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FLORISTIC COMPOSITION, ECOLOGICAL CHARACTERISTICS AND ETHNOBOTANICAL PROFILE OF PROTECTED AND OPEN GRAZING LAND OF KARKHASA, BALOCHISTAN, PAKISTAN

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ABSTRACT

The present work was intended to explore the floristic composition and ecological characteristics of representative sites (protected and nearby unprotected) of Karkhasa range land of Balochistan. An exhaustive list of 154 plant species belonging to 39 families, was compiled (gymnosperms =1, monocot=6, dicot=32). The comparison between the respective sites indicated 147 plant species on protected sites and 35 plant species on unprotected sites. Floristic inventory indicated the dominance of Asteraceae with 26 plant species and Poaceae with 21 species. In the biological life form, Therophytes spectra were the dominant life form class followed by Hemicryptophytes and Chaemophytes in the study area. The leaf size spectra showed Nanophylls as the dominant class followed by Microphylls and Leptophylls. The plant species have been further divided into various economic classes based on their uses by local communities. The results revealed 117 species of fodder plants, 33 of medicinal plants, 21 combustible wood plants. in addition, 3 species were used for thatch roof, 3 species were found to be edible (vegetables / fruit), 2 species of plants were used to prepare herbal teas; others have been used for other purposes. Protection and conservation of natural resources of rangeland is crucial for sustainable utilization of accessible natural flora so, it is strongly suggested that overgrazing and over-exploitation of vegetation should be controlled in open grazing lands in order to preserve floristic composition.

Keywords: Karkhasa Rangeland; Protected areas; Floristic diversity; Quetta.

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INTRODUCTION

Rangelands are important because of their vital role as provide habitat for food production, fodder for livestock besides serving a reservoir of biodiversity and improving local economy. Rangeland is considered a Land/area with native vegetation mostly in the forms of grasses or other herbaceous grass like vegetation and shrubs and is conserved in its natural form (Mannetje, 2002).

Among natural ecosystems around the globe, rangelands occupy approximately 50% of the total land area of the world (Friedel *et al.,* 2000). Pakistan is mostly (88 million hectare) covered with rangelands (Khan and Mohammad, 1987). Several researchers explored various rangelands of Pakistan for their unique floristic structural compositions (Hussain *et al.,* 2015; Durrani*et al.,* 2010; Hazrat*et al.,* 2010; Khan *et al*., 2011;2014; Shaheen*et al.,* 2014; Anjum *et al.,* 2019)

The present study endeavored to highlight the role of a protected rangeland in conserving biodiversity in terms of wild flora by exploring plant diversity, ecological characteristics and ethnobotanical profile of a protected site in comparison to a nearby unprotected site. The present study will help to provide baseline data which may serve as a tool to appraise the importance of protection of wild flora in their natural ecosystems from various anthropogenic pressures including over harvesting and uprooting of valuable wild medicinal plants, over-grazing of palatable plant species, deforestation, etc. To achieve the desired aim, two sites were selected, protected and unprotected. In protected site several destructive practices including excessive exploitation of wild flora by over-harvesting, over-collection, uncontrolled grazing, clearing of vegetation cover, up-rooting and cutting of fuel wood were prohibited, while unprotected sites were devoid of any such practices and local communities living nearby were exploiting their own natural resources to threatening levels. The protected site is managed by the Divisional forest officers of forest Department of Quetta, Balochistan and thus, their permission is required to enter the boundaries; unprotected site was open with no restrictions.

Geo-Climate of Karkhasa land: Karkhasa land is located 10 Km West of Quetta city. Quetta is the capital

city of Balochistan, Pakistan and the ninth largest city of the country. It lies between 30º 11" north and 66º 54" east (Fig 1). The area is at 1680 meters from sea level. Due to numerous types of fruits and plants around it, it is known as garden of Pakistan. This city features a continental and semi-arid climate with a considerable temperatures variation; the maximum temperature recoded was 42 ºC during July 1998, while -18.3 ºC was the least/minimum temperature recorded during January 1970.

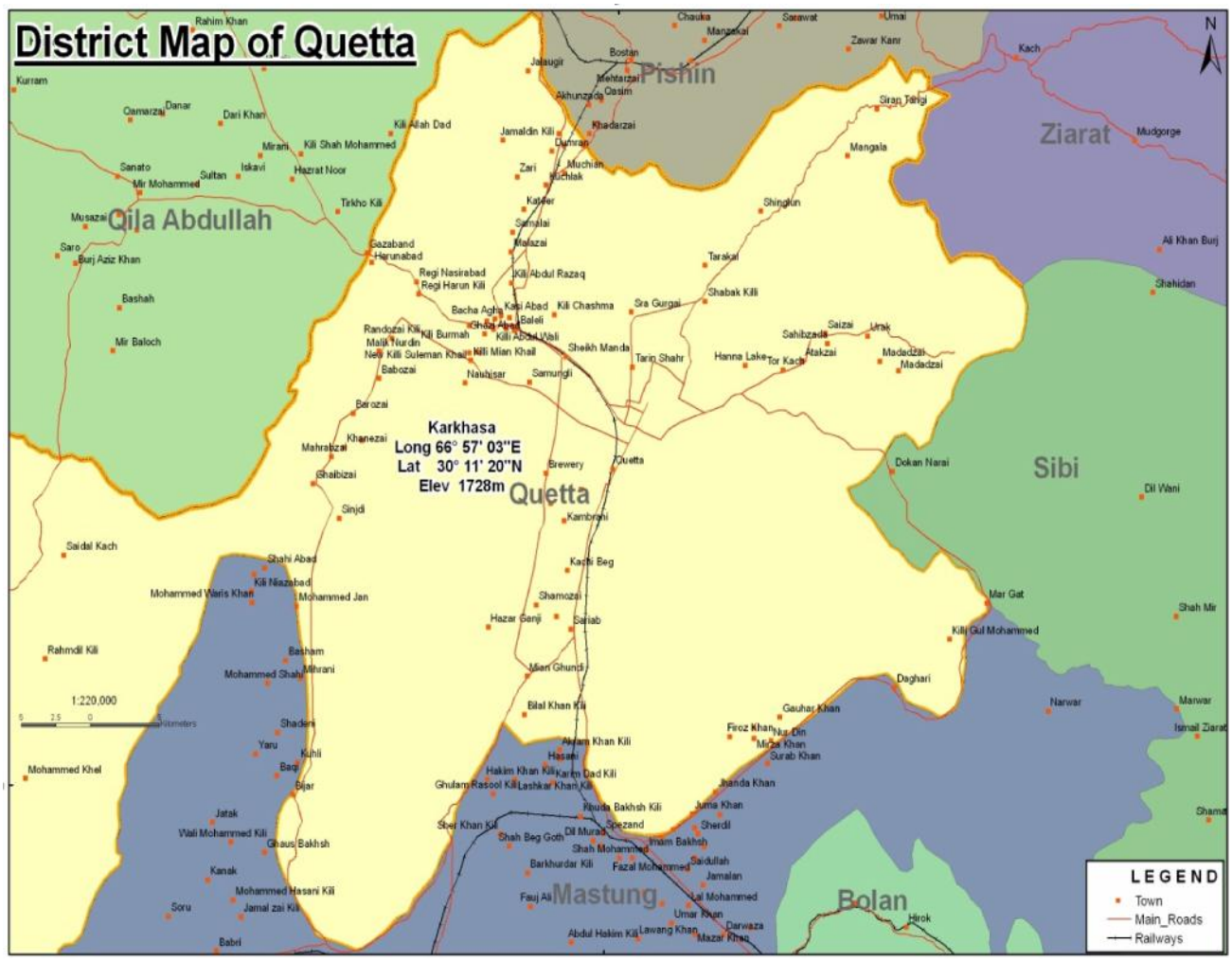


Fig 1. Map of Quetta highlighting the study domain (Karkhasa rangeland) (C.C.E.F., 2013).

MATERIALS AND METHODS

Study area: The study area (Karkhasa) adjoins the northern part of Hazarganji-Chiltan National Park. Karkhasa is a long narrow valley of around 16 km, with an average width of about 1 km. Due to its scenic beauty and location; it is declared and managed as a recreational Park. The overall area is around 10 thousand acres. Study domain lies at longitude of $66^{0}55$ and latitude of $30^{0}09$. In Quetta valley, Karkhasa is serving as an important water catchment area and for this purpose a dam was constructed in the area (WWF, 1998). Due to proper management and conservational practices, vegetation cover is remarkable in the protected sites as compared to the unprotected sites of Karkhasa. Overexploitation of wild flora for livestock grazing, medicinal plants or fuel wood collection was observed around the area in the unprotected sites. It is, thus, desired to determine the plant diversity and its ecology for future development and preservation.

Sampling sites: After a preliminary survey, the study area was divided into two main sites *viz.,* protected and unprotected sites based on the level of disturbance of habitats of wild flora. Each representative site was further sub-divided into strata by adopting a probability sampling technique called stratified random sampling which resulted in 4 sampling sites in protected area and 2 sampling sites in unprotected area. Two dry hilly sites and two watercourses sites were selected in the protected

area, while just one hilly site and one watercourse site in the unprotected one. Plants were collected from each strata of each site by simple random sampling (SRS) and were pressed properly according to the standard techniques (Bridson& Forman, 1999; Maden, 2004).

Preservation, identification and classification of plants: As first step all collected plant species were pressed and, after drying them, mounted on standard size herbarium sheets properly as per routine herbarium techniques according to Jain and Rao, (1977). Plant identification was confirmed with the help of Flora of Pakistan (Nasir and Ali, 1970-1979; Nasir and Ali, 1980-1989; Ali and Nasir, 1989-1991; Ali and Qaisar, 1993 - 2007, Ali and Qaisar, 1995 -2009). The floristic composition of the study area was prepared in alphabetical order. Raunkiarian approach (1934) was adopted to classify plants in different biological spectra (life form and leaf size) classes. The ethnobotanical data were collected by adopting the simple approach of free listening interviews with randomly selected informants and key informants were further selected for detailed field interviews (Ghorbani, 2005). Based on the information regarding the use of wild plant species by local inhabitants all plants were classified in to different economic use classes such as fodder, fuel wood, medicinal purposes, edible, roof thatching while some plants were poisonous. Local languages were used to communicate with the local inhabitants. Most of the ethnobotanical knowledge was found to be with elderly people of age group of 50-80 years. In total 89 informants were interviewed, in order to avoid any biasness in data all informants were selected randomly but with the focus to give an equal and fair chance to all male, female and age groups to become a part of sampling as informants. Most of the questions were open handed in order to build a bond with local inhabitants due to the cultural ethics of rural communities with few close ended question including age of each informant, education and use of wild plants in their daily lives. During all interviews it was found that uneducated inhabitants were aware about uses of wild flora than the young more educated generation.

RESULTS AND DISCUSSION

A complete floristic list of Karkhasa was compiled including 154 plant species belonging to 39 families (gymnosperms =1, monocot=6, dicot=32). It was observed that the 147 plant species collected from protected sites were much higher than the 35 species collected in the unprotected site. Overall, floristic list encompassed 109 herbs, 24 shrubs and 21 grass species (Table 1). Further findings unveiled presence of 147 species on hills, 51 species near watercourses; out of these, 6 species were confined to watercourses of protected area while only 7 plant species were collected from nearby open/unprotected site.

The area was dominated by Asteraceae and Poaceae, 26 and 21 plant species respectively. Other representative families were Lamiaceae, 14 species, followed by Brassicaceae, 12 species, Fabaceae, 10 species, Boraginaceae, 9 species and Apiaceae, 6 plant species. These data were well in line with the findings of Stewart (1959), Jafri (1962), Stewart (1972), Nasir and Ali (1971-1994); Ali and Qaiser (1993-2007); Shaheen*et al.,* (2014); Khan *et al*., (2014); Hussain *et al.,* (2015), Ali *et al.,* (2016) and Ali *et al.,* (2017) documenting Asteraceae, Poaceae, Brassicaceae, Lamiaceae, Fabaceae and Boraginaceae being the major families in other parts of Pakistan. A floristic inventory of an area provides essential information about ecological attributes of natural resources by revealing particular relationship among plants species and their association with their ambient environment. Floristic characteristics vary according to altitudes. Floristic composition further help to provide a clear picture regarding biological spectra, stratification, plant habitat and climatic condition s. Floristic inventories, on the other hand; are easy to handle and are less time-consuming (Saima*et al.,* 2010).

In the present study, the most commonly found shrubs were: *Haloxylongriffithii, Seriphidiumquettense, Sophoramollis, Hertia intermedia; Nepeta praetervisa, Astragalus spp.* and *Convolvulus leiocalycinus.* These species were confined to particular climatic conditions and present widely in other ecological zones of Pakistan with analogous environmental attributes. Among grass species *Pennisetumorientale, Poa pratensis, Bromus tectorum, Bromussericeus, Cymbopogon j0warancusa, Loliumlemulentum, Eremopyrumbenouepartes, Taeniatherumcarinatum*and*Saccharum griffithii* were most common ones. *Shismusarabicus* was abundant in relatively moist habitats such as within the thickets of shrubby plants. Similar were the findings of Tareen and Qadir, (1987,1991); Durrani and Hussain, (2005) and Durrani*et al.,* (2009, 2010) from other parts of Balochistan

Table 1. Floristic list of Karkhasa protected area and nearby open grazing Rangeland.

S/No	Families	Name of species	Spiny (S)/ Non Spiny(NS)	Habitat						L.F.C*	L.S.C**	Economic uses
				Protected			Un protected					
				Dry hills	WC	both	Dry Hills	WC	both			
1	Alliaceae	*Allium griffithianum*Boiss	NS	+	+	+	-	-	-	G	Mic	Medicinal
2	Amaryllidaceae	*Ixiolirionmontanum*(Labill) Herb	NS	+	-	-	-	-	-	G	Mic	Fodder
3		*Buniumpersicum*(Boiss.)Fedtsch	NS	+	-	-	-	-	-	G	Na	Medicinal, Food
4		*Bupleurum exaltatam*M.Bieb	NS	+	-	-	-	-	-	T	Na	Medicinal
5		*Ferulaasafoetida*Linn	NS	+	+	+	-	-	-	G	Mes	Medicinal
6	Apiaceae0	*Ferulaoopoda*(Boiss and Buhse) Boiss	NS	+	+	+	-	-	-	G	Mes	Medicinal
7		*Peucedanumaucheri*Boiss	NS	+	-	-	-	-	-	T	Mic	Medicinal
8		*Psammogetoncanescens*(DC.)Vatke	S	+	-	-	-	-	-	T	L	Fodder
9		*Achillea wilhelmsii*C. Koch	NS	+	-	-	+	+	+	T	L	Medicinal
10		*Anthemisodontostephana*Boiss	NS	+	-		+	-	-	T	Na	Fodder, Medicinal
11		*Carduuspycnocephalus* L.	S	-	-	-	-	+	-	H	Mes	Fuel Wood
12		*Carthamusoxyacantha*M.Bieb	S	+	-	-	-	+	-	T	Mic	Fodder, Fuel Wood
13		*Centaurea iberica* Trev	NS	+	-	-	-	-	-	T	Mes	Fodder
14		*Ceratocarpusarenarius*Linn	S	+	-	-	-	-	-	T	Mic	Fodder
15		*Campanula leucocladа*Boiss	NS	+	-	-	-	-	-	T	Na	Fodder
16		*Conyza canadensis* (L.) Cronquist	NS	+	-	-	-	-	-	T	Na	Fodder
17		*Cousineastocksii*C.Winker	S	+	-	-	-	-	-	T	Mes	Fodder
18		*Cousineaminuta*Boiss	S	+	-	-	-	-	-	T	Mes	Fodder
19		*Cymbolaenagriffithii*(A.Grey) Wagentiz	NS	+	-	-	-	-	-	T	L	Fodder
20		*Echinopsechinatus*Roxb	S	+	-	-	-	-	-	T	Mic	Fodder, Fuel Wood
21		*Hertia intermedia* (Boiss) O.Ktze	NS	+	-	-	+	-	-	Ch	Mic	Fodder, Fuel Wood Medicinal
22	Asteraceae	*Inulapentanema*(Aitch . and Hemsl.)Kitam	NS	+	-	-	-	-	-	T	Na	Fodder
23		*Jurineacarduiformus*Boiss	NS	+	-	-	-	+	-	T	Mic	Fodder
24		*Kolpinialinearis*Pallas	NS	+	-	-	-	-	-	T	Na	Fodder
25		*Lactucapersica*Boiss	NS	+	-	-	+	-	-	Ch	Mic	-
26		*Lactucaserriola* L.	NS	+	+	+	-	-	-	T	Na	-
27		*Lactucaviminea*(L) F W.Schmidt	NS	+	-	-	-	-	-	Ch	Mes	-
28		*Microcephala lamellate* (Bunge)Pobed	NS	+	-		-	-	-	T	Na	Medicnal
29		*Pulicariagnaphaloides*(Vent) Boiss	NS	+	+	+	-	-	-	H	Na	Fodder, Fuel Wood
30		*Scorzonerapusilla*Pall	NS	+	-	-	-	-	-	T	Mic	Fodder
31		*Senecio decaisnei*DC	NS	+	-	-	-	-	-	T	Na	Fodder
32		*Seriphidiumquettense*(Podlech) Ling	NS	+	-	-	-	-	-	Ch	L	Fodder, Fuel Wood, Roof taching, Medicinal
33		*Sonchus asper* (L.)Hill	NS	+	+	+	-	+		T	Mic	Fodder
34		*Taraxacumofficinale*Linn	NS	+	-	-	-	-	-	H	Mic	Fodder, Medicinal

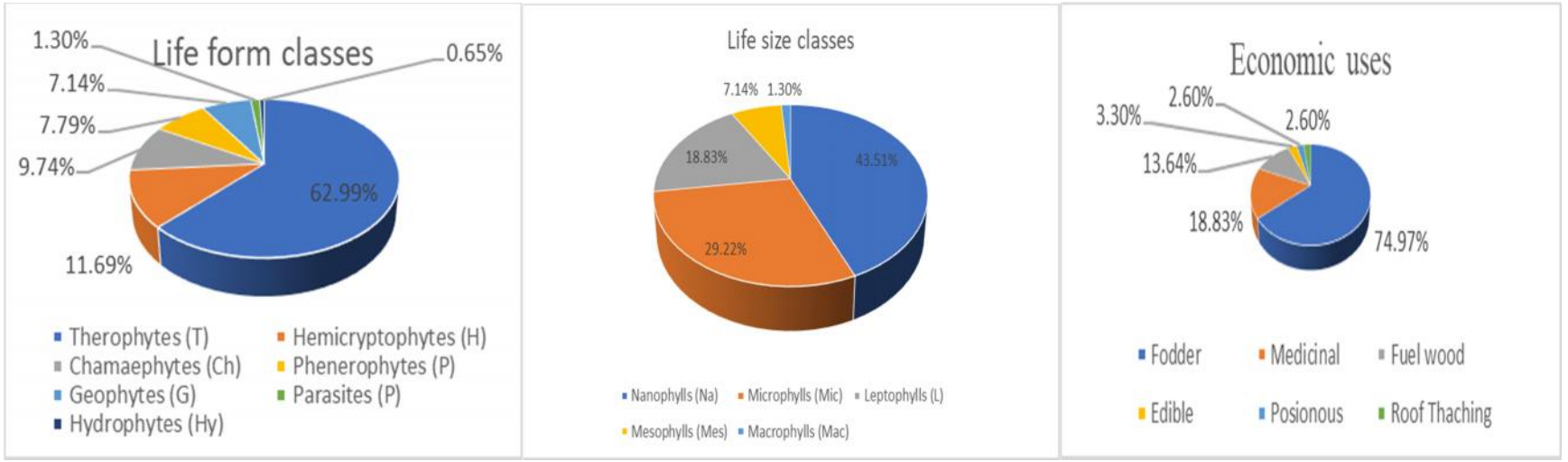
35		*Arnebiainconspicua*Hemsl. and Lace	NS	+	-	-	-	-	-	T	Na	Fodder
36		*Arnebiadecumbens*(Vent) Coss. and Kral	NS	+	-	-	-	-	-	T	Na	Fodder
37		*Heliotropiumdasycarpum*Ledeb	NS	+	-	-	-	+	-	T	Na	Fodder, Fuel wood
38	Boraginaceae	*Heliotropiumeuropaeum*Linn	NS	+	-	-	-	-	-	T	Na	Fodder
39		*Lappulasinaica*(DC.) Asch.ex.Schweinf	NS	+	-	-	-	-	-	T	Na	Fodder
40		*Lappulasessiliflora*(Boiss) Gurke	NS	+	-	-	-	-	-	T	Na	Fodder
41		*Mattiastrum asperum* (Stocks)	NS	+	+	+	-	-	-	T	Mic	--
42		*Noneacaspica*(Wd) G.Don	NS	+	-	-	-	-	-	T	Na	Fodder
43		*Onosmakhyberianum*I.MJohnston	S	+	-	-	-	-	-	T	Na	Fodder
44		*Alyssum dasycarpum*Stapfex.Willd	NS	+	-	-	-	-	-	T	Na	Fodder
45		*Alyssum desertorum*Stapf	NS	+	-		-	-	-	T	Na	Fodder
46		*Alyssum linifolium*Stapf ex Wild	NS	+	+	+	-	-	-	T	Na	Fodder
47		*Brassica sp*	NS	+	-	-	-	-	-	T	Mic	Fodder
48		*Conringiaplanisiligua*Fisch andMey	NS	+	-	-	-	-	-	T	Mic	Fodder
49		*Crambecordifolia*Steven	NS	+	+	+	-	-	-	H	Mes	Fodder, Medicinal
50	Brassicaceae	*Descurainiasophia* (L.) Webband Berth	NS	+	-	-	-	-	-	T	Na	Fodder
51		*Lepidium cartilagineum* (Mayer)Thell.	NS	+	-	-	-	-	-	T	Mic	Fodder
52		*Lepidium sp*	NS	+	-	-	-	-	-	T	Mic	Fodder
53		*Leptaleumfilifolium* (Willd.) DC	NS	+	-	-	-	-	-	T	Na	Fodder
54		*Malcolmiasp*	NS	+	-	-	-	-	-	T	Mic	Fodder
55		*Malcolmiaafricana* (L.) R.Br.	NS	+	-	-	+	-	-	T	Mic	Fodder
56		*Acanthophyllumsquarrosum*Boiss	S	+	-	-	+	-	-	Ch	L	Fodder, Fuel Wood
57	Caryophyllac0eae	*Aspergula*sp	NS	+	-	-	-	-	-	T	L	Fodder
58		*Sileneconoidea*L.	NS	+	-	-	-	-	-	T	Na	Fodder
59		*Stellariaalsinoides*Boiss and Buhse	NS	+	+	+	-	-	-	T	L	Fodder
60		*Atriplexcanescens*James	NS	+	-	-	-	-	-	Ph	Na	Fodder, Fuel Wood
61	Chenopodiaceae	*Haloxylongriffithii*(Moq.)Bunge ex Boiss	S	+	-	-	+	_	-	Ch	L	Fodder
62		*Kochia stellaris*Moq.	NS	+	+	+	-	-	-	Ph	Na	Fodder, Fuel wood
63		*Salsola kali* L	S	+	-	-	-	+	-	T	L	Fodder
64		*Suaedafruticosa*Firssk ex Gmelin	NS	+	-	-	-	-	-	T	L	Fodder
65	Convolvulaceae	*Convolvulus arvensis* L.	NS	+	-	-	-	-	-	T	Mic	Fodder
66		*Convolvulus leiocalycinus*Boiss	S	+	-	-	-	-	-	Ch	Na	Fodder, Fuel Wood
67	Cryophylaceae	*Holosteumumbellatum*L	NS	+	+	+	-	-	-	T	L	Fodder
68	Cuscutaceae	*Cuscutapulchella*Engelm	NS	-	+	-	-	-	-	T,Pr	L	------
69	Dipsicaceae	*Scabiosaolivieri*Coult	NS	+	+	+	-	-	-	T	Na	Fodder
70		*Scabiosamuslakhansis*	S	+	-	-	-	-	-	T	Na	Fodder
71	Ephedraceae	*Ephedra gerardiana*Wall ex.Stapf	NS	+	-	-	-	-	-	Ch	L	Medicinal
72		*Chrozophoratinctoria*(Linn) Raf	NS	+	-	-	-	-	-	T	Mes	Poisonous
73	Euphorbiaceae	*Euphorbia osyridea*Boiss	NS	+	-	-	-	-	-	Ch	Na	Poisonous
74		*Euphorbia granulate* Forsk	NS	+	-	-	-	-	-	T	L	Medicinal

75	Fabaceae	*Alhaji maurorum*Medic	S	+	-		-	-	-	Ch	Na	Fodder
76	Fumaraceae	*Fumaria indica*(Hwsskn.) Pugsley	NS	+	-	-	-	-	-	T	Na	Fodder
77	Gentianaceae	*Gentianoidesoliveri*(Griseb.)	NS	+	-	-	-	-	-	G	Mic	Medicinal
78	Geraniaceae	*Erodium cicutarium*(L).Herit ex Aitch.	NS	+	-	-	+	-	-	T	Na	Fodder
79	Iridaceae	*Iris falcifolia*Bunge	NS	+	-	-	-	-	-	G	Mic	Medicinal
80	Juncaceae	*Juncus maritimus*Lam	NS		-	-	-	+	-	Hyd	Na	Fodder
81		*Nepeta praetervisa*Rech. f.	NS	+	-	-	-	-	-	H	L	Fodder, Herbal tea
82		*Nepeta bracteata*Bth	NS	+	-	-	-	-	-	H	L	Fodder
83		*Eremostachysloasifolia*Benth	NS	+	+	+	-	-	-	H	Mes	Poisonous
84		*Lallemantiaroyleana*Benth	NS	+	-	-	-	-	-	T	L	Medicinal, Fodder
85		*Marrubiumanisodon*C.Koch	NS	+	+	+	-	+	-	T	Mic	Fodder
86		*Mentha longifolia* L	NS	-	-	-	-	+	-	H	Mic	Medicinal, Herbal tea
87		*Perovskiaabrotanoides* Karel	NS	+	+	+	-	-	-	Ph	Mic	Fodder, Fuel Wood
88	Lamiaceae	*Perovskiaatriplicifolia*Bth	NS	+	+	+	-	-	-	Ph	Mic	Fodder, Fuel Wood, R.thaching Medicinal
89		*Salvia cabulica*Benth	NS	+	-	-	-	-	-	Ph	Na	Medicinal
90		*Salvia santolinaefolia*Boiss	NS	+	-	-	-	-	-	Ph	Na	Medicinal
91		*Salvia macrosiphon*Boiss	NS	+	-	-	-	-	-	Ph	Na	Medicinal
92		*Scutellariastocksii*Boiss	NS	+	-	-	-	-	-	T	Na	Medicinal
93		*Teucrium stocksianum* Hedge and Lemond	NS	-	+	-	-	-	-	T	L	Medicinal
94		*Ziziphoratenuior*L	NS	+	-	-	-	-	-	T	L	Fodder
95	Liliaceae	*Eremurusstenophyllus*(Boiss and Buhse) Baker	NS	+	-	-	-	-	-	G	Mic	Medicinal
96		*Gagea pseud reticulata* Vved.	NS	+	-		-	-	-	G	Na	Fodder
97		*Tulipalehmanniana*Merckl	NS	+	-	-	-	-	-	G	Mic	Fodder
98	Malvaceae	*Malva neglecta*Wallr	NS	-	-	-	-	+	-	T	Mic	Fodder
99	Orobanchac0.aca e	*Orobancheaegyptiaca* Pers	NS	+	-	-	-	-	-	T,Pr	Na	----
100		*Hypecoum pendulum* Linn	NS	+	-	-	-		-	T	Na	Fodder
101	Papaverac0eae	*Papaver decaisnei*Hochst. and Steud. ex Boiss	NS	+	-	-	+	-	-	T	Mic	-----
102		*Roemariahybrid* (Linn)Dc	NS	+	-	-	-	-	-	T	Mic	Medicinal
103		*Astragalus anisacanthus*Boiss	S	+	-	-	-	-	-	H	L	Fodder, Fuel wood
104		*Astragalus auganus* Bunge	NS	+	-	-	-	-	-	T	Na	Fodder
105		*Astragalus stocksii*Bunge	S	+	-	-	-	-	-	Ph	Na	Fodder, Fuel Wood
106		*Caragana ambigua*Stocks	S	+	+	+	-	-	-	Ph	Na	Fodder, Fuel wood
107	Papilionaceae	*Ebenusstellata*Boiss	S	+	-	-	-	-	-	Ch	Na	Fodder, Fuel wood
108		*Medecagolupulina*Linn	NS	+	-	-	-	-	-	T	L	Fodder
109		*Melilotusindica*(Linn) Ak	NS	+	+	+	-	-	-	T	L	Fodder
110		*Onobrychismicrantha*Schrenk	NS	+	-	-	-	-	-	T	Na	Fodder
111		*Sophoramollis*(Royle) Baker	NS	+	+	+	+	+	+	Ch	Na	Fodder, Medicinal, Roof thaching
112	Plantaginaceae	*Plantagolanceolata*Linn	NS	-	-	-	-	+	-	T	Mic	Medicinal

113		*Plantagosp (small herb)*	NS	-	-	-	-	+	-	T	Mic	Fodder
114	Plumbaginaceae	*Acantholimonpolystachyum*Boiss	S	+	-	-	+	-	-	Ch	Na	Fodder Fuel wood
115		*Aegilops tauschii*Coss.	NS	+	-		-	-	-	T	Mic	Fodder
116		*Avenafatua* Linn	NS	+	+	+	+	-	-	T	Mic	Fodder
117		*Boissierasquarrosa*(Bank and Soland) Nevski	NS	+	+	+	-	-	-	T	Na	Fodder
118		*Bromussericeus*Drabov	NS	+	-	-	-	-	-	T	Na	Fodder
119		*Bromus tectorum* Linn	NS	+	-	-	+	-	-	T	Na	Fodder
120		*Chrysopogonaucheri*(Boiss)Stapf	NS	+	-	-	-	-	-	H	Mic	Fodder
121		*Cymbopogon commutatus*(Steuds)Stapf	NS	+	-	-	+	-	-	H	Na	Fodder
122		*Cymbopogon jwarancusa*(Jones)Schult	NS	+	-	-	+	-	-	H	Na	Fodder
123		*Cynodondactylon* (L.) Pers.	NS	-	+	-	-	-	-	H	Mic	Fodder
124	Poaceae	*Eremopyrumdistans*(C.Koch) Nevski	NS	+	-	-	-	-	-	T	Na	Fodder
125		*Pennisetumorientale*L.C.Rich	NS	+	+	+	+	-	-	H	Mic	Fodder
126		*Piptatherumbalochistanicum*Freitag	NS	+	+	+	-	-	-	H	Mic	Fodder
127		*Hordeummurinum*Linn	NS	+	-	-	-	+	-	T	Na	Fodder
128		*Loliumtemulentum*Linn	NS	+	-	-	-	-	-	T	Mic	Fodder
129		*Poa pratensis* Linn	NS	+	-	-	-	-	-	H	Mic	Fodder
130		*Saccharum griffithii*Munro ex Boiss	NS	+	+	+	-	+	-	H	Mac	Fodder, Fuel Wood
131		*Schismusarabicus* Ness	NS	+	-	-	-	-	-	T	Na	Fodder
132		*Stipa arabica*Trin and Pupr	NS	+	-	-	-	-	-	H	Mic	Fodder
133		*Taeniatherumcrinitum* (Schreb) Nevski	NS	+	+	+	-	-	-	T	Na	Fodder
134		*Tetrapogonvillosus*Desf	NS	+	+	+	-	-	-	T	Mic	Fodder
135		*Vulpiapersica* (Boiss.andBuhse) Kreez.andBobrov	NS	+	-	-	-	-	-	T	Na	Fodder
136		*Polygala sibirica*Linn	NS	+	-	-	-	-	-	T	L	Fodder
137		*Polygonum afghanicum*Meissn	S	+	-	-	-	-	-	T	L	Fodder
138	Polygalaceae	*Polygonum aviculare* Linn	NS	+	-	-	-	-	-	T	Na	Fodder
139		*Rheum ribes*Linn	NS	+	-	-	-	-	-	G	Mac	Medicinal, Food
140		*Rumexobtusifolius*L.	NS	-	+	-	-	-	-	T	Na	Fodder
141	Ranunculaceae	*Adonis aestivalis*L	NS	+	+	+	-	-	-	T	Na	Medicinal
142		*Ranunculus falcatus* Linn	NS	+	-	-	-	-	-	T	L	Fodder
143	Rosaceae	*Prunus brauhica*(Boiss.)Aith.andHemsl	S	+	+	+	-	-	-	Ch	Na	Medicinal, Fuel Wood
144		*Galium aparine* L.	NS	+	+	+	-	-	-	T	L	Fodder
145	Rubiaceae	*Gailloniamacrantha* Blatt. and Hallb	S	+	-		-	-	-	Ch	Na	Fodder, Fuel wood
146		*Verbascumerianthum*Bth	NS	-	+	-	-	-	-	Ph	Mes	-------
147	Scrophulariaceae	*Veronica biloba* L	NS	+	-	-	-	-	-	T	L	Fodder
148		*Veronica didyma*Tenore	NS	+	-	-	-	-	-	T	L	Fodder
149	Solanaceae	*Solanum nigrum* L.	NS	+	-	-	-	+	-	T	Na	Fodder
150		*Solanum surattense*Burm.F	S	-	-	-	-	+	-	T	Mic	Fodder

151	Tamericaceae	*Tamarixramosissima*Ledeb	NS	-	+	-	-	+	-	Ph	L	Fodder, Fuel wood
152	Thymeliaceae	*Daphne mucronata*Royle	NS	+	-	-	-	-	-	Ph	Na	Medicinal, dye for leather
153	Valerianaceae	*Valerianellaoxyrrhyncha*Fish and Mey	NS	+	-	-	-	-	-	T	Na	Fodder
154	Zygophylaceae	*Peganum harmala* L	NS	+	+	+	-	+	-	T	Mic	Poisonus, Evil repelant Medicinal

***Life form classes (L.F.C)**: Ph = phanerophytes, H = hemicryptophytes, Ch = chaemophytes, T = therophytes, G = geophytes, Pr =parasite. ****Leaf size classes (L.S.C)**: L = leptophylls, Na = nanophylls, Mic microphylls, Mac = macrophylls



A **B** **C**

Fig. 2. Summary of (A) life form, (B) leaf size classes and (C) economic uses of some plants of Karkhasa area

Current study area demonstrated water channels present in respective sites with particular microclimate and floristic composition. *Tamarixramosissima*, *Juncus maritimus*, *Mentha longifolia, PlantagoCynodon, Rumexobtusifolius*and *Verbascumerianthum. Cuscutapulchella* (shoot parasite) and *Orobancheaegyptiaca*(root parasite) were also most commonly found. These results were in agreement with the findings of Durrani and Hussain (2005) Durrani*et al*., (2010), who reported similar species in other water courses of Balochistan.

Findings of Ali *et al.,* (2018); Ullah and Badshah, (2017); Ali *et al.,* (2016); Hussain *et al*.,(2015); Khan *et al*., (2011, 2014); Shaheen*et al*.,(2014); Malik *et al.,* (2007); Sher and Khan., (2007) ; Durrani*et al*., (1996); Tareen and Qadir (1993); were in agreement with contemporary results. Biological Spectra of study area showed 7.14% geophytes such as *Gageapseudoreticulata, Allium griffithianum, Ixiolirionmontanum, Buniumpersicum*and *Tulipalehmanniana,* which are greatly affected and remain inactive during long dry periods due to their short life cycle. Khan *et al.*, (1999) reported that hemi-cryptophytes and geophytes had immense subterranean perennating parts which favors plant propagation and enable them to flourish again even after undesirable dry periods. Under undesirably climatic condition, while plants are under stress, there is always a better chance for plant species which are more capable of adaptation and proliferation under changing environmental conditions. Biological spectra further provide useful data while comparing geographically estranged plant communities; and serving as a marker of existing environment. Similar biological spectra of distant communities reflect similar environmental and edaphic conditions.

Leaf size is associated with moisture content supply of ambient environment. There is always a decrease in leaf size with decreasing moisture. Magaphylls were missing in current study area because of same reasons**.** It is thus concluded that in leaf size classes, small leaves were ecological adapted to the prevalent ecological and environmental conditions. In current study the reduction in leaf-size spectra may serve as an indicator of xeric climatic condition of study area. It was observed that nanophylls (43.51%) was the dominant class followed by microphylls (29.22%) and leptophylls (18.83%). These findings are similar with the results of Ali *et al.,* (2018); Ali *et al.,* (2016); Ullah *et al.,* (2016); Durrani*et al*., (2010); Durrani*et al*., (2005); Tareen and Qadir (1993). The leaf size information may further help to disclose physiological events of plant species and their overall communities.

Ethnobotanical knowledge emerges traditional and indigenous uses of plants in local systems by native inhabitants. Protected areas due to proper management and conservational practices support a great variety of flora with enormous folk uses. There were 117 (80%) fodder species, 33 (22%) medicinal and 21(14%) for fuel wood. Three species are used as roof thatching, 3 as vegetable/fruits and 2 species are used for making herbal tea. Most of species are used as fodder in rangelands (Durrani and Hussain, 2005). A number of ethnobotanical profiles were compiled from diverse parts of Balochistan (Durrani*et al*. 2010, 2009, 2003, 1996; Durrani and Manzoor, 2006;Tareen *et al*. 2010. From Swat (Hussain*et al*., 2006, Hazrat*et al.,* 2010), South Waziristan (Hussain *et al*., 2006), Bunir (Shah and Hussain, 2008), Punjab (Qureshi *et al*., 2011) and in Mastuj Valley (Shah and Hussain, 2012) reported plants with traditionally medicinal uses.

Medicinal plants as natural resources are important in the investigated area. This is for the reason that poverty, lower literacy rate and lack of basic health care amenities in local areas. Trade of plants with therapeutic potentials is extensive in Balochistan. However, due to the lack of scientific knowledge regarding collection, preservation and strategic marketing policies, medicinal plants do not play its part in the economic growth of the Province. In recent works, most plant species were reported with various uses. Plant species with therapeutic potentials were regularly used to cure various ailments and earning livelihood. However, overgrazing of these medicinal plants was common in nearby unprotected sites. Overgrazing caused annihilation of valuable medicinal plants in the area as aerial parts are detached and remaining are destroyed by trampling. It is therefore inevitable to control and manage grazing system and promote the regeneration of medicinally important plant species even at community levels. In our study, it was found that overall growth and distribution of certain medicinal plants including *Buniumpersicum, Gentianoidesoliveri, Microcephala lamellate, Nepeta praetervisa, Amagdylusbrauhicus*and *Rheum ribes*is were limited to certain protected sites, with almost no representation on unprotected sites due to their uncontrolled exploitation and uprooting by local communities.

Local inhabitants of nearby communities (Brahui tribe) collect and use medicinal plants from Karkhasa rangeland. Over collection and over-exploitation of valuable wild plants and other natural assets led to the severe decline of soil fertility due to loss of vegetation cover. Local communities living near Karkhasa rangelands were mostly very poor without even basic amenities of life and health, thus; directly depending upon natural resources of study area for fuel wood and medicinal plants. Fuel wood collectors, irrespective of any other worth of certain important plants, while collecting uproot plant species with several woody bases, roots or stems in the unprotected sites. Overall results indicated a drastic reduction of vegetation cover due to over-grazing of fodder species, over-

collection of most commonly used medicinal plants and fuel wood collection. Protection of rangeland is the need of the day for sustainable utilization of existing flora and it is strongly suggested that overgrazing and over-exploitation of vegetation should be controlled in open grazing lands in order to conserve floristic composition.

Conclusion: The native wild flora of a rangeland is national community's heritage and must be managed in the best way in order to give the greatest benefits. The results obtained in this study highlighted a wide variation in floristic composition and ecological characteristics of wild flora on protected site respect to the unprotected ones indicating the value of protected areas in conserving biological diversity. The present study, thus, provided a baseline data for future research endeavors particularly in fields like biochemistry, biotechnology and pharmacology to further explore the value of wild flora and protected areas. Nevertheless, it can be concluded that unprotected sites facing a severe threat of dilapidation due to deleterious anthropogenic activities and rationally with lower regeneration capacity. This natural ecosystem requires a conservation strategy with a proper management system to endure its natural resources generation after generation.

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