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PALATABILITY AND ANIMAL PREFERENCES OF PLANTS IN RAIN FED AREA

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ABSTRACT

Palatability is that distinguishing characteristic which motivates the animals to graze the plants. The present study focused on to explore palatability of flora district Banuu. The palatability values were calculated day by day monitoring of the individual animal grazing preferences by various plant species, various plant parts and different plant conditions for 2 consecutive years. During the current study, about 193 species of 155 genera belonging to 54 families were enumerated for palatability value in the research area. Out of 193 plant species about 37 species (19.17%) were non-palatable having poisonous characteristics in nature and about 156 (80.83%) plant species were palatable having different measurement of palatability in the area. Among 156 plant species the palatable plants were 50 (17.66%) grazed by cow, about 92 (32.50%) were by goat and about 90 (31.80%) by sheep. While the remaining 51 (18.02%) were browsed by camel. The people of the study area having large numbers of domesticated animals. Overgrazing has adverse effects on plant diversity in the area. So, control grazing and afforestation is good in future outline for this area.

Key words: District Bannu, Palatability, Species diversity, rain feed area**.**

INTRODUCTION

Bannu is one of the Southern district at a distance 197.5 km away from Peshawar. It is positioned in between 32.43° to 33.06° North latitude and from 70.22° to 70.57° East longitude and bordered at North by FR Bannu (Frontier Regions of Bannu) and nearby to the North Waziristan Agency (NWA). At East surrounded by Karak district, at South East by Lackki Marwat and at South-West by (SWA) South Waziristan Agency. The total area of Bannu is about 1,227 Km^2 and the inhabitants of the area is 677,346 (1998 District Census report of Bannu) (Fig. 1).

Palatability is that distinguishing plant characteristic or plant species condition that motivates the animal to graze that very specific plant species (Heady, 1964). Palatability of foods or fluids vary by the condition of an individual unlike its flavor or taste because it becomes low after usage and elevated when deprived (Lowe and Butryn, 2007). Palatability is really hard to describe in language of biological processes concerned in food selection. As frequently used the word implies suitability however not essentially prestige. Via varying competition and supremacy hierarchies linking plant species, the invertebrate herbivores may require powerful effect on the constitution of terrestrial plant species communities (Brown and Gange, 1989; Carson and Root, 1999; Schadler *et al*., 2003). Commonly palatability rate increases with a declining Carbon and Nitrogen ratio (Mattson 1980; Strong *et al.,* 1984; Hartley and Jones, 1997; Griffin *et al*., 1998). Carbon based those secondary metabolites like phenols and lignin is essentially control palatability and decomposability. Therefore, a very close association between palatability and decomposition have to be present, yet if leaf character may vary among living leaves and the litter (Aerts, 1996). It has been often pragmatic that sheep usually favour grasses and forbs other than shrubs; whereas goats choose shrubs (Wilson *et al.,* 1995; Huston, 1978; Grunwaldt *et al.,* 1994; Khan, 1996; Kirilov *et al*., 2016; Kirilov and Vasileva, 2016).

Species diversity: The species variety is a function of the quantity of species there occur (Margalef, 1958, Lloyd and Ghelardi, 1964; Pielou, 1966). The decline in the local species diversity is a prevalent force of human activity (Groombridge, 1992; Pimm *et al*., 1995; Vitousek *et al*., 1997), and might effect decrease in primary production (Naeem *et al.,* 1994; Tilman *et al.,* 1996; 1997*a*; Hector *et al.,* 1999). The 2 main planned mechanisms for this result of variety on efficiency are that lower plant species richness decreases the probability to facilitate species by key qualities that will be there in the community (the sampling effect; Aarssen, 1997; Huston, 1997; Tilman *et al*., 1997*b*), and to facilitate a a lesser amount of varied community of challenging species would consume assets less entirely (niche complementarity; Naeem *et al*., 1994; Tilman *et al.,* 1996; 1997*b*; Hector *et al*., 1999).

Plant resources in the rain feed area: Pakistan is a predominantly a dry country with eighty percent area falling in dry and semi-arid regions (Shah *et al*., 2011; Hussain and Durrani, 2008). At present Pakistan stands generally amongst the infertile countries by yearly rainfall of less than 240 milimeter (Farooq *et al*., 2007). Climate is

categorized principally as desert or close to desert; half of the country gets a lesser amount (250 mm) rainfall per annum and out of total geographical area (79.6 million hectares), merely (23 million hectares) is cultivated area. Almost seventy five percent of the cultivated area is irrigated and the rest (4.0 Million hectares) is rain-Fed (PCST, 2005a) playing a significant part in the nationwide economy (Adnan *et al*., 2009). The forests cover up an area of 4.0 million hectares, which is fifty percent of the whole area in the country (PCST, 2005b; Siddiqui, 2007). In addition, with an area of (28.5 million hectares) the rangelands inhabit almost one-third (32.4 percent) of the whole land (Economic Survey, 2010-2011). Thus, water is one of the most limiting constraints for agricultural production in Pakistan.

MATERIALS AND METHODS

The palatability values were calculated by each day evaluation of the individual animals grazing preferences by diverse plants, the plant parts and plant state for 2 succeeding years (2013- 2015). The information was arranged for final declaration. The collected plants species were dried well, preserved and mounted on herbarium sheets and the plants species were recognized with the assist of Flora of Pakistan (Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1992; Ali and Qaiser, 1995-2015). Plants were classified into following palatability classes: non palatable, highly palatable, mostly palatable, less palatable and rarely palatable (Hussain and Durrani, 2009).

Palatability: During the current study about 193 species of 155 genera belonging to 54 families were calculated for palatability values in the study area (Table 1). Poaceae was predominant family having 37 species, Asteraceae (17 species), Papilionaceae (15 species), Solanaceae (9 species), Brassicaceae (8 species), Cucurbitaceae (7 species), Amaranthaceae and Boraginaceae (6 species each), Chenopodiaceae, Euphorbiaceae, Mimosaceae and Polygonaceae (5 species each), Malvaceae and Moraceae (4 species each), Apiaceae, Lamiaceae and Zygophyllaceae (3 species each), Alliaceae, Apocynaceae, Asclepiadaceae, Asphodelaceae, Caryophllaceae, Convolvulaceae, Cyperaceae, Myrtaceae, Plantaginaceae, Ranunculaceae, Rutaceae, Typhaceae, Papaveraceae, Tamaricaceae and Verbenaceae (2 species each), Nyctaginaceae, Linaceae, Anacardiaceae, Fumariaceae Arecaceae, Aizoaceae, Capparidaceae, Cuscutaceae, Iridaceae, Juncaceae, Meliaceae, Primulaceae, Resedaceae, Rhamnaceae, Rubiaceae, Scrophulariaceae, Gentianaceae, Oxalidaceae, Violaceae, Vitaceae, Orobanchaceae and Tiliaceae (1 species each) (Table 2). Out of 193 plant species about 37 plant species (19.17%) were non-palatable owing to poisonous in character while about 156 (80.83%) plant species were palatable owing to a variety of extent of palatability in the study area (Table 3). The ratio of palatable plant was greater than non-palatable plants in the area. On the basis of palatability plants were classified into four classes on the basis of their utilization by animal in the area. Highly palatable plants to animal were (12.43%), mostly palatable plant (19.17%) less palatable plant (30.56%) and rarely palatable plant 18.13%. As high palatable plants species not present to animals after that depends on less palatable plant species. Likewise, goat and sheep too depend on these species for some degree. Herbivory is strongly avoided owing to spiny in nature of the plant species (Table 4). On the plant part used basis, it was noted that shoot and whole plant parts were used (61.53%). In (37.17%) plant species leaves were used as a food for animal whereas in (1.92%) floral parts were used (Table 5). On the basis of form (68.98%) plant species were used in fresh form and (10.12%) in dry form whereas (20.88%) were used in both dry and fresh form (Table 6). In the current study it was eminent that Cattle use plant typically in fresh form. Likewise, cow favoured largely the grasses in fresh as well as in dry form like wheat straw. The palatability stimulates the animal to choose the plant as ingredient of its diet. In other words the response of motivation is to graze the plant species. The motivation response connection in food choice and acceptance is inhibited by a difficult chain of proceedings. Amongst the palatable (17.66%) plant species were grazed by cow, (32.50%) were grazed by goat and (31.80%) grazed by sheep. Whereas (18.02%) plant species were browsed by camel (Table 07). Cattle frequently prefer herbaceous plants and also use shrubs to some degree. Cows chiefly use grasses whereas camel use trees and spiny plant species.

Table 1. Palatability, plant part used, form and animal preferences of plants in study area (district Bannu).

S/No.	Botanical names of plants	Palatability different classes					Plant Part used					Condition			Livestock		
		NP	P	H	M	L	R	W	L	I	F	D	B	C	G	S	Ca
01	*Abelmoschus esculentus* (L.) Moench.	-	+	-	-	+	-	-	+	-	+	-	-	+	+	+	+
02	*Achyranthes aspera* L.	-	+	-	-	+	-	-	+	-	+	-	-	+	-	+	-
03	*Acacia modesta* Wall.	-	+	+	-	-	-	-	+	-	+	-	-	-	-	-	+
04	*Acacia nilotica* (L.) Wild.ex Delile	-	+	+	-	-	-	-	+	-	+	-	-	-	-	+	+
05	*Aerva javanica* (Burm. F.) Juss.	-	+	-	-	-	+	-	+	-	-	+	-	-	+	-	+
06	*Albiza lebbeck* (L.) Benth	-	+	-	-	-	-	-	+	-	+	-	-	-	-	-	+
07	*Alhagi maurorum* Medic.	-	+	-	-	-	+	-	-	-	+	-	-	-	-	-	+
08	*Allium sativum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
09	*Allium cepa* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	*Alopecurus nepalensis* Trin Ex Steud	-	+	-	-	-	+	+	-	-	-	-	-	+	-	-	-
11	*Aloe vera* (L.) Brum	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	*Anagallis arvensis* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	*Amaranthus blitoides* S. Watson	-	+	+	+	-	-	-	+	-	+	-	+	+	-	-	-
14	*Amaranthus viridis* L.	-	+	-	+	-	-	-	+	-	+	-	-	+	-	-	+
15	*Aristida adscensionis* L.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	-	-
16	*Aristida cyanantha* Nees ex Steud.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	-	-
17	*Arnebia hispidissima* (Lehm.) A. DC	-	+	-	-	+	-	-	-	-	+	-	-	-	-	-	+
18	*Asphadelus tunifolius* Caven.	+	-	-	-	-	-	-	-	-	+	-	-	-	-	-	-
19	*Astragalus scorpiurus* Bunge.	-	+	-	-	-	-	+	-	-	+	-	-	+	-	+	+
20	*Atriplex stocksii* Boiss	-	+	-	-	+	-	-	+	-	-	-	+	-	+	-	+
21	*Avena fatua* L.	-	+	+	-	-	-	+	-	-	+	-	-	-	+	+	-
22	*Boerhavia procumbens* Banks ex Roxb	-	+	-	+	-	-	+	-	-	+	-	-	-	-	+	-
23	*Brassica campestris* L.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	+
24	*Brassica tourneforii* Gouan	-	+	-	-	+	-	+	-	-	+	-	-	-	-	-	+
25	*Bromus pectinatus* Thunb.	-	+	-	-	+	-	+	-	-	+	-	-	+	-	-	-
26	*Calendula officinalis* L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
27	*Calligonum polygonoides* L.	-	+	-	-	-	-	-	+	-	+	-	-	-	-	-	+
28	*Calotropis procera* (Willd.) R. Br.	-	+	-	-	+	-	+	+	-	+	-	-	-	+	+	-
29	*Capsicum annuum* L.	-	+	-	-	+	-	+	+	-	+	-	-	-	+	+	-
30	*Capparis decidua* (Frossk.) Edgew.	-	-	+	-	-	-	+	-	-	+	-	-	-	+	-	+
31	*Carduus argentatus* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

32	*Carthamus persicus* Willd.	-	+	-	-	-	-	+	-	-	+	-	-	-	-	-	+
33	*Carthamus tinctorus* L.	-	+	-	-	+	-	+	-	-	+	-	-	-	-	-	+
34	*Celosia argentea* L.	-	+	-	-	+	-	+	-	-	-	-	-	-	+	+	-
35	*Cenchrus bifolrus* Roxb.	-	+	-	+	-	-	+	-	-	+	-	-	-	-	+	-
36	*Cenchrus ciliaris* L.	-	+	-	-	-	+	+	-	-	+	-	-	+	-	-	-
37	*Centaurea iberica* Spreng.	-	+	-	-	+	-	-	+	-	-	+	-	-	+	-	-
38	*Centaurium pulchelhum* (Sw.) Druce	-	+	-	+	-	-	+	-	-	+	-	-	-	-	+	-
39	*Chenopodium album* L.	-	+	-	+	-	-	+	-	-	-	-	+	-	-	+	-
40	*Chenopodium murale* L.	-	-	-	+	-	-	+	-	-	+	-	-	-	-	-	+
41	*Chrozophora tinctoris* (L.) Raf.	-	+	-	-	+	-	-	+	-	+	-	-	-	-	-	+
42	*Cicer arietinum* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	+	+	+
43	*Cirsium arvense* (L.) Scop.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
44	*Cistanche tubulosa* (Schrenk.) Hook. f.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
45	*Citrullus colocynthis* (L.) Shred.	-	+	-	-	+	-	-	-	+	-	-	+	-	-	-	-
46	*Citrus limon* (L.)Burm.f	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	-
47	*Citrus reticulata* Blanco	-	+	-	-	+	-	-	+	-	+	-	-	-	+	-	-
48	*Convolvulus arvensis* L.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	-
49	*Convolvulus spicatus* Hallier f.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	-
50	*Conyza bonariensis* (L.) Cronquist	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
51	*Corchorus depressus* (L.)	-	+	-	-	+	-	+	-	-	+	-	-	-	-	+	-
52	*Croton bonplandianus* Bat.	-	+	-	-	+	-	+	-	-	+	-	-	+	+	+	-
53	*Cucumis sativus* L.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	-
54	*Cucurbita maxima* Duch Ex. Lam.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
55	*Cucurbita pepo* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
56	*Cuscuta reflexa* Roxb.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57	*Cymbopogon distans* Schutt.	-	+	-	-	+	-	-	-	-	-	-	+	-	+	+	-
58	*Cyamopsis tetragonoloba* (L.) Taubert	-	+	-	+	-	-	+	-	-	-	-	+	+	+	+	+
59	*Cynodon dactylon* (L.) Pers.	-	+	-	+	-	-	+	-	-	-	-	+	+	+	+	-
60	*Cyperus difformis* L.	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	-
61	*Cyperus rotundus* L.	-	-	-	-	+	-	-	+	-	+	-	-	-	-	+	-
62	*Dalbergia sissoo* Roxb.	-	+	-	-	-	-	-	+	-	+	-	-	-	+	+	+
63	*Datura alba* Nees.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
64	*Desmostachya bipinnata* (L.)Stapf.	-	+	-	-	-	-	-	+	-	-	+	-	+	-	-	-
65	*Dichanthium annulatum* Forssk.	-	+	+	-	-	-	+	-	-	-	-	+	+	-	-	-
66	*Digera muricata* (L.) Mart	-	-	-	-	-	-	-	+	-	-	+	-	-	+	+	-
67	*Dinebra retroflexa* (Vahl) Panzer.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

68	*Daucus carota* L.	-	+	-	-	+	-	-	-	-	+	-	-	+	+	+	-
69	*Echinochloa crus-galli* (L.) P. Beauv.	-	+	-	-	-	+	-	+	-	-	+	-	+	-	-	-
70	*Echinops echinatus* L.	-	+	-	-	-	-	+	-	-	+	-	-	-	-	-	+
71	*Eleusine indica* (L.) Gaertn.	-	+	-	-	+	-	-	-	-	+	-	-	+	+	-	-
72	*Eragrostis pilosa* (L.)P. Beauv.	-	+	-	-	-	+	-	+	-	-	+	-	-	+	-	-
73	*Eragrostis minor* Host.	-	+	-	-	-	+	-	+	-	-	+	-	-	+	-	-
74	*Eruca sativa* Mill.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	+
75	*Eucalyptus camaldulaensis* Dehnh.	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	+
76	*Euphorbia dracunculoides* Lam.	-	+	-	-	+	-	-	+	-	-	+	-	+	+	+	-
77	*Euphorbia helioscopia* L.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
78	*Euphorbia prostrata* Ait.	-	+	-	-	-	+	+	-	-	+	-	-	+	-	-	-
79	*Fagonia indica* L.	-	+	-	-	-	-	+	-	-	+	-	-	-	-	-	+
80	*Farsetia jacquemontii* (Hook. F. & thoms.) Jafri	-	+	-	-	-	-	+	-	-	+	-	-	+	+	+	+
81	*Ficus carica* L.	-	+	-	-	+	-	-	+	-	-	+	-	-	+	-	-
82	*Ficus religiosa* L.	-	+	-	-	-	-	-	+	-	-	+	-	-	+	-	-
83	*Filago pyramidata* L.	-	+	-	-	-	+	+	-	-	-	+	-	-	-	+	-
84	*Fumaria indica* Hausskn.	-	+	-	+	-	-	-	+	+	-	-	-	-	+	-	-
85	*Galium tricorne* Stokes	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
86	*Heliotropium crispum* Desf.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	+
87	*Heliotropium europaeum* (F. & M.) Kazmi	-	+	-	-	+	-	+	-	-	+	-	-	-	-	-	+
88	*Heliotropium strigosum* Wild	-	+	-	-	+	-	+	-	-	+	-	-	-	-	-	+
89	*Hibiscus rosa-sinensis* L.	-	+	-	-	-	-	-	+	-	+	-	-	-	+	+	-
90	*Hordeum vulgare* L.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	+
91	*Hordeum murinu* Sub. Glacum (Steud) Tzveleve	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
92	*Hypecoum pendulum* L.	-	+	-	-	-	-	+	-	-	+	-	-	+	+	+	-
93	*Hyoscyamus niger* L.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	+
94	*Juncus inflexus* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
95	*Ifloga spicata* Forssk.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	+	-
96	*Iris lactea* Pallas	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
97	*Lactuca sarriola* L.	-	+	-	-	-	-	+	-	-	+	-	-	-	+	+	-
98	*Lathyrus aphaca* L.	-	+	+	-	-	-	+	-	-	+	-	-	-	-	+	-
99	*Lathyrus sativus* L.	-	+	-	+	-	-	-	+	-	-	+	-	+	-	-	-
100	*Launaea angustifolia* (Desf.) Kuntze	-	+	-	-	-	-	+	-	-	+	-	-	-	+	+	-

101	*Launaea procumbens* Pravin Kawale	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
102	*Leptochloa panicea* Retz.	-	+	-	-	-	-	-	-	-	-	-	-	+	+	+	-
103	*Linum corymbulosum* Reichenb.	-	+	-	-	+	-	+	-	-	+	-	-	+	+	+	-
104	*Luffa aegyptica* Mill.	-	+	-	-	-	-	-	+	-	+	-	-	-	+	+	-
105	*Lycopersicum esculentum* Miller	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
106	*Magifera indica* L.	-	+	-	-	-	+	-	+	-	+	-	-	-	+	+	-
107	*Malcolmia africana* (L.) R.Br.	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	-
108	*Malva neglecta* Wallr.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	-
109	*Malvastrum coromendelianum* (L.) Gracke	-	+	-	-	-	+	-	+	-	+	-	-	-	+	-	-
110	*Mentha longifolia* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
111	*Mentha spicata* (L.) L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
112	*Momordica charantia* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
113	*Medicago polymorpha* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	+	+	-
114	*Melia azedarach* L.	-	+	-	-	-	+	-	+	-	+	-	-	-	+	-	-
115	*Melilotus alba* Desr.	-	+	-	+	-	-	-	+	-	-	-	+	+	-	+	-
116	*Melilotus indica* (L.) All.	-	+	+	-	-	-	+	-	-	-	-	+	-	-	+	-
117	*Morus alba* L.	-	+	+	-	-	-	-	+	-	+	-	-	-	+	+	-
118	*Morus nigra* L.	-	+	+	-	-	-	-	+	-	+	-	-	-	+	+	-
119	*Nerium indicum* Mill.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
120	*Neslia apiculata* Fisch.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-	-
121	*Nicotiana plumbaginifolia* Viv.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
122	*Nonea edgeworthii* A. DC.	-	+	-	-	-	+	+	-	-	+	-	-	-	-	-	+
123	*Nonea pulla* (L.) DC.	-	+	-	-	-	+	+	-	-	+	-	-	-	-	-	+
124	*Oligomeris linifolia* (Vahl.) Macbride	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
125	*Oryza sativa* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	+	+	+
126	*Ocimum basilicum* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	+	-
127	*Oxalis corniculata* L.	-	+	-	-	-	+	-	+	-	-	-	+	-	-	+	-
128	*Oxyria digyna* (L.) Hill.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	+
129	*Pennisetum glaucum* L.	-	+	-	-	-	-	+	-	-	-	-	+	-	+	-	-
130	*Parthenium hysterophorus* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
131	*Pegnum harmala* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
132	*Periploca aphylla* Decne.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-	+
133	*Phalaris minor* Retz.	-	+	-	+	-	-	+	-	-	-	+	-	-	+	-	-
134	*Phoenix dactylifera* L.	-	-	-	-	-	+	-	+	-	+	-	-	-	+	+	-

135	*Phragmites karka* (Retz.) Trimn.ex Steud.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
136	*Plantago lanceolata* L.	-	+	-	-	+	-	-	-	-	-	-	+	-	-	+	-
137	*Plantago ovata* Frossk.	-	+	-	-	+	-	-	-	-	-	-	+	-	-	+	-
138	*Poa annua* L.	-	+	+	-	-	-	+	-	-	-	-	+	-	+	+	-
139	*Poa botryoides* (Trin. Ex Griseb.) Kom.	-	+	+	-	-	-	+	-	-	-	-	+	-	-	+	-
140	*Poa bulbosa* L.	-	+	+	-	-	-	+	-	-	-	-	+	-	-	+	-
141	*Polygonum biaristatum* Aitch. & Hemsl.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
142	*Polygonum plebejum* R.Br	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
143	*Polypogon monspeliensis* (L.) Desf.	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-
144	*Portulaca oleracea* L.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	+	+
145	*Psammogeton biternatum* Edgew.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
146	*Psidium guajava* L.	-	+	-	+	-	-	-	+	-	+	-	-	-	+	-	+
147	*Prosopis cineraria* L.	-	+	-	+	-	-	-	+	-	+	-	-	-	+	-	+
148	*Prosopis juliflora* Swartz.	-	+	-	+	-	-	-	+	-	+	-	-	-	+	-	+
149	*Raphanus sativus* L.	-	+	-	+	-	-	+	-	-	-	-	-	+	+	+	-
150	*Ranunculus muricatus* L.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
151	*Ranunculus scleratus* L.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
152	*Rostraria cristata* L.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	+	-
153	*Rostraria pumila* (Desf.) Tzvelev.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	+	-
154	*Rhazya stricta* Decne.	-	+	-	-	-	+	-	+	-	+	-	-	-	+	-	-
155	*Rumex dentatus* (Meisn.) Rech.f.	-	+	-	-	+	-	+	-	-	+	-	-	+	-	-	-
156	*Saccharum bengalense* Retz.	-	+	+	-	-	-	-	+	-	-	-	+	+	-	-	-
157	*Saccharum officinarum* L.	-	+	-	+	-	-	-	+	-	+	-	+	-	+	+	-
158	*Saccharum spontaneum* L.	-	+	-	-	-	+	+	+	-	-	-	-	-	-	+	-
159	*Salsola foetida* Del.ex Spreng.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	+
160	*Setaria pumila* (Poir.) Roem.	-	+	-	+	-	-	+	-	-	-	-	+	-	-	+	-
161	*Silene vulgaris* (Moench) Garcke.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
162	*Sesbenia sesbans* (L.)Merrill.	-	+	-	-	+	-	-	+	-	+	-	-	-	+	+	-
163	*Sisymbrium irio* L.	-	+	-	+	-	-	+	-	-	+	-	-	-	+	+	-
164	*Sonchus asper* (L.) Hill.	-	+	-	-	-	+	+	-	-	+	-	-	-	+	-	+

165	*Solanum nigrum* L.	-	+	-	+	-	-	+	-	-	-	-	+	+	-	+	-
166	*Solanum surattense* Burm.f.	-	-	-	+	-	-	+	-	-	-	-	-	-	-	-	+
167	*Sorghum halepense* (L.) Pers.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	-
168	*Sorghum bicolor* (L.)Moench.	-	+	-	-	+	-	+	-	-	+	-	+	+	+	+	-
169	*Spergula fallax* (Lowe) E.H.L. Krause	-	+	-	-	+	-	-	-	+	-	+	-	-	+	-	-
170	*Suaeda fruticosa* Forssk.ex J.F. Gmelin.	-	+	-	+	-	-	+	-	-	-	-	+	-	-	-	+
171	*Taraxacum officinale* F.H. Wiggers	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
172	*Tamarix aphylla* (L.) Karst	-	+	-	-	-	+	-	+	-	+	-	-	-	+	-	+
173	*Tamarix dioica* Roxb. Ex Roth.	-	+	-	-	-	+	-	+	-	+	-	-	-	+	-	+
174	*Torilis nodosa* (L.) Gaertn.	-	+	-	-	+	-	+	-	-	-	-	+	-	+	-	-
175	*Tribulus terrestris* L.	-	+	+	-	-	-	+	-	-	+	-	-	-	-	+	-
176	*Trichosanthes dioica* Rxb.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	+	-
177	*Trifolium alexandrianum* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	-	-	-
178	*Trifolium repens* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	-	-	-
179	*Trigonella crassipes* Boiss.	-	+	-	+	-	-	+	-	-	+	-	-	+	+	+	-
180	*Triticum aestivum* L	-	+	+	-	-	-	+	-	-	+	-	+	+	+	+	-
181	*Typha latifolia* L.	-	+	-	-	-	+	-	+	-	+	-	-	+	-	-	-
182	*Typha minima* Frunck ex Hoppe	-	+	-	-	-	+	-	+	-	+	-	-	+	-	-	-
183	*Verbena officinalis* L.	-	+	-	-	+	-	+	-	-	+	-	-	-	+	-	+
184	*Veronica aqutica* Bern.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
185	*Vicia hirsuta* (L.) S.F. Gray, Nat.	-	+	-	-	+	-	-	+	-	-	+	-	-	+	-	-
186	*Vitex negundo* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
187	*Vitis vinifera* L.	-	-	-	-	+	-	-	+	-	+	-	-	-	+	-	-
188	*Viola stockii* Boiss.	-	+	-	-	-	+	-	+	-	-	+	-	-	-	+	-
189	*Withania coagulans* Dunal.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
190	*Withania somnifera* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
191	*Xanthium strumarium* L.	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
192	*Zea mays* L.	-	+	+	-	-	-	+	-	-	-	-	+	+	+	+	+
193	*Ziziphus jujuba* Mill.	-	+	+	-	-	-	+	-	-	+	-	-	-	+	+	+
	Total	37	156	24	37	59	35	96	57	3	109	16	32	50	92	90	51
	Percentage	19.17	80.83	12.43	19.17	30.56	18.13	61.53	37.17	1.92	68.98	10.12	20.88	17.66	32.50	31.50	18.02

Key: Np =Palatability; Non palatable; P = palatable; H = highly palatable; M = mostly palatable; L = less palatable; R = rarely palatable
Plant part used; W = whole plant; L = leaves; I = inflorescence, Condition; F = fresh; D =dry; B = both : Livestock = cow; G = goat; S = sheep and Ca = camel

Table 2. Plant distribution in various families and genera.

S. No.	Name of Family	Number of Genera	Number of Species	S.No.	Name of Family	Number of Genera	Number of Species
1	Poaceae	27	37	28	Rutaceae	27	2
2	Asteraceae	15	17	29	Typhaceae	15	2
3	Papilionaceae	13	15	30	Tamaricaceae	13	2
4	Solanaceae	7	9	31	Verbenaceae	7	2
5	Brassicaceae	7	8	32	Anacardiaceae	7	1
6	Cucurbitaceae	6	7	33	Arecaceae	6	1
7	Amaranthaceae	5	6	34	Aizoaceae	5	1
8	Boraginaceae	4	6	35	Capparidaceae	4	1
9	Chenopodiaceae	4	5	36	Cuscutaceae	4	1
10	Euphorbiaceae	3	5	37	Fumariaceae	3	1
11	Mimosaceae	3	5	38	Gentianaceae	3	1
12	Polygonaceae	4	5	39	Iridaceae	4	1
13	Moraceae	2	4	40	Juncaceae	2	1
14	Malvaceae	4	4	41	Linaceae	4	1
15	Apiaceae	3	3	42	Meliaceae	3	1
16	Lamiaceae	2	3	43	Nyctaginaceae	2	1
17	Zygophyllaceae	3	3	44	Orobanchaceae	3	1
18	Alliaceae	1	2	45	Oxalidaceae	1	1
19	Apocynaceae	2	2	46	Papaveraceae	2	1
20	Asclepiadaceae	2	2	47	Primulaceae	2	1
21	Asphodelaceae	2	2	48	Resedaceae	2	1
22	Caryophllaceae	2	2	49	Rhamnaceae	2	1
23	Convolvulaceae	1	2	50	Rubiaceae	1	1
24	Cyperaceae	1	2	51	Scrophulariaceae	1	1
25	Myrtaceae	2	2	52	Tiliaceae	2	1
26	Plantaginaceae	1	2	53	Violaceae	1	1
27	Ranunculaceae	1	2	54	Vitaceae	1	1
					Total	155	193

Table 3. Non-Palatable Vs Palatable plant species

S.No	Non- palatable	Palatable
1	**19.17%**	**80.83%.**

Table 4. Differential palatability

S. No.	Palatability	Percentage
1	Highly palatable	12.43%
2	Mostly palatable	19.17%
3	Less palatable	30.56%
4	Rarely palatable	18.13%

Table 5. Part used

S. No.	Part used	Percentage
1	Whole plant	61.53%
2	Leaves	37.17%
3	Floral parts	1.92%

Table 6. Condition.

S.No.	Condition	Percentage
1	Fresh condition	68.96
2	Dry condition	10.12
3	Dry and fresh condition	20.88

Table 7. Grazzed by various animals.

S.No.	Animal	Percentage
1	Cow	17.66
2	Goat	32.50
3	Sheep	31.80
4	Camel	18.02

DISCUSSION

Present results demonstrate that during this study, 193 plants were enumerated for degree of selectivity by cattle in the area (Table 1). Poaceae was predominant family having maximum plant species (37 spp.) in the area (Ullah *et al*., 2011). Most of the grasses belong to these family and palatable in nature (Omer *et al*., 2006; Solomon *et al*., 2007). The second large family was Asteraceae having 17 species. The members of this family having little forage values (Kayani *et al*., 2007). Asteraceae was followed by Papilionaceae (15 species), Solanaceae (9 species), Brassicaceae (8 species) and having a forage values to livestock (Farooq, 2003). Brassicaceae was followed by Cucurbitaceae (7 species), Amaranthaceae (6 species) and Boraginaceae (6 species), Chenopodiaceae (5 species), Euphorbiaceae (5 species), Mimosaceae (5 species) and Polygonaceae (5 species), Malvaceae (4 species) and Moraceae (4 species), Apiaceae (3 species), Lamiaceae (3 species) and Zygophyllaceae (3 species), Alliaceae (2 species), Apocynaceae (2 species), Asclepiadaceae (2 species), Asphodelaceae (2 species), Caryophllaceae (2 species), Convolvulaceae (2 species), Cyperaceae (2 species), Myrtaceae (2 species), Plantaginaceae (2 species), Ranunculaceae (2 species), Rutaceae (2 species), Typhaceae (2 species), Tamaricaceae (2 species) and Verbenaceae (2 species) while the remaining all families are monospecific in the area (Table 2) according to Ullah *et al*., 2016 Maximum numbers of plants were palatable in nature in this area (Fig. 2). It was observed that palatable plants were dominant (80.83%) over non-palatable plant (19.27%). These results were accordance to Heneidy (1996). Most of the palatable plants were herbaceous in nature and domesticated animals prefer these plants for various degree of palatability these result agree with the Khan and Hussain, 2012. The non-palatable plants were *Parthenium hysterophorus, Pegnum harmala, Phragmites karka, Polygonum biaristatum, Polygonum plebejum, Psammogeton biternatum, Taraxacum officinale, Veronica aqutica, Vitex negundo, Withania coagulans, Withania somnifera* and *Xanthium strumarium* in these study research. Their non-palatability is due to acrid poisonous taste and odorous smell (Vallentine 1990: Kayani *et al*., 2007).

Differential palatability: Generally vegetation in the research area is scattered and depends on annual precipitation. The plants which were palatable were more subjected to grazing in such condition. The palatable plants were separated into 4 categories on the basis of animal preferences in the area (Fig. 3). Of the total 193 recorded plant species 156 plants were palatable. Among the palatable plants (12.43%) were high palatable, (19.17%) most palatable plants, (30.56%) less palatable plants and (18.13%) rarely palatable plants in the research area. It was eminent that *Amaranthus blitoides, Cicer arietinum, Dichanthium annulatum* were highly palatable plants these results were agreed with (Melinda *et al*., 2002). Similarly, most palatable plant species in the area were *Amaranthus viridis, Aristida adscensionis, Aristida cyanantha, Sisymbrium irio, Solanum nigrum, Suaeda fruticose, Trigonella crassipes* were considered mostly palatable plants in the area (Farooq, 2003). When high and most palatable plants were unavailable to cattle they rely on less palatable ones (Khan and Hussain, 2012). The less palatable plant were *Achyranthes aspera, Calligonum polygonoides, Calotropis procera, Capsicum annuum, Carthamus persicus, Carthamus tinctorus, Cirsium arvense, Citrullus colocynthis, Cyperus rotundus, Daucus carota, Eleusine indica, Eucalyptus camaldulaensis, Euphorbia dracunculoides, Fagonia indica, Heliotropium crispum, Heliotropium europaeum, Heliotropium strigosum, Launaea procumbens, Leptochloa panacea, Linum corymbulosum, Luffa aegyptica, Lycopersicun esculentum, Malcolmia africana, Spergula fallax, Verbena officinalis* and *Vicia hirsute* were less palatable plants in study area (Gardner *et al*., 1996). Rarely palatable plant were enumerated 18.13% in the area. When high palatable, most palatable and less palatable plants were insufficient in the area they depended on rarely palatable ones. *Aerva javanica, Albiza lebbeck, Alhagi maurorum, Alopecurus nepalensis, Cenchrus ciliaris, Dalbergia sissoo, Desmostachya bipinnata, Digera muricata, Echinochloa crus-galli, Eragrostis pilosa, Eragrostis minor, Euphorbia prostrata, Farsetia jacquemontii, Filago pyramidata, Ifloga spicata, Periploca aphylla, Phoenix dactylifera, Rhazya stricta, Saccharum spontaneum, Sonchus asper, Typha latifolia, Typha minima* and *Viola stockii* were (rarely palatable plants) in the study area and these results were also accordance to Hussain and Durrani (2009). Chemical nature and morphological nature of plant species effect relative palatability. The palatable plants were categorized into three groups on the basis of their parts used. The whole parts were grazed 61.53%, leaves

(37.17%) and inflorescences (1.92%) in the area (Fig. 4). The plants which grazed as a whole were herbaceous in nature (Hussain and Mustafa, 1995). Similarly, animal were also consumed leaves (37.17%) of the plants (Holechek *et al*., 1998). Some animals preferred inflorescences (1.92%). The inflorescences of *Citrullus colocynthis, Fumaria indica* and *Spergula fallax* (Holechek *et al.,* 1998) morphological characteristic of species trim down the palatability of plants to animal. Who calculated the concentrated browsing led plants to generate thorn and showed resistance against browsing for their continued existence. Chemical nature of the plants and nutrition also played significant role against the grazing animals (Hussain and Durrani, 2009). It was observed that livestock preferred the plants in fresh condition were 68.98%, where 10.12% in dry condition and 20.88% in both fresh and dry condition were used in the area (Fig. 5). The plants used in fresh condition were *Acacia modesta, Acacia nilotica, Alhagi maurorum, Boerhavia procumbens, Brassica campestris, Brassica tournefortii, Chenopodium murale, Convolvulus arvensis, Eleusine indica, Eruca sativa, Eucalyptus camaldulaensis, Euphorbia prostrata, Fagonia indica, Farsetia jacquemontii, Sisymbrium irio, Sonchus asper, Sorghum halepense, Sorghum bicolor, Tamarix aphylla, Tamarix dioica,* and *Ziziphus jujuba* (Hussain and Mustafa, 1995). The dry plants used in dry condition were *Aerva javanica, Centaurea iberica, Desmostachya bipinnata, Digera muricata, Echinochloa crus-galli, Eragrostis pilosa, Eragrostis minor, Euphorbia dracunculoides, Filago pyramidata, Lathyrus sativus, Phalaris minor, Spergula fallax, Vicia hirsute* and *Viola stockii* (Farooq, 2003). Similarly, animal consumed the plants both in fresh and dry condition were *Atriplex stocksii, Chenopodium album, Cicer arietinum, Cynodon dactylon, Dichanthium annulatum, Medicago polymorpha, Melilotus alba, Melilotus indica, Oxalis corniculata, Pennisetum glaucum, Setaria pumila, Solanum nigrum, Solanum surattense, Sorghum halepense, Sorghum bicolor, Torilis nodosa, Trifolium alexandrianum, Triticum aestivum* and *Zea mays* (Marqueus *et al.*, 2004). It was observed that cow preferred 17.66% plants of in the area (Khan and Hussain, 2012). Cow were usually consumed the grasses according to Hickman *et al*., (2004). Goat preferred (32.50%) and sheep (31.50%) plants as a food in the area. Goat and sheep usually preferred herbaceous flora (Dutoit and Alard, 1996 Gillen and Sims, 2004, Solomon *et al*., 2007). Camel is huge animal, preferred 18.02% of plant species in the study area (Melinda *et al*., 2002). Camel consumed the following plant *Acacia modesta, Acacia nilotica, Aerva javanica, Alhagi maurorum, Amaranthus viridis, Fagonia indica, Heliotropium europaeum, Salsola foetida, Suaeda fruticose, Tamarix aphylla, Tamarix dioica, Verbena officinalis* and *Ziziphus jujuba* (Gyamtosho *et al*., 1996).

Conclusion

In general, most of the plant species were palatable in nature. From this study, It was also observed that palatability is not fix character. It is not only depend on plant species but also depend on different factors such as animal types, habitat, season and climate. Animals preferred different plant but someone greater due to nutritional values and food requirements in support of improving physical condition of animals in the region. From this study, it was also observed that over grazing has a drastic effect which may leads toward desertification of the area.

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