilago farfara* L.	Asteraceae	Watapan	Leaves	Juice made from of leaves is used for cough and asthma
81.	*Valeriana jatamansi* Jones	Valerianaceae	Mushk	Rhizome	Powder made from rhizome is used in digestive problems, in fever, also as aromatic and also for uncontrolled urine flow in kids, as well as carminative
82.	*Verbena bonariensis* L.	Verbenaceae	Unknown	Leaves	Leaves juice is used as stimulant, diuretic, also effective in dysentery and diarrhea
83.	*Viburnum grandiflorum* Wall. ex DC.	Caprifoliaceae	Meva	Whole plant	Fruits are edible used in stomach disorders and branches as fuel wood
84.	*Viola canescens* Wall ex Roxb.	Violaceae	Banafsha	Whole plant	The plant is used as diaphoretic, febrifuge, flowers are used in epilepsy and nervous problems and paste against eczema
85.	*Ziziphus jujuba* Mill.	Rhamnaceae	Baira	whole plant	Fruit is used in stomach disorders, cold, cough, flu, juice of leaves is used in depression, ulcer and blood purification, honey is also collected
86.	*Ziziphus nummularia* (Brum.f) Wight & Arn.	Rhamnaceae	Karkunda	leaves, fruit	Fruit is laxative, leaves juice is used as cooling agent

Table 3. Physical and chemical characteristics of the soil collected from the community.

Plant community	Soil samples	Sand %	Silt %	Clay %	T.C	O.M %	W.C %	PH	$CaCo_3$ %	K meq/l
Pinus roxburghii, Quercus incana & *Rhododendron arboretum*	01	12.9	16.1	71.0	C.L	10.2	35.4	7.3	32.3	190
	02	21.0	28.0	51.0	L	15.1	30.1	6.8	29.7	100
	03	39.2	16.8	44.0	SD.L	11.9	19.7	7.0	25.9	130

Key: Sd: Sand, S: Silt, C: Clay, T.C: Textural class, C.L: clay loam, L: loam, SDL: sandy loam, O.M: Organic matter, W.C: Water content, K: Potassium

Discussion

Buner is a rural district of KPK, Pakistan, the total covered area of the district is 1760sqkm. Mahaban and Malka is located in mid Buner, it is the third peak point of the district having altitude up to 2500m. Floristically the areas were studied for vegetation structure, physiochemical analysis of soil and ethnobotanically as well. Both the areas are covered by big hills all around mostly by *Pinus* trees. A total of 91 species were collected belonging to 80 genera distributed in 44 families, the dominant families in the study areas were Asteraceae represented by 8 species, followed by Lamiaceae 7 species, Poaceae 6 species while the number of Papilionaceae species was 4 only. The dominant genus is *Asparagus* represented by 3 species, followed by *Adiantum, Ajuga, Artemisia, Asplenium, Ficus, Potentilla* and *Zizyphus* each having 2 species. A homogenous dominant community in the areas based on important value index was *Pinus roxburghii* (100.2), *Quercus incanna* (58.44) and *Rhododendron arboreum* (46.14) mostly on habitats like grassy slopes, peaks, canyon and gentle slopes as well. The ground flora is badly damaged by overgrazing, urbanization and fuel activities. The shrub layer was dominated by *Mallotus philippensis* (20.0), *Montheca buxifolia* (17.93) and a creeper *Hedera nepalensis* having (14.48) important value index, common in habitats like rocky slopes, canyon, shaded and misty areas, grassy slopes and exposed areas, while the herbaceous layer was dominated by *Malva verticillata* (23.0), *Bistorta amplexicaulis* (14.21) and *Barleria cristata* (13.9) near streams, shady and misty slopes, rocky slopes and cultivated fields.

Bio-spectrum showed that the dominant classes were Hemicryptophyte and Therophyte represented by 24.4%, while the least represented classes were Megaphanerophyte and Mesophyte equally share 1.1% only, while the largest leaf size class was Microphyll represented by 34.4% and smallest class was Macrophyll which was represented by 3.33%. Ethnobotanically 86 species are reported which were classified into 8 classes, Medicinal class is the largest having 54 species, followed by fodder class 14 species, fuel, fencing and thatching class having 12 species, edible class has 8 species and finally 1 poisonous species is *Arisaema jacquemontii*. For physiochemical analysis of soil, samples were collected 10-15cm below soil surface in a polythene bag, the soil showed less variation as clay loam to loam and sandy loam, mostly the clay particles dominated the soil type having maximum value 71.0% in soil sample 1 and minimum 44.0% in sample 3, while silt and sand particles showed a little variation in terms of percentage. The organic matter is on the lower side having maximum value 15.1% in soil sample 2 and a minimum 10.2 % in sample 1, likewise the high water holding capacity 35.4% was noted in soil sample 1 and the lowest 19.7 % in sample 3. Predominantly the pH is acidic the average value is 7.3, while the percentage of Calcium carbonate showed minor variation with maximum 32.2% in sample 1 and 25.9% in soil sample 3, and finally the Potassium ranging high from 190meq/l in soil sample 1 to lowest 100meq/l in sample 2.

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