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ECO-TAXONOMIC STUDIES OF CHAGHARZAI VALLEY DISTRICT BUNER (KHYBER PAKHTUNKHWA) PAKISTAN

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Abstract

Eco-taxonomic and ethnobotanical studies were conducted in a Chagharzai valley of District Buner (KPK) Pakistan in four consecutive years 2011-2014. During this study a total of 127 species belonging to 108 genera, distributed in 34 families were identified. The dominant community of the valley was *Pinus roxburghii, P. wallichiana* and *Quercus incanna* based on importance value index. The IVI of *Pinus roxburghii* was (100.9), followed by *Pinus wallichiana* (91.58) and under story species *Quercus incanna* (64.45). Bio-spectrum, leaf size classification of all the species was recorded. The soil of the study area showed a variation from sandy to loam or clay as well with acidic pH, low organic matter, water holding capacity and Calcium carbonate while potassium is recorded up to 150 Meq/lit in soil sample 3. The ethnobotanical study was carried out by interviewing the local elders and herbalists (Hakeems), during this study 60 ethnobotanically important species were recorded.

Key words: Buner, Eco-taxonomy, Phytosociology, Soil analysis, Ethnobotany

Introduction

Eco-taxonomy deals with the study of an area both ecologically and taxonomically and also to gather the informatory knowledge about the collected specimens, in order to make a checklist of endangered, endemic and economically important plant species of the area. Ecological parameters include density, abundance, frequency, association between species, dominance of different species and analysis of soil.

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 (Ali & Qaiser, 1986). Many plant species are under threat of extinction due to over exploitation and once a species becomes extinct it is extinct forever, it can never be restored (Rambo, 1989). Today ecological trends is of great concern in Pakistan due to different pressures, includes unplanned urbanization, deforestation and over exploitation of natural resources (Alam & Ali, 2009; Shinwari & Shinwari, 2010; Ali *et al*., 2012). The loss and degradation of natural forests results in decline of species number and genetic diversity of population (Afzal *et al*., 2001). Due to increase in population and a high unemployment rate, local people are forced to use the forest resources for their needs. The medicinal plants are not only used by themselves, but also sold in the local markets to earn their bread. Furthermore, marble mining, fuel, timber, agriculture, urbanization and grazing are the main factors in deforestation, which leads to great loss of natural habitat of plants and so ecological balance, is disturbed.

District Buner (KPK) had thick forests in the past, but due to poor attention on 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 marble mining, urbanization, deforestation, overgrazing and over exploitation will lead to the ultimate loss of certain important plant species like *Pinus, Mallotus, Dodonea* and several other economically important plants of this area are continuously losing their abundance. To tackle this issue is not only to document flora of entire area but also to take safety measures for those economically important plant species which were over exploited by human activities and under threatening conditions.

Previously eco-taxonomic studies of various areas from Pakistan were carried out by some workers (Tareen, 1986; Ahmad, 1988; Ilyas, 1988). However, the district Buner was previously studied by few workers for ethnobotanical purposes (Sher *et al.,* 2011; Alam *et al.,* 2011; Khan & Shah, 2013, Ali *et al*., 2015 and Ilyas, 2015). No reports are available with respect to eco-taxonomy of the Chagharzai valley District Buner.

Study area: Chagharzai is a beautiful valley of District Buner, mostly consists of green pine forests on the hills all around. The altitude ranges from 1000-2800m. The total area of the valley is 63540 hectares, while the location is 34º -11 to 34º -34N latitude and 72º -13 to 72º -45 E longitudes. The valley falls in moist temperate zone. The average rainfall is 900mm annually, while the climate is moderate in summer and very harsh in winter, the average temperature in summer remain around 15º C for about 7 months of the year, while in winter the temperature is well below freezing. Chagharzai valley is a part of Sino-Japanese region (Fig. 1).

Material and Methods

The study was conducted in the years 2011-2014. Point centered quadrat 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 of the area. 15-20 random points were selected depending on the slope and exposure. 8

sites were selected for sampling based on exposure, altitude, slope and anthropogenic activities. For herbs quadrat size 2x4 ft was used while for shrubs 4x6ft size was enough to evaluate the vegetation. The community was recognized on the basis of important value index. The life form and leaf size 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 their textural class, sand, silt and clay proportion, further more the soil was chemically analyzed for water holding capacity, organic matter, pH, Calcium carbonate and potassium concentration. All the species were identified using the flora of Pakistan (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1992; Ali & Qaiser, 1993-2015). Ethnobotanical study was also carried by interviewing the local elders and Herbalists (Hakeems) using a questionnaire. Leaf and life forms were mostly noted in the field (Raunkiaer, 1934).

Observation and Results

***Pinus roxburghii, Pinus wallichiana* and *Quercus incanna* Community (PPQ):** PPQ is one of the most protected community present in Buner mostly on high altitude. The most dominant species based on important value index was *Pinus roxburghii* (100.9), next to it was *Pinus wallichiana* (91.58), followed by under story species *Quercus incanna* (64.45) (Table 1).

Life form classification of the collected species from Chagharzai: On the basis of life form classification 68 species were classified into 08 classes. The largest class was Therophyte (29.4%), next to it was Hemicryptophyte (20.5%), Phanerophyte (19.1%), Geophyte (11.7%) while Megaphanerophyte and Nanophanerophyte shared (7.35%) followed by the smallest classes Mesophyte (2.94%) and (1.47%) of Chaemophyte (Fig. 2.)

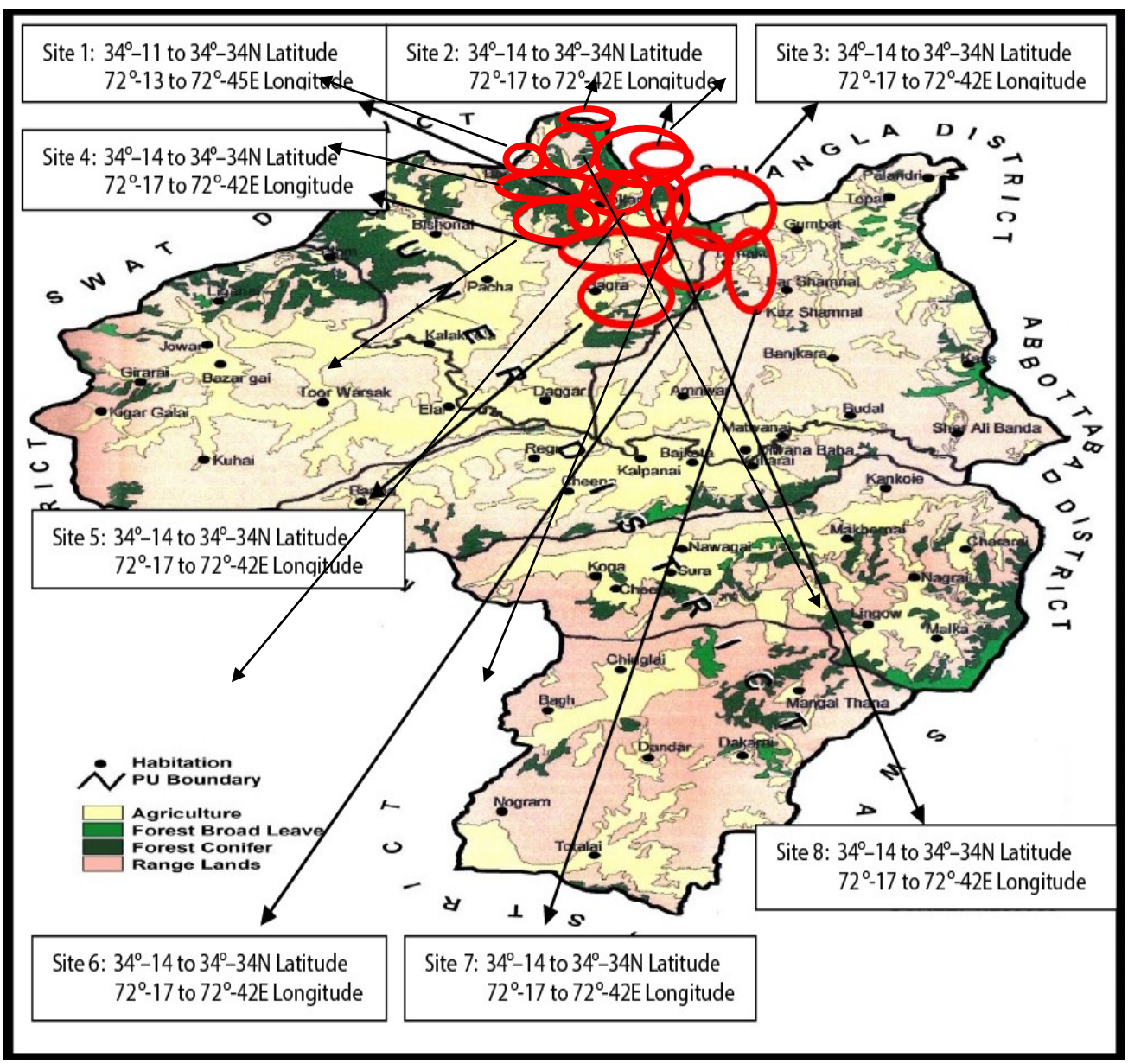

Fig. I. Map of District Buner showing study sites.

Table 1. Family, Habitat, life form, leaf size, and Important Value Index of the flora in Chagharzai Valley.

S.No.	Name of species	Family	Habitat	Life form	Leaf size	IVI
	Tree layer					
01	*Abies pindrow* Royle	Pinaceae	Steep slope	MGP	Lep	23.58
02	*Acacia catechu* (L.) Willd.	Mimosaceae	Dry rocky slope	Php	Lep	13.25
03	*Acacia modesta* Wall.	Mimosaceae	Dry rocky slope	Php	Lep	28.46
04	*Aesculus indica* (Wall ex Camb.) Hk. f.	Hippocastanaceae	Gentle slope	PHP	Mes	4.24
05	*Ailanthus altissima* (Mill.) Swingle	Simroubaceae	Field edges, slopes	MGP	Mic	3.66
06	*Broussoides papyrifera* (L.) L' Herit ex Vent.	Moraceae	Field edges, Houses	PHP	Mes	12.5
07	*Cedrus deodara* (Roxb. ex D.Don) G.Don	Pinaceae	Misty peak	MGP	Lep	17.5
08	*Cerasus cerasoides* (Buch-Ham ex. D. Don) Sokolov	Rosaceae	Road side	MGP	Mes	2.50
09	*Dalbergia sisso* Roxb.	Papilionaceae	Dry rocky slope	MGP	Mic	4.00
10	*Diospyros lotus* L.	Ebenaceae	Foot hills, slopes	PHP	Mes	8.27
11	*Ehretia laevis* Roxb.	Boraginaceae	Rocky shaded slope	NPP	Mic	7.18
12	*Ficus palmata* Forssk.	Moraceae	Road side	PHP	Meg	7.39
13	*Juglans regia* L.	Juglandaceae	Road side	PHP	Mes	15.92
14	*Olea ferruginea* Royle	Oleaceae	Graveyards	PHP	Mic	15.89
15	*Pinus roxburghii S*argent	Pinaceae	Rocky slope	MGP	Lep	100.9
16	*Pinus wallichiana* A.B.Jackson	Pinaceae	Steep slope	MGP	Lep	91.58
17	*Quercus baloot* Griff.	Fagaceae	Steep slopes	PHP	Mes	12.22
18	*Quercus dilatata* Lindl. ex Royle	Fagaceae	Shaded slope	PHP	Mes	23.75
19	*Quercus incanna* Roxb.	Fagaceae	Under forest	PHP	Mes	64.45
20	*Rhododendron arboreum* Smith	Ericaceae	Steep slope	PHP	Mes	60.10
21	*Ziziphus nummularia* (Brum. F.) Weight & Arn.	Rhamnaceae	Rocky slope	NPP	Mic	13.9
	Shrub Layer					
22	*Berberis lycium* Royle	Berberidaceae	Field edges	NNP	Mes	9.20
23	*Buxus papillosa* C.K. Schneid.	Buxaceae	Steep stream bank	NNP	Mic	11.16
24	*Buxus wallichiana* Bail.	Buxaceae	Steep stream bank	NNP	Mic	9.20
25	*Colebrookea oppositifolia* Smith	Lamiaceae	Dry rocky slope	NPP	Mes	14.4
26	*Cotoneaster affinis* Lindley	Roasceae	Moist shaded slope	NPP	Nan	6.10
27	*Dodonea viscosa* (L.) Jacq.	Sapindaceae	Rocky slope	NNP	Mic	13.2
28	*Justicia adhatoda* L.	Acanthaceae	Dry rocky slope	NPP	Mic	8.37
29	*Mallotus philippensis* (Lam.) Mull.	Euphorbiaceae	Dry, rocky slope	PHP	Mes	9.60
30	*Monotheca buxifolia* (Falc.) A. DC.	Sapotaceae	Misty canyon	PHP	Mic	16.10
31	*Rhus javanica* L.	Anacardiaceae	Road side	MGP	Mes	11.59

Table 1. (Cont'd.)

S.No.	Name of species	Family	Habitat	Life form	Leaf size	IVI
32	*Sarcococca salinga* (D.Don) Muell.	Buxaceae	Moist slope	PHP	Mic	16.9
33	*Viburnum grandiflorum* Wall ex DC.	Caprifoliaceae	Stream bank	PHP	Mic	29.73
34	*Ziziphus jujuba* Mill.	Rhamnaceae	Rocky roadside	NPP	Mic	6.90
	Herb Layer					
35	*Achillea millefolium* L.	Asteraceae	Forest foot	HCP	Lep	8.30
36	*Actea spicata* L.	Ranunculaceae	Shaded slope	MIC	Thp	11.4
37	*Adiantum capillus veneris* L.	Adiantaceae	Moist rocks.	HCP	Nan	6.13
38	*Adiantum incisum* C Persl.	Adiantaceae	Moist shaded rocks	HCP	Nan	11.6
39	*Adiantum venustum* D.Don	Adiantaceae	Shaded rocks	HCP	Nan	4.97
40	*Ajuga bracteosa* Wall. ex Benth.	Lamiaceae	Grassy peak plains	THP	Mic	8.44
41	*Ajuga parviflora* Benth.	Lamiaceae	Misty rocky place	THP	Mic	8.34
42	*Aegopodium alpestre* Ledb.	Apiaceae	Misty slope	THP	Mic	11.59
43	*Allium roylei* L.	Alliaceae	Wasteland	GEO	Mic	9.81
44	*Alternanthera pungens* Kunth.	Amaranthaceae	Wheat fields	CHP	Mic	7.60
45	*Amaranthus caudatus* L.	Amaranthaceae	Dry stream beds	THP	Mic	2.75
46	*Anagalis arvensis* L.	Primulaceae	Moist shadedplaces	THP	LEP	5.82
47	*Anaphalis margaritacea* (L.) Benth.	Asteraceae	Moist roadside	THP	Nan	7.50
48	*Apluda mutica* L.	Poaceae	Dry foothills	HCP	Nan	5.82
49	*Aquilegia fragrans* Benth.	Ranunculaceae	Stream bank	HCP	Mic	7.11
50	*Aquilegia moorcroftiana* Wall. ex Royle	Lamiaceae	Forest floor	HCP	Mic	4.30
51	*Arisaema jacquemontii* Blume	Araceae	Steep misty slope	Geo	Mes	10.67
52	*Aristida cyanatha* Nees es steud.	Poaceae	Wasteland	HCP	Nap	7.11
53	*Artemisia scoparia* Wajdst & kit.	Asteraceae	Dry rocky slope	CHP	Mic	8.30
54	*Artemisia vulgaris* L.	Asteraceae	Dry grassy slope	CHP	Mic	4.30
55	*Asplenium trichomanes* L.	Aspleniaceae	Moist slope	HCP	Lep	1.85
56	*Austragalus congestus* Baker	Papilionaceae	Road side	NNP	Lep	4.48
57	*Bergenia ciliata* (Haw.) Sternb	Saxifragaceae	Misty rocks	HCP	Mes	11.4
58	*Bistorta amplexiculis* (D. Don) Green	Polygonaceae	Forest floor	THP	Mes	21.3
59	*Buglossoides arvensis* (L.) Jhon.	Boraginaceae	Fields edges	THP	Mic	3.51
60	*Cannabis sativa* L.	Cannabaceae	Plain, slopes	THP	Mic	4.41
61	*Capsella bursa pastoris* (L.) Medikus	Brassicaceae	Filed edges	THP	Mes	0.97
62	*Cenchrus ciliaris* L.	Poaceae	Rocky slope	HCP	Nan	4.63
63	*Chrysopogon aucheri*(Boiss.) stafp	Poaceae	Rocky slope	HCP	Nan	14.4

Table 1 (Cont'd.)

S.No.	Name of species	Family	Habitat	Life form	Leaf size	IVI
64	*Cirsium falconeri* Mill.	Asteraceae	Road side	THP	Mic	7.20
65	*Commelina albescens* Harsk.	Commelinaceae	Moist stream beds	THP	Mic	7.20
66	*Conyza bonariensis* (L.) Cronqst.	Asteraceae	Foothill	THP	Nap	3.54
67	*Cirsium asvense* (L.) Scopoli	Asteraceae	Dry rocky foothill	THP	Mic	4.55
68	*Cynodon dactylon* (L.) Pers.	Poaceae	Wasteland	HCP	Nan	23.0
69	*Dianthium annulatum* (Forssk.) Stapf	Poaceae	Graveyard	HCP	Nan	0.97
70	*Duchesnea indica* (Andrews) Focke	Rosaceae	Shaded stream beds	HCP	Nan	13.9
71	*Dryopteris felix mas* (L.) Schott	Pteridaceae	Moist rocks	HCP	Nan	6.10
72	*Duthiea bromoides* Hack.	Poaceae	Road side	HCP	Nan	4.55
73	*Euliopsis binata* (Retz.) C.E. Hubbard	Poaceae	Rocky stream beds	HCP	Nan	8.64
74	*Echium plantagineum* L.	Boraginaceae	Cultivated fields	THP	Mic	4.80
75	*Galium elegans* Wall.	Rubiaceae	Forested graveyard	THP	Nan	7.37
76	*Geranium oscellatum* Camb.	Geraniaceae	Moist shaded plain	HCP	Mic	2.51
77	*Heliotropium europaeum* L.	Boraginaceae	Road side	THP	Nan	3.51
78	*Heracleum canescens* Lindl.	Apiaceae	Field edge	THP	Mic	4.42
79	*Hypericum perforatum* L.	Guttiferae	Waste land	HCP	Lep	8.30
80	*Hypodemaatium crenatum* Forsk.	Hypodematiaceae	Under rocks	GEO	Lep	11.59
81	*Imperata cylindrica* L.	Poaceae	Dry rocky slope	GEO	Nan	4.60
82	*Indigofera himalayensis* Ali	Papilionaceae	Shaded slope	THP	Lep	4.97
83	*Jasminum humile* (D. Don) Grohmann	Oleaceae	Moist shaded slope	NPP	Mic	4.57
84	*Juncus inflexus* L.	Juncaceae	Stream rocks	GEO	Lep	5.47
85	*Lamium album* L.	Lamiaceae	Grassy gentle slope	THP	Mic	5.29
86	*Lithospermum officinale* L.	Boraginaceae	Cultivated field	THP	Nan	6.00
87	*Lonicera quinquelocularis* Handwick	Caprifoliaceae	Cultivated field	PHP	Mes	9.70
88	*Lunea procumbens* (Roxb.) Ramay& Raja	Asteraceae	Grassy slope	THP	Mes	12.53
89	*Malva neglecta* Wallr.	Malvaceae	Stream bank	THP	Mic	8.34
90	*Mentha longifolia* (L.) Huds.	Lamiaceae	Stream beds	GEO	Mic	8.35
91	*Myosotis sylvatica* Ehrh. ex Hoffin.	Boraginaceae	Road side	THP	Lep	6.14
92	*Nastratium officinale* R. Br.	Brassicaceae	Stream beds	THP	Nan	7.70
93	*Oxalis corniculata* L.	Oxalidaceae	Shaded plain, slope	THP	Nan	10.5
94	*Paeonia emodi* Wall. ex H.K.f.	Paeoniaceae	Forest floor	GEO	Mes	12.5
95	*Persicaria capitata* (L.) Hara	Polygonaceae	Stream bank	HCP	Mic	8.80
96	*Plantago lanceolata* L.	Plantaginaceae	Filed edges, slopes	HCP	Mes	4.31

Table 1. (Cont'd.)

S.No.	Name of species	Family	Habitat	Life form	Leaf size	IVI
97	*Plantago major* L.	Plantaginaceae	Road side	GEO	Mes	5.80
98	*Poa infirma* L.	Poaceae	Wet fields	THP	Nan	10.5
99	*Pogonatherum paniceum* (Lam.) Hack.	Poaceae	Gentle slope	HCP	Mic	4.80
100	*Potentilla argentea* L.	Rosaceae	Forest foothill	THP	Nan	6.59
101	*Potentilla nepalensis* Hook.	Rosaceae	Forest floor	THP	Nan	6.90
102	*Pseudognaphalium affine* (D.Don) Ander.	Asteraceae	Moist slope	THP	Nan	10.3
103	*Pteridium aquilinium* (L.) Kuhn.	Pteridaceae	Shaded rock	GEO	Mic	13.5
104	*Pteris cretica* L.	Pteridaceae	Stream bank	GEO	Mic	4.95
105	*Ranunculus hirtelus* Royle	Ranunculaceae	Stream beds	THP	Mes	3.51
106	*Ranunculus laetus* Wall ex Hook.	Ranunculaceae	Slopy stream beds	THP	Mic	4.42
107	*Ranunculus sceleratus* L.	Ranunculaceae	Stream beds	THP	Mes	8.30
108	*Rosularia adenotricha* (Wall. ex Edgew.) Jansson ex Roch.f.) *subsp. adenotricha*	Crassulaceae	Shaded rocks	THP	Nan	4.93
109	*Salvia nubicola* Wall. ex Sweet.	Lamiaceae	Moist forest foot	CHP	Mes	4.97
110	*Senecio analogus*DC.	Asteraceae	Moist shaded slope	THP	Mes	6.13
111	*Setaria pumila* (Poir.) Roem & Schult.	Poaceae	Wasteland	THP	Nan	5.47
112	*Silene conoidea* L.	Caryophyllaceae	Wheat fields	THP	Nan	6.00
113	*Skimmia laureola* (DC.) Sieb. & Zucc. ex Walp.	Rutaceae	Forest floor	NNP	Mes	8.30
114	*Sonchus arvensis* L.	Asteraceae	Wheat field	THP	Mic	9.70
115	*Strobilanthes wallichii* Nees.	Acanthaceae	Dry slope	NNP	Mes	12.5
116	*Taraxcum officinale* F.H. Wiggers	Asteraceae	Wheat fields	GEO	Mes	8.34
117	*Themeda anathera* (Nees ex Steud.) Hack.	Poaceae	Dry slope	HCP	Nan	5.80
118	*Tylophora hirsuta* (Wall.) Wight	Asclepiadaceae	Forested Graveyard	GEP	Mic	6.59
119	*Valeriana jatamansi* Jones	Valerianaceae	Forest floor	GEO	Mic	29.2
120	*Verbena bonariensis* L.	Verbenaceae	Moist pasture	THP	Nan	4.42
121	*Verbena officinalis* L.	Verbenaceae	Wheat fields	THP	Nan	10.3
122	*Viola canescens* Wall ex Roxb.	Violaceae	Moist slope	THP	Mic	15.2
123	*Viola pilosa* Blume	Violaceae	Shaded rocks	THP	Mic	8.89
124	*Vulpia persica* (Boiss & Bushe.) Krecz.	Poaceae	Dry plain field	HCP	Mic	6.59
125	*Zosima absinthifolia* (Vent.) Link.	Apiaceae	Gentle slope	THP	Mic	4.57
	Creeper Layer					
126	*Ficus sarmentosa* Ham. ex J.E. Smith	Moraceae	Rocky surface	PHP	Mes	4.92
127	*Hedera nepalensis* K. Koch	Araliaceae	Moist slope	MSP	Mes	9.25

Key:MGP: Megaphanerophyte, PHP: Phanerophyte, NNP: Nanophanerophyte, HCP: Hemicryptophyte, THP: Therophyte, GEO: Geophyte, MSP: Mesophyte, Mic: Microphyll, Mes: Mesophyll, Lep: Leptophyll, Nan: Nanophyll.

Table 2. Ethnobotany of the collected species from Valley Chagharzai of KPK Pakistan.

S.No	Name of species	Local Name	Part Used	Ethnobotany
01	*Abies pindrow*	Acher	Whole plant	Used as fuel, timber and needles as thatching the roofs.
02	*Achillea millefolium*	Jarai	Leaves	Juice of leaves is effective in fever, indigestion, blood pressure and healing wounds, also used in women's diseases.
03	*Adiantum capillus veneris*	Sumbal	Leaves	Past of leaves used as antidote, antiasthma and as a shampoo as well.
04	*Adiantum venustum*	Sumbal	Leaves	Juice of boiled frond used for eye disorders, for cough and headache, leaves past used against snake bite and scorpion sting.
05	*Aegopodium alpestre*	Kamasla	Whole plant	Convert milk into curd also used as fodder.
06	*Aesculus indica*	Jawaz	Whole plant	The fruits are effective in colic pain in domestic animals, timber, handles for agricultural tools and construction.
07	*Anaphalis margaritacea*	Unknown	Whole plant	Used as fodder.
08	*Apluda mutica*	Wakha	Whole plant	Used as fodder.
09	*Aquilegia fragrans*	Ziar guly	Whole plant	Plant is boiled in water the juice is used as carminative and stimulant.
10	*Aquilegia moorcroftiana*	Udi guly	Whole plant	Juice used in asthma, cough, stimulant and in jaundice.
11	*Arisaema jacquemontii*	Marjarai	Rhizome	Poisonous but some time tiny piece of bulb put in sweets or bread and engulf to decrease the sugar level very effectively.
12	*Artemisia scoparia*	Tarkha boty	Leaves	Juice of leaves used for skin disorders, the juice also used in fever and skin disorders.
13	*Asplenium trichomanes*	Unknown	Whole plant	Used for beautification.
14	*Astragalus congestus*	Unknown	Whole plant	Juice extracted from boiled leaves used as digestive and also against ulcer, fodder for goats as well.
15	*Berberis lyceum*	Ziar largy	Whole plant	Uprooting the whole plant before spring the yellow roots are dried and converted into powder form some time mixed with Desi ghee 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.
16	*Bergenia ciliata*	Ghata panra	Root	Juice extracted from boiled leaves used as digestive and also against ulcer, fodder for goats as well.
17	*Bistorta amplexiculis var. amplexiculis*	Tarwa panra	Rhizome	Tea made from rhizome to cure fever, powdered rhizome effective in gout and rheumatism and cure ulcer.
18	*Buglossoides arvensis*	Khalo	Leaves	Leaves used as sedative and Juice extracted from fodder as well.
19	*Buxus papillosa*	Ladar	Shoot	Powder made from shoots used in blood purification.
20	*Buxus wallichiana*	Ladar	Branches	Branches used in packing fruits.
21	*Cedrus deodara*	Deyar	Wood, resin	Resin is very commonly used in diabetes, Kidney pain, joints pain and diuretic as well, also used for domestic cattles in flatulence.
22	*Cenchrus ciliaris*	Wakha	Whole plant	Fresh and dried grass is used as fodder.
23	*Cerasus cerasoides*	Tangaye	Fruit, wood	Fruit is eaten as laxative, wood is used as timber and fuel.
24	*Chrysopogon aucheri*	Wakha	Whole plant	Fresh leaves are dried and spread inside room floor to keep the room warm in winter.
25	*Cirsium falconeri*	Bangi	Seeds, leaves	Leaves juice used as diuretic, tonic, extract of seeds effective in liver disorders, also edible as vegetable.
26	*Dodonea viscosa*	Ghawarasky	Whole plant	Paste of fresh leaves applied on fresh cuts for quick healing, major source of fuel, fencing and on roofs of houses made from mud.
27	*Dryopteris felix mas*	Gunjaye	Fronds	Fresh fronds used as vegetable.
28	*Duthiea bromoides*	Wakha	Culms	Used as fodder.
29	*Ficus sarmentosa*	Enzar	Figs	Used as fodder.
30	*Hedera nepalensis*	Lopay panra	Leaves	Leaf juice used as stimulant, in abdominal pain and purgative, fruit juice also used in high blood pressure.

Table 2. (Cont'd.)

S.No	Name of species	Local Name	Part Used	Ethnobotany
31	*Heracleum canescens*	Da ghar Dhania	Whole plant	Decoction used in nervous problems and sexual disorders, plant is used as fodder as well.
32	*Hypericum perforatum*	Shin chi	Leaves, Flower	Plant leaves are effective astringent and strong diuretic, flower paste used in piles uterus contraction.
33	*Juglans regia*	Ghuz	Fruit, bark	Fruit is edible and of commercial value, used as tonic for nervous and cardiac issues, bark is used in cleaning teeth as Thandasa, also as lipstick, source of timber and furniture.
34	*Lithospermum officinale*	Unknown	Leaves	Herbal tea made from leaves in some parts.
35	*Lonicera quinquelocularis*	Unknown	Whole plant	Paste of fresh leaves tide on wounds, also used as fuel wood.
36	*Launaea procumbens*	Ziar guly	Whole plant	The whole plant is used as diuretic and fodder.
37	*Malva neglecta*	Panerak	Leaves	Decoction made from the leaves is used as antispasmodic, and also as a vegetable.
38	*Monotheca buxifolia*	Ladara	Whole plant	Fruit edible, used as fencing and fuel wood.
39	*Paeonia emodi*	Mamekh	Rhizome	Flowers and seeds are used as sedative and also as narcotic, fruit is used in back bone issues.
40	*Persicaria capitata*	Palpolak	Leaves	Leaves paste is effective in wound healing.
41	*Pinus roxburghii*	Nakhtar	Whole plant	Gum is collected to make medicine after menstruation, Seeds are eaten, and wood is used in furniture, fuel, needles used in thatching, also cultivated as ornamental.
42	*Pinus wallichiana*	Peioch	Whole plant	Resin is used on boils, spur as brooms for cleaning, thatching roof, excellent timber, to make furniture, fuel wood and ornamental.
43	*Plantago major*	Jabai	Leaves, seeds	A paste of fresh leaves is effective in burning and healing wounds, seeds are effective in constipation, dysentery.
44	*Potentilla argentea*	Kunchi	Root	A root powder used for blood purification and paste as cosmetics as well.
45	*Potentilla nepalensis*	Kunchi	Fruit	The fruit is edible and is digestive.
46	*Pseudognaphalium affine*	Unknown	Unknown	Used as fodder.
47	*Pteridium aquilinium*	Hatoye	Fronds	Fresh fronds are cooked as digestive vegetable and old one used as thatching material.
48	*Pteris cretica*	Gunjay	Leaves	Fresh leaves tide upon wounds as for quick healing.
49	*Quercus baloot*	Toor banj	wood, nuts	Seeds are used as diuretic and astringent soaked in water and used in diarrhea and stomach problems, timber wood, handles for agricultural tools.
50	*Quercus dilatata*	Toor banj	Wood	Wood is very hard used to make handles for agricultural tools and walking sticks.
51	*Quercus incanna*	Spin banj	Wood	Wood is used as timber and fuel.
52	*Rhododendron arboreum*	Gul Namer	Whole plant	Flowers are collected for nectar, wood is used as fuel and also cultivated for beautification.
53	*Rhus javanica*	Titary	Fruit	The fruit is edible as laxative.
54	*Sarcococca salinga*	Lodanar	Leaves, Flower	The Juice of leaves is a good laxative and blood purifier, paste of flowers used against muscles pain.
55	*Skimmia laureola*	Nazar panra	Leaves	Leaf paste effective in smallpox, generally smoke is used to avoid the devils.
56	*Valeriana jatamansi*	Mushk	Rhizome	Powder made from rhizome used in digestive problems, in fever, also as aromatic and also for uncontrolled urine flow in kids, as well as carminative.
57	*Verbena bonariensis*	Unknown	Leaves	Leaves juice is used as stimulant, diuretic, also effective in dysentery and diarrhea.
58	*Viburnum grandiflorum*	Meva	Whole plant	Fruits are edible used in stomach disorders and branches as fuel wood.
59	*Viola canescens*	Banafsha	Whole plant	The plant is used as diaphoretic, febrifuge, flowers are also used in epilepsy and nervous problems and flowers paste against eczema
60	*Viola pilosa*	Banafsha	Whole plant	Flowers are used as antiseptic, febrifuge, diaphoretic Juice of leaves and flowers is effective in cold, cough, powdered roots used in jaundice, effective in liver disorders and also carminative as well.

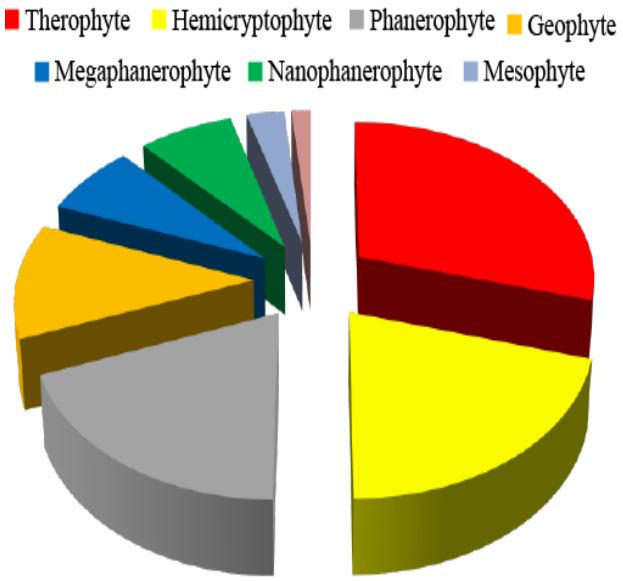

Fig. 2. Life form classes of the flora of Chagharzai valley.

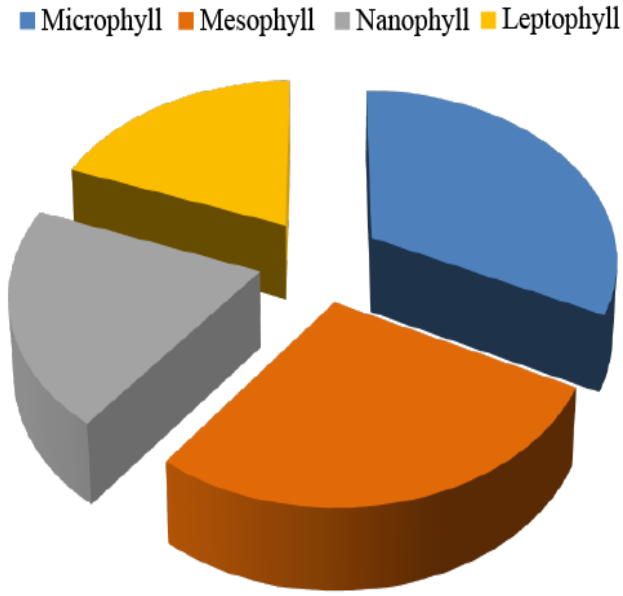

Fig. 3. Leaf size classes of the flora of Chagharzai valley.

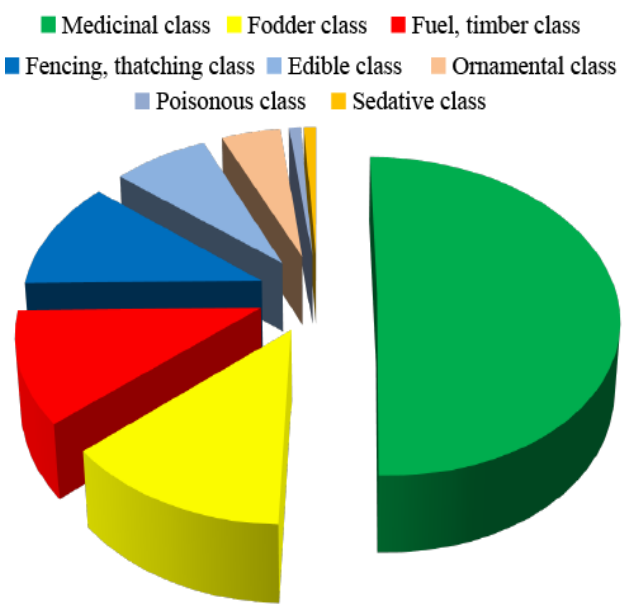

Fig. 4. Ethnobotanical classification of the flora of Chargharzai valley

Leaf Size classification of the collected species from Chagharzai: Based on leaf size the collected species were categorized into 4 classes. The dominant class was Microphyll (32.3%), followed by Mesophyll (27.9%), Nanophyll (20.5%) and finally by (19.1%) of Leptophyll (Fig. 3).

Ethnobotanical information: District Buner is a remote area of Khyber Pakhton Khwa Pakistan. The dependency on herbalists (Hakeems) in the District is reduced by the introduction of allopathic medicines. But still there are many areas where the plants are still used by the locals as medicines. In the past ethnobotanical studies in Buner were conducted by different workers on few localities. Khan *et al*., (2003) studies Gokand valley ethnobotanicaly, and reported about 138 species including 40 cultivated species. Out of 138 species 50 were used as fodder, 46 as fuel, 17 as vegetables, 17 as a medicine while the reaming as timber, fish poisoning and bee attractant. Hamayun (2003) studied utilization of medicinal herbs and traditional knowledge of Buner, he enlisted 70 species as medicinal herbs. Watanabe *et al.,* 2001. Conducted a survey of wild flowers in Pakistan, the study included conservation, utilization of medicinal plants of Islamabad.

This is the first attempt to analyze the Chagharzai valley of district Buner eco-taxonomically. The study area was visited many times in the years (2011-2014). During the study many elderly locals were interviewed to record the vernacular names and medicinal application of the species (Table 2). The present study includes 60 ethnobotanically important species classified into 8 classes (Fig. 4)

Soil Analysis of Chagharzai valley: Mostly the soil of Chagharzai valley is composed of clay particles, in three collected samples from different habitats, the average of clay particles is 48.8% as compared to 33.3% of sand and 15.7% of silt, out of three textural classes the concentration of clay particles is more except in soil sample 2 where the sand is 55.0%. The textural classes are clay loam, sandy loam and loamy sandy. The soils are acidic in nature showed no significant variation having pH 7.3, 7.9 and 7.6 respectively. The organic matter is very low accept soil sample 1 having 10.2%. The water holding capacity is maximum in soil sample 1 (31.4%) compared to (21.0%) and (23.1%) of samples 2 and 3 respectively the average value is (25.1%). Likewise "$CaCo_3$" showed not much variation compared to "K" which showed variation, the concentration of Calcium carbonate ranging from 23.6% of soil sample 3 to 32.3% of sample 1, while the average value is (26.7%). The concentration of Potassium ranging from 90 Meq/lit to 150% in soil samples 1 and 3 respectively (Table 3).

Table. 3. Soil analysis form Chagharzai valley of District Buner.

Community	SoilSample	Sand %	Silt %	Clay %	T.C. class	O.M %	WHC %	pH	$CaCo_3$ %	K Meq/lit
Pinus roxburghii,	1	12.9	16.1	71.0	C.L	10.2	31.4	7.3	32.3	90
P. Wallichiana & *Q. incanna*	2	55.0	15.5	30.5	S.L	3.97	21.0	7.9	24.2	100
	3	29.3	15.7	45.0	L.S	4.24	23.1	7.6	23.6	150
Average		33.3%	15.7%	48.8%		6.13%	25.1%	7.6	26.7%	113.3

Key: T.C= Textural class, C.L= Clay loam, S.L= Sandy loam, L.S= Loamy sand, O.M= Organic matter, WHC= Water holding capacity.

Discussion

The valley Chagharzai of district Buner was investigated for eco-taxonomic and ethnobotanical studies in four consecutive years (2011-2014). Chagharzai is a mountainous valley with scattered small villages. The covered area of the valley is 63543 hectares. During the study 127 species belonging to 108 genera distributed in 34 families were identified. Out of 34 families 32 were of Dicot 1 each of Monocot and Gymnosperm. Based on important value index the dominant community of the district was *Pinus roxburghii* (100.9), *P. wallichiana* (91.58) and *Quercus incanna* (64.45). The shrub layer was dominated by *Viburnum grandiflorum* (29.73) and *Montheca buxifolia* (16.10) mostly near streams, while the two dominant herbaceous species were *Valeriana jatamansi* (29.2) and *Bistorta amplexculis* (21.3) on forest floor and moist shaded rocks. The dominant family of the valley was Asteraceae is having 6 genera and 6 species as well, followed by Poaceae with 4 genera and 4 species, the only gymnosperm family Pinaceae was represented by 3 genera and 4 species, Pteridaceae has 3 genera and 3 species, Rosaceae is having 2 genera and 3 species and both Adiantaceae and Violaceae have 1 genera and 2 species each. The bio-spectrum observations showed Therophyte as the largest class represented by 29.4% and the smallest Chaemophyte has 1.47% representation only, while leaf size classification revealed Micrphyll as the largest class compared to smallest Leptophyll having 1.91% presentation.

Ethnobotanically 60 species were recorded during interviewing the local elders and herbalists, the species were further classified into 8 classes dominated by medicinal class having 54 species , followed by fodder class 14, fuel, fencing and thatching class has 12, edible class has 8 species, 5 species were ornamental while both poisonous and sedatives classes were represented by 1 species each. The soil of the valley was coarse to fine on dry rocky slopes and near muddy streams as well as at eroded exposed areas. The soil is acidic and mostly not differentiated into horizons, however in few locations the soil was not enough deep and subsurface soil is not exist. Soil texture play important role in vegetation distribution and dominance. In valley, plain areas and stream banks where the texture is mostly sandy to loamy vegetation showed variation represented by different species including those of herbs, shrubs and some trees as well like *Pyrus pashia, Juglans regia, Mallotus philippensis, Dodonea viscosa, Justicia adhatoda, Ficus sarmentosa, Berberis lycium, Capsela bursa pastoris, Polygonum, Persicaria* species compared to high altitude and moist shaded steep slopes where the texture was coarse sandy and rocky the vegetation become uniform represented mostly by *Pinus roxburghii* and *P. wallichiana* species, however tree like *Rhododendron arboreum* and among shrubs *Sarcococca salinga*, *Quercus* species, *Viburnum grandiflorum* and *Montheca buxifolia* were also common, megaphanerophytes like *Abies pindrow* and *Cedrus deodara* are rare and critically endangered species of the study area which were observed on high altitude. On forest floor common herbaceous species including *Valeriana jatamansi*, *Arisaema jacuemontii*, *Viola pilosa*, *Achillea millefolium*, *Adiantum capillus veneris, Asplenium trichomanes* and *Dryopteris felix mas* locally called gunjay also used as vegetable.

Moving form low to high altitude the amount of Potassium increased from 90Meq/lit to 150Meq/lit in soil sample 3, however the percentage of $CaCo_3$ is decreased from 32.3% in sample 1 at low altitude to 23.6% in soil sample 3 collected at high altitude, the reason may be water running down the slope carrying the calcium to low altitude areas. No significance difference was recorded in pH change, however the percentage of WHC was decreased from 31.4% in soil sample 1 at low altitude where vegetation showed variation to that of 23.1% of soil sample 3 at high altitude where the vegetation was dominated by uniform forest of *Pinus roxburghii* and *P. wallichiana* species showed xerophytic nature, likewise the organic matter also decreased from low to high altitude that was 10.2% to 4.24% in soil sample 1 and 3 respectively it may result in low water holding capacity so the variation in vegetation is decreased mostly represented by megaphanerophyte. The amount of clay also decreased from 71.0% in valley and low altitude areas mostly dominated by Hemicryptophytes, Chaemophytes, Nanophanerophytes and Geophytes as well compared to 30.5% and 45.0% respectively at high altitude where Megaphanerophyte dominated the steep slope. Silt showed no significance difference both at low and high altitude. While the amount of sand 12.9% was low at lower altitude compared to 55.0% and 29.3% in soil samples 2 and 3 at high altitude where apart from *Pinus roxburghii* and *P. wallichiana* species like *Rhododendron arboreum*, *Buxus wallichiana*, *B. papillosa*, *Quercus incanna*. *Q. baloot*, *Bergenia ciliata*, *Valeriana jatamansi*, *Chrysopogon aucheri* were common, the Pteridophytes were represented by *Hypodematium crenatum*, *Dryopteris* and *Adiantum* species among creepers species like *Ficus sarmentosa* and *Hedera nepalensis* were common on moist shaded rocky surface of the forest floor.

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