Research Article

Identification and nutrients composition of different rangeland species (grasses, herbs, shrubs, and trees) grazed by small and large ruminants in Balochistan: Kharan region

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Abstract

This study was comprised of two major parts. The first part was consisted of collection of local information about livestock (sheep, goats, cattle, buffalo, camels) and their feeding practices from farmers (n=30) of two sub regions (Jodahay Kalat and Tomulk). Results showed that among all livestock species, there were more heads of sheep (37.57%) and the most preferred feeding practice was use of grazing only (43.33%). In second part, samples (n=45) of thirteen different rangeland species (*Koelipinia Linearis* Pallas, *Euphorbia Falcata*, *Tribulus Pentandrus*, *Launaea Glomerata*, *Cardaria draba*, *Rostraria cristate*, *Cenchrus Ciliaris*, *Isatis stocksii* boiss, *Melva Neglecta* wallr, *Atriplex Dimorposregium*, *Polypogon monspeliensis*, *Tamarix Articulata* Vahl, *Salsola Arbuscula* Pallas) grazed by small and large ruminants were collected. Results showed that CP contents as percent of dry matter were maximum ($P<0.05$) in *Salsola arbuscula* Pallas (30.60 ± 5.19) and minimum ($P<0.05$) in *Melva neglecta* wallr (10.22 ± 3.18). The maximum ($P<0.05$) EE contents (%) were found in *Koelipinia linearis* Pallas (3.87 ± 1.11) whilst *Melva neglecta* wallr showed least ($P<0.05$, 1.50 ± 0.33) EE contents. The NDF and ADF contents were highest ($P<0.05$) in *Salsola arbuscula* Pallas (59.33 ± 3.30) and *Salsola Arbuscula* Pallas (42.19 ± 6.11), respectively. The maximum OM contents were recorded in *Cardaria draba* (98.20 ± 2.98) and *Atriplex dimorposregium* (97.38 ± 1.61) whilst the highest SC ($P<0.05$) contents recorded in *Tribulus pentandrus* (70.11 ± 7.88). It was concluded that rangeland plant species significantly varied in chemical composition, therefore feeding strategy for small and large ruminants may be designed according to nutritional status of available grazing during different seasons of the year.

Keywords: Rangeland species; Livestock; Chemical composition; Detergent analysis

Introduction

In Pakistan, it is estimated that approximately 60 % of the total area (45.2 M ha) is consist of rangeland [1]. The rainfall is less than 200 mm in most of these rangelands i.e., rough topography, rocky soils and deserts where agricultural practices could not be sustained due to very low production. Conversely these rangelands partly support feed requirement of livestock. There are five major groups of rangelands in Pakistan. Sub alpine temperate zone, Sub-tropical humid zone, Sub-tropical sub-humid zone, Arid and semiarid desert plains, and the Mediterranean zone [2, 3] In Pakistan, Balochistan is the largest province (44% of total geographical area) with lowest population than other provinces. Livestock husbandry is the main activity of people. There are three main livestock production or grazing system exists i.e., nomadic, transhumance, and sedentary [4]. It is estimated that approximately 1.47 million hectares is under cultivation (out of 34 million hectare), while 60% of the cultivated area is rain fed [5]. Sheep and camels are the main livestock species of the province and these animals depends on rangeland for their feed requirements. Due to lack of awareness among pastoral farmers and policy dearth from governing bodies, the degradation of rangelands in Balochistan is a major issue affecting nomadic livestock production, natural eco-system and environment [6].

The rangeland plant species are consisting of trees, shrubs, herbs and grasses which serves as source of forage for grazing livestock species however, availability of required nutrients varies from plant-to-plant species and within plant species from region to region. In general, many rangeland species of plant contain higher ratio of ash and fiber with low percentage of protein with medium detestability level. These plants have relatively small feeding values, but they are not always same in their chemical composition because of most species contain

such factors which are anti-nutritional and cause limitation and reduction in the production. In a study [7], it is revealed that actively growing forage contains high crude protein as compared to dormant stage. At Harboi rangeland area of Kalat, Balochistan, it was found that grass has higher amount of carbohydrates, nitrogen free extract, dry matter, crude fiber hemicellulose, acid detergent fiber, neutral detergent fiber as compared with the herbs and shrubs, which has commonly high amount of ether extract, acid detergent lignin, crude protein and ash than grass.

Balochistan province has very wide area and possesses various ecological zones. These zones have different seasonal pattern, landscape and rangeland animal and plant species. The rangeland plant species may also differ in nutritional worth as well as preference by small and large ruminants for grazing. In this context, scanty and scattered work has been done in few zones of Balochistan however, knowing nutritive value of these rangelands preferred by livestock species is still deficient in many regions. Keeping in view these facts, this study planned to know the nutrients composition of different rangeland species used by small and large ruminants in Kharan region of Balochistan.

Materials and methods

Part 1: Collection of local information

In first part of this study, local information collected from the shepherds/farmers of the two sub tehsils (Jodahay kalat, and Tomulk) of Kharan region using survey questionnaire. In total, thirty (30) shepherds/farmers were interviewed, fifteen from each area of the study. The collected information included literacy level of farmers, flock/herd composition, livestock grazing time and prevailing feeding practices and rangeland species (grasses, herbs, shrubs, tree leaves) grazed by livestock.

Part 2: Field collection of samples and laboratory analyses

This part/section was further divided into following three sections.

- i) Sample collection of locally identified rangeland plants
- ii) Botanical identification of the collected rangeland plants
- iii) Laboratory analyses

i) Sample collection of locally identified rangeland plants

Samples (approximately 800-1000 g) of rangelands plants (grasses, herbs, shrubs, tree leaves) locally identified by farmers (n=30) and were collected from two major sub regions of Jodahay Kalat and Tomulk. These rangeland plants were collected based on preference of small and large ruminants and were kept in plastic jars until botanical identification.

ii) Botanical identification

The botanical identification of collected rangelands plants (locally identified by farmers) preferred fed by small and large ruminants in Kharan region was carried out in presence of panel consisting of three members. The botanical experts from University of Balochistan Quetta (n=02) and LUAWMS Uthal (n=01) rendered their services as panel member.

iii) Chemical analysis

The collected samples of grasses, herbs, shrubs and tree leaves were ground and placed in labeled jars for knowing chemical analysis. The animal nutrition laboratories of Lasbela University, Uthal and Veterinary and Animal Sciences, Lahore for proximate analyses and cell wall contents analyses, respectively.

a) Proximate analyses

The samples were subjected to proximate analyses (dry matter, ash, crude protein and ether extract) according to the standard procedure [8].

b) Van Soest detergent system

The collected ground samples were subjected to detergent analyses [9] to know Neutral Detergent Fiber (NDF) and Acid Detergent Fiber (ADF) contents using Fibertech. The value of hemicellulose contents in samples were obtained by calculating the difference in NDF and ADF contents. The cell soluble (CS) contents in samples were obtained by subtracting NDF contents from 100.

Statistical analyses

The statistical analyses performed on data obtained with reference to DM, ash, CP, ether extract, organic matter, NDF, ADF, cellulose and cell soluble contents in collected rangeland plants. The statistical procedure of one-way analysis of variance [10] technique was used. The Duncan's multiple range test [11] was used to know the difference among means in collected rangeland species.

Results

Part 1: Collection of Local Information

The data thus obtained on literacy level of livestock farmers in Kharan region are presented in (Fig. 1). Maximum population is not educated (66.67%) whilst 15% are educated up to middle and 18.33% are primary or below primary level literate. The data collected on knowing the herd/ flock composition in Kharan region are presented in (Table 1). The different livestock species i.e., sheep, goats, kids, lambs, bucks, rams, cattle, and camels represented flock/herd composition of the study area. The sheep were the dominant contributor (37.57%) of the flock/herd whilst cattle were least in numbers number (1.09%). The other livestock species i.e., goat, kids, lambs, bucks, rams and camels showed percent contribution of 29.53, 9.89, 10.75, 4.02, 3.48 and 3.67 respectively.

The data collected on feeding practices of livestock species in Kharan region are showed in (Fig. 2). The feeding practice of 'grazing' was maximum contributor (43.33 %) whilst the practice based on feeding "crop

residues only” (6.67 %) was the least contributor. The contribution of rest of the feeding practices i.e., grazing + crop residues (10%) and grazing + fodder was 40 percent. The grazing time of livestock species in Kharan region is showed in (Fig. 3). Results

showed that “morning to evening” was the most preferred (93.33%) time of farmers for grazing whilst “morning time” only was least preferred (6.67%) for grazing. Rest timings of grazing were not practiced.

Figure 1. Literacy level in livestock farmers of Kharan region, Balochistan

Table 1. Herd/Flock composition of sedentary livestock production in Kharan region

S. No.	Livestock species	Animal heads (farmers=30)	Percent share
1	Goat	1596	29.53
2	Sheep	2030	37.57
3	Kids	534.0	9.89
4	Lambs	581.0	10.75
5	Bucks	217.0	4.02
6	Rams	188.00	3.48
7	Cattle	59.00	1.09
8	Buffaloes	N.A*	0.00
9	Camels	198.0	3.67
	Total	5403	100%

*NA= Not Available

Figure 2. Feeding practice of livestock species in Kharan region, Balochistan

Figure 3. Livestock grazing time practiced by livestock farmers in Kharan region, Balochistan

Part 2: Field collection of samples and laboratory analyses

In this part of study, the rangeland species (n=13) grazed by livestock species were collected from two different locations of Kharan region. The rangeland species were given local name by livestock farmers however, botanical identification was done by botanical and agrarian experts of University of Balochistan Quetta and LUAWMS Uthal, respectively (Table 2).

In proximate analyses, the dry matter (DM), crude protein (CP), ether extract (EE) and ash contents (%) of thirteen rangeland species were determined using AOAC method (Table 3). The dry matter contents ranged from 90-96% in most of the collected rangeland species of the study area. The maximum ($P<0.05$) DM contents found in *Rostraria cristate* (96.60 ± 1.10), *Polypogon monspeliensis* (96.00 ± 0.50), *Koelpinia linearis* Pallas (95.82 ± 0.81), *Isatis stocksir* boiss (95.52 ± 2.31), *Salsola arbuscula* pallas (95.39 ± 1.38), *Cardaria draba* (95.05 ± 0.91), *Atriplex dimorposregium* (95.01 ± 0.34) and *Launaea glomerata* (95.00 ± 1.45) whilst minimum ($P<0.05$) DM contents found in *Melva neglecta* wallr (90.40 ± 1.78). In case of

crude protein contents, the maximum ($P<0.05$) CP as percent of DM recorded in *Salsola arbuscula* pallas (30.60 ± 5.19), *Polypogon monspeliensis* (28.08 ± 3.65) and *Isatis stocksir* boiss (26.96 ± 8.29) and minimum ($P<0.05$) in *Melva neglecta* wallr (10.22 ± 3.18). The ether extract (E.E)/crude fat contents varied from 1.50 to 3.90 % in collected rangeland species of the study area. In this context, the highest ($P<0.05$) E.E contents (%) were recorded in *Koelpinia linearis* pallas (3.87 ± 1.11), *Atriplex dimorposregium* (3.49 ± 0.87), *Cardaria draba* (3.30 ± 1.90), *Cenchrus Ciliaris* (3.10 ± 1.26), *Polypogon monspeliensis* (3.02 ± 1.12) and *Isatis stocksir* boiss (3.02 ± 0.92) whilst *Melva neglecta* wallr showed least ($P<0.05$, 1.50 ± 0.33) E.E/crude fat contents. In reference to ultrahigh temperature treatment (furnace treatment), the ash contents (%) verified from 2.60 to 41% in collected rangeland species of the study area. The highest ($P<0.05$) ash contents i.e., (41.04 ± 6.44) recorded in *Rostraria cristate* whilst the least ($P<0.05$) ash contents recorded in *Atriplex dimorposregium* (2.62 ± 1.61).

Table 2. Local and Botanical identification of rangeland plant species of Kharan region

S. No.	Local name	Botanical name	Grade
1	Zampad	<i>Koelpinia Linearis</i> Pallas	Herb
2	Shirago	<i>Euphorbia Falcata</i>	Herb
3	Sarenk	<i>Tribulus Pentandrus</i>	Herb
4	Alko	<i>Launaea Glomerata</i>	Herb
5	Garbust	<i>Cardaria draba</i>	Herb
6	Gayab	<i>Rostraria cristate</i>	Grass
7	Puzhuk	<i>Cenchrus Ciliaris</i>	Grass
8	Dalkah	<i>Isatis stocksii</i> boiss	Herb
9	Pochiko	<i>Melva Neglecta</i> wallr	Herb
10	Magir	<i>Atriplex Dimorposregium</i>	Grass
11	Malhar	<i>Polypogon monspeliensis</i>	Grass
12	Gazzz	<i>Tamarix articulata</i> Vahl	Tree
13	Narrok	<i>Salsola arbuscula</i> Pallas	Shurb

Table 3. Proximate analyses of rangeland plants species of Kharan region

Botanical Name	DM %	% of DM		
		CP	E.E	Ash
<i>Koelpinia Linearis</i> Pallas	95.82 ^a ±0.81	15.30 ^c ±2.72	3.87 ^a ±1.11	22.44 ^b ±3.32
<i>Euphorbia Falcata</i>	92.20 ^b ±1.11	15.75 ^{bc} ±4.89	2.85 ^{ab} ±1.02	10.99 ^e ±1.22
<i>Tribulus Pentandrus</i>	94.29 ^{ab} ±2.63	21.21 ^{ab} ±4.11	2.29 ^b ±0.59	9.56 ^c ±4.01
<i>Launaea Glomerata</i>	95.00 ^a ±1.45	14.87 ^c ±2.10	2.09 ^{ab} ±1.33	4.11 ^d ±3.55
<i>Cardaria draba</i>	95.05 ^a ±0.91	18.58 ^{bc} ±4.12	3.30 ^a ±1.90	1.80 ^e ±2.98
<i>Rostraria cristate</i>	96.60 ^a ±1.10	22.08 ^{ab} ±5.10	1.97 ^{bc} ±0.88	41.04 ^a ±6.44
<i>Cenchrus Ciliaris</i>	94.85 ^{ab} ±1.26	20.56 ^b ±2.80	3.10 ^a ±1.26	19.59 ^b ±3.16
<i>Isatis stocksir</i> boiss	95.52 ^a ±2.31	26.96 ^a ±8.29	3.02 ^a ±0.92	11.17 ^c ±3.58
<i>Melva Neglecta</i> wallr	90.40 ^c ±1.78	10.22 ^d ±3.18	1.50 ^c ±0.33	8.90 ^c ±4.54
<i>Atriplex Dimorposregium</i>	95.01 ^a ±0.34	22.08 ^{ab} ±4.89	3.49 ^a ±0.87	2.62 ^{de} ±1.61
<i>Polypogon monspeliensis</i>	96.00 ^a ±0.50	28.08 ^a ±3.65	3.02 ^a ±1.12	5.15 ^{cd} ±4.19
<i>Tamarix Articulata</i> Vahl	93.39 ^b ±1.41	20.30 ^b ±4.64	2.17 ^b ±0.68	20.23 ^b ±4.66
<i>Salsola Arbuscula</i> Pallas	95.39 ^a ±1.38	30.60 ^a ±5.19	1.96 ^b ±0.83	19.17 ^b ±7.15
Level of Significance	P<0.05	P<0.05	P<0.05	P<0.05

The cell wall/fiber fractions i.e., neutral detergent fiber (NDF), acid detergent fiber (ADF) and hemicellulose contents of rangeland species collected from study area are given in (Table 4). It showed that NDF contents in these rangeland species ranged from 30-59%. The NDF contents were highest (P<0.05) in *Salsola arbuscula* pallas (59.33±3.30), whilst lowest (P<0.05) in *Euphorbia falcata* (33.74±2.67) and *Tribulus pentandrus* (29.89±7.88). In these rangeland species, the ADF contents varied from 18.89 to 42.19 percent. The highest (P<0.05) ADF

contents were found in *Salsola arbuscula* pallas (42.19±6.11) whilst the minimum (P<0.05) ADF contents were recorded in *Rostraria cristate* (21.88±3.01), *Euphorbia falcata* (20.19±3.35), *Isatis stocksii* boiss (19.99±4.22) and *Tribulus pentandrus* (18.89±6.76). The hemicellulose contents in tested rangeland species varied from 10 to 36 percent. The highest (P<0.05) hemicellulose contents were found in *Launaea glomerata* (35.75±5.12) whilst lowest (P<0.05) in *Cardaria draba* (10.50±3.66).

The results of organic matter (OM) and cell soluble (CS) contents in collected rangeland species are presented in (Table 5). In this connection, *Cardaria draba* (98.20 ± 2.98) and *Atriplex dimorposregium* (97.38 ± 1.61) showed maximum OM contents whilst minimum ($P < 0.05$) OM contents were recorded in *Rostraria cristate* (58.96 ± 6.44).

In case of CS contents, these varied from 41 to 70 % in collected rangeland species. The *Tribulus pentandrus* (70.11 ± 7.88) showed highest CS ($P < 0.05$) contents whilst *Salsola arbuscula pallas* (40.77 ± 3.30) showed least ($P < 0.05$) CS contents among the collected rangeland species of Kharan region.

Table 4. Cell wall contents in rangeland plants of Kharan region

Botanical Name	NDF %	ADF %	Hemi-cellulose %
<i>Koelpinia Linearis</i> Pallas	$41.41^c \pm 3.11$	$26.99^{bc} \pm 2.22$	$14.42^{cd} \pm 3.22$
<i>Euphorbia Falcata</i>	$33.74^d \pm 2.67$	$20.19^c \pm 3.35$	$13.55^{cd} \pm 2.20$
<i>Tribulus Pentandrus</i>	$29.89^d \pm 7.88$	$18.89^c \pm 6.76$	$11.00^{cd} \pm 4.45$
<i>Launaea Glomerata</i>	$55.84^b \pm 3.11$	$29.09^b \pm 3.20$	$35.75^a \pm 5.12$
<i>Cardaria draba</i>	$36.90^{cd} \pm 3.21$	$26.40^{bc} \pm 4.23$	$10.50^d \pm 3.66$
<i>Rostraria cristate</i>	$52.50^{bc} \pm 5.35$	$21.88^c \pm 3.01$	$30.62^{ab} \pm 5.31$
<i>Cenchrus Ciliaris</i>	$56.60^b \pm 2.55$	$38.67^{ab} \pm 8.19$	$17.93^c \pm 4.89$
<i>Isatis stocksii</i> boiss	$35.23^{cd} \pm 6.56$	$19.99^c \pm 4.22$	$15.24^{cd} \pm 3.19$
<i>Melva Neglecta</i> wallr	$38.78^{cd} \pm 2.82$	$22.62^b \pm 3.22$	$16.16^{cd} \pm 1.56$
<i>Atriplex Dimorposregium</i>	$51.80^{bc} \pm 3.77$	$21.44^b \pm 2.32$	$30.36^b \pm 1.97$
<i>Polypogon monspeliensis</i>	$55.30^b \pm 3.10$	$35.50^{ab} \pm 3.11$	$19.80^c \pm 2.76$
<i>Tamarix Articulata</i> Vahl	$50.15^{bc} \pm 3.21$	$30.22^b \pm 2.41$	$19.93^c \pm 2.19$
<i>Salsola Arbuscula</i> Pallas	$59.33^a \pm 3.30$	$42.19^a \pm 6.11$	$17.14^{cd} \pm 5.09$
Level of Significance	$P < 0.05$	$P < 0.05$	$P < 0.05$

Discussion

Kharan district is situated in province Balochistan and lies in southwest of Pakistan. It is a mountainous deserts region. Livestock husbandry with other occupations is also one of the main occupations of the subsistence living of the people. The feed availability is main handicap of the healthy livestock production and health status. The livestock of the region mostly depends upon grazing in mountainous parts. The nutrients availability from the rangelands is not known. The knowing the potential benefits of available rangeland species is not only necessary for proper feeding strategy of the livestock but also for the conservation and propagation of

nutritionally important rangeland species of the region.

This study conducted in two parts/sections. In first part, the education level of livestock farmers, flock/ herd composition, grazing time and prevailing feeding practices were studied. In second part/section, the animals preferred rangeland samples were collected and dry matter, crude protein, ether extract, ash contents, organic matter contents, acid detergent fiber, neutral detergent fiber, hemicelluloses and cell contents of rangeland species were evaluated. The results of both parts of the study are discussed in following sections of this chapter.

Table 5. Organic matter and cell soluble contents in rangeland plants of Kharan region

Botanical Name	Organic matter	Cell Soluble (CS)
<i>Koelpinia Linearis</i> Pallas	77.56 ^c ±3.22	58.59 ^c ±3.11
<i>Euphorbia Falcata</i>	80.09 ^c ±1.22	66.26 ^{ab} ±2.67
<i>Tribulus Pentandrus</i>	90.44 ^b ±4.01	70.11 ^a ±7.88
<i>Launaea Glomerata</i>	95.89 ^{ab} ±3.55	44.16 ^{de} ±3.11
<i>Cardaria draba</i>	98.20 ^a ±2.98	63.10 ^b ±3.21
<i>Rostraria cristate</i>	58.96 ^d ±6.44	47.50 ^d ±5.35
<i>Cenchrus Ciliaris</i>	80.41 ^c ±3.16	43.40 ^{de} ±2.55
<i>Isatis stocksii</i> boiss	88.33 ^b ±3.58	64.77 ^{ab} ±6.56
<i>Melva Neglecta</i> wallr	91.10 ^b ±4.54	61.22 ^{bc} ±2.82
<i>Atriplex Dimorposregium</i>	97.38 ^a ±1.61	48.20 ^d ±3.77
<i>Polypogon monspeliensis</i>	94.85 ^{ab} ±4.19	49.70 ^d ±3.10
<i>Tamarix Articulata</i> Vahl	79.77 ^c ±4.66	49.85 ^d ±3.21
<i>Salsola Arbuscula</i> Pallas	80.83 ^c ±7.15	40.77 ^e ±3.30
Level of Significance	P<0.05	P<0.05

Part-1: Collection of local information

The results of this study showed that mostly the livestock famers of Kharan were illiterate i.e., approximately 67%. The reasons may be least access to the far-flung schools, availability of devoted teachers, lack of awareness to importance of education, poverty of the livestock farmers, unemployment etc. The children are not given an opportunity to get education rather they are trained as shepherd to graze and manage animals. The overall literacy rate was also poor. In this context, it is reported that overall literacy rate in Kharan region is 45.66% [12].

The animal keeping preference is mostly depending on climate, feeding availability and marketing opportunities. The Kharan is a sandy desert area with hot climate weather, here people keep those animals which shows high resistance to hot climate. The herd/flock composition showed that farmers love to keep sheep, goat, and camel instead of other livestock species. The dominant sheep breed was Rakhshani breed. The dominancy of this breed may be due to preference of its meat taste. Sheep mutton is in red color and contains considerable amount of fat which is preferred by the people of this region. Among

goat breeds, the Khurasani breed is the dominant one. This breed possesses many special traits i.e., highly intelligent, loving to her soul who take care of herself and always lead to other livestock toward water and vegetation. This breed can travel long distance and have high resistance to disease. The climate of Kharan region is also more suitable for the camel husbandry however, the data showing less number of camel heads in sedentary system of livestock keeping. This region contains large number of camels however, those farmers are mostly pastoral and hence access to them was least.

The livestock farmers were involved in several practices regarding feeding of animals in this region. The most opted feeding practice was grazing of the animals which showed 40.45% preference. The livestock farmers often used to graze their animal during whole day. The livestock farmers were good in taking feeding care about their animals. After grazing, they fed fodder and crop residues to their animals. Our findings are in agreement with earlier study [13] where it was reported that farmer preferred grazing system of feeding and few of them support nutritional requirement of their animals with fodder crop residues. Further in

our study, the livestock farmers of Kharan region paid more attention to additional feeding to small ruminants in order to enhance their milk yield which subsequently utilized by them for home use.

In Kharan region, the livestock farmer practiced two different grazing timings i.e., morning time only and morning to evening time. It was observed that the most of the farmers (90%) of Kharan region preferred to graze their animals from morning till evening time. It may be due to the fact that more time spent on grazing by animals may grab more nutrients for those animals from grazed rangelands. In this context, it is explained that in arid and semi-arid zone of Balochistan, the shrubs fodders are important part for the production of livestock because of palatability and nutritional source [14]. Moreover, trees and shrubs are mostly preferred for grazing/browsing by the animals due to their more nutrients value [15].

Part-II: Field collection of samples and laboratory analyses

The Kharan region is desert area its land is mostly fertilized during rainy season, as after rains, there is lush growth of trees, herbs and shrubs. In the winter season, the temperature goes down whilst during summer season, the temperature goes high leading to destruction of vegetation and forests. During present study, the preferred rangeland species of small and large ruminants were; *Koelpinia linearis pallias*, *Euphorbia falcata*, *Tribulus pentandrus*, *Launaea glomerata*, *Cardaria draba*, *Rostraria cristate*, *Cenchrus ciliaris*, *Isatis stocksii* boliss, *Melva neglecta* wallr, *Atriplex dimorposregium*, *Polypogon monspeliensis*, *Tamarix articulata* vahl, and *Salsola arbuscula* pallas. The earlier literature [16, 17] explains that mostly in Balochistan, the rangeland species varies with rainfall. In south, there are mostly desert shrubs, in central area there are mostly shrubs, grasses of *Haloxylon* and *Artemesia*

species and in the north area there are perennial grassland of *Cymbopogon* and *Chrysopogon*.

The nutritional profile or chemical composition of rangeland species varies from regions to regions and due to natural difference based on genetic differences. The forage quality may also vary due to difference in rainfall pattern and nature of soil etc. [18]. In present, study, thirteen different rangeland species of various grades were collected from two locations. The dry matter in these rangeland species ranged from 90-96%. In this connection, somehow varied DM contents reported by researcher [19] who found DM contents 63.41%, 69.04%, 73.78% and 80.9% in *Pennisetum orientale*, *Stipa pennata*, *Cymbopogon jwarancusa* and in *Tetrapogon villosus*, respectively.

For the ruminant animals crude protein contents in grasses, herbs, shrubs and trees play an important role for fulfilling the nitrogen especially for the rumen microbes. In our study, the CP contents in rangeland species of Kharan region ranged from 10.22 to 30.60 %. In earlier stated study [19], it was also reported that CP contents among grasses ranged from 9.95% to 6.83% and in shrubs, it ranged from 8.23% to 11.51%. In our study, the ether extract (E.E) contents in the collected rangeland species varied from 1.50-3.90 %. The ether extract contents in tested rangeland species of *Andropogon gayanus* and *Ficus polita* ranged from 7.50% to 18.4% [20].

The ash contents (%) in collected rangeland species verified from 02.60 to 41%. The wide range in ash contents of collected samples may be due to of many reasons like weather climate, draught, humidity, stage of maturity and the sample which was collected during specific season. It is recorded that whenever there would be a drought then the ash content may increase from 18-30% to the total dry matter [21]. The ash contents in *Andropogon*

gayanus and *Ficus exasperate* recorded between 7.10% and 17.1%, respectively [20]. It is essential to evaluate the feeds and rangeland species for fiber contents. The new concept of fiber fractions is essential for balancing ration in case of ruminants. The fiber fractions based on neutral detergent fiber (NDF) and acid detergent fiber fractions (ADF). In our study, the NDF contents in rangeland species ranged from 30-59% whilst ADF contents in tested rangeland species varied from 18.89 to 42.19 %. In samples collected from four different locations of Ethiopia's mid Rift, it was reported [22] that NDF contents ranged from 30.41-78.55% and ADF contents from 19.42-47.5%. Rangeland species collected from Harboi, Balochistan showed that grasses generally had more NDF, ADF and hemicelluloses than shrubs [19]. Generally dry matter, crude fiber, neutral detergent fiber, acid detergent fiber, hemicellulose and acid detergent lignin increase with increase in plant's maturity whilst crude protein, ether extract and ash contents decrease with increase in plant's maturity. Moreover, it is accepted that hemicelluloses contents are the most digestible fraction among fiber contents of the plant sources/rangeland species. The range of hemi-cellulose contents, in our findings, varied from 10 to 36 percent.

Like other nutrients in feeds, the cell soluble (CS) contents and organic matter (OM) are equally important and are highly valued while formulating rations for ruminants and other livestock species. The CS contents have negative correlation with fiber contents of the plant /rangeland species. In present findings, the CS contents ranged from 41 to 70% which also explains that rangeland species containing less fiber contents were high in cell soluble contents and vice versa. It is also stated in literature that dry matter increases (due to increase in NDF and ADF contents) while cell contents decrease with advance in maturity of plants [23].

The OM is that part which is left after the deduction of ash contents from the total i.e., hundred. Of rangeland species, it is assumed that grasses have more OM contents than shrubs. In our study, the OM in rangeland species ranged from 59 to 98%. The OM contents recorded maximum in *Prosopis cineraria* and *Cynodon dactylon*. Such range of values are in agreement with the earlier findings [24].

Conclusion

It is concluded that sheep were maximum whilst cattle were least in numbers than other livestock species in sedentary livestock production system of Kharan region. The most preferred feeding practice was use of grazing only whilst the least preferred practice was based on crop residues only. Among thirteen different rangeland species (*Koelpinia linearis pallas*, *Euphorbia falcata*, *Tribulus pentandrus*, *Launaea glomerata*, *Cardaria draba*, *Rostraria cristate*, *Cenchrus ciliaris*, *Isatis stocksii* boiss, *Melva neglecta* wallr, *Atriplex dimorposregium*, *Polypogon monspeliensis*, *Tamarix articulata* vahl, *Salsola arbuscula pallas*) grazed by small and large ruminants, the CP, NDF and ADF contents were found maximum and least CS contents in *Salsola arbuscula pallas*.

Author's contributions

Conceived and designed the experiment: MA Sasoli, R Abro & IB Marghazani, Performed the experiment: MA Sasoli, GA Mughal, S Ahmed & MY Reki, Analyzed the data: AK Khaskheli & M Ashraf, Contributed materials/ analysis/ tools: AK Khaskheli, M Ashraf & A Qadir, Wrote the paper: MA Sasoli & IB Marghazani.

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