Readers Insight
Publisher of open access books and journals
PJMLS OPEN ACCESS
Print ISSN: 2707-4471. Online ISSN: 2707-448X
Research Article
DOI: 10.31580/pjmls.v8i4.3433
Vol. 8 No. 4, 2025: pp. 941-946
www.readersinsight.net/pjmls
Pak-Euro Journal of Medical and Life Sciences

Submission: October 01, 2025
Revised: December 16 , 2025
Accepted: December 29, 2025
Published Online: December 31, 2025

NUTRITIONAL EVALUATION OF RANGELAND PLANT SPECIES PREFERRED BY MAKURANI CAMELS IN BALOCHISTAN

Biburg Mengal[1], Illahi Bakhsh Marghazani[1]*, Bahram Chacher[1], Abdul Hameed Baloch[2], Zarnain Malik[1], Mohammad Hayat[3], Saifullah Rodeni[4], Ghulam Farooq Esot[5], Ismail Anwar Siapad[5], Syed Shahzaib Shah[5]

[1]**Department of Animal Nutrition**, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Uthal, Pakistan
[2]**Department of Animal Breeding and Genetics**, Faculty of Veterinary & Animal Sciences, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Uthal, Pakistan
[3]**Department of Veterinary Pathology**, Faculty of Veterinary & Animal Sciences, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Uthal, Pakistan
[4]**Department of Animal Reproduction**, Faculty of Veterinary & Animal Sciences, Lasbela University of Agriculture, Water and Marine Sciences (LUAWMS), Uthal, Pakistan
[5]**Livestock and Dairy Development Department,** Balochistan, Pakistan

***Corresponding Author:** Illahi Bakhsh Marghazani. E. mail: ibmarghazani@luawms.edu.pk

Abstract

Despite a population of over 1.1 million camels in Pakistan, the sector remains neglected, leaving camel farmers in a cycle of poverty. Balochistan province holds the largest share (41%) of these animals. This study investigated the nutritional value of rangeland plants preferred by the Makurani camel in its native habitats of Lasbela and Makran. In this context, Makurani camels preferred plant species were collected, stored and later identified by botanical experts. The sample collection was carried out in two regions i.e., Lasbela (representing forest-like grazing) and Makran (representing desert landscape). Samples were analyzed for dry matter (DM), crude protein (CP), ether extract (EE), ash, and fiber contents (NDF and ADF) using standard laboratory procedures. Results showed that in the Lasbela region, Makurani camels primarily preferred Salvadora persica (Jaar), while in Makran, Prosopis cineraria (Kahoor) was the most preferred rangeland plant species. Ziziphus (Ber) was common to both regions. Nutritional analysis showed that crude protein ranged from 11.76% to 18.16% in Lasbela and 10.19% to 17.11% in Makran. Ash content was found maximum in Salvadora species (up to 33.29%), indicating high mineral potential. Fibre content was highest in Capparus decidua, which contained the highest fiber levels (NDF 50.98%, ADF 43.16%). The study reveals that the Makran region suffers from sparse vegetation and poorer plant health compared to Lasbela. This study recommends adaptation of rotational grazing and providing supplementary feeding, particularly in the nutrient-scarce Makran region, to optimize camel production and health.

Keywords: *Fiber, Forage preference, Makurani camel, Protein, Rangelands*

INTRODUCTION

There are approximately 27.104 million camels in the world. There are 24.167 million single-humped dromedary camels (*Camelus dromedarius*) compared to about 2.0 million two-humped camels (*Camelus bactrianus*) (1). Despite having a robust 1.1 million strength of camels at national level (2), the policy makers, professionals and government departments are paying less or negligible attention for their optimal utilization. Due to their continued lack of access to the full revenue potential of camels, camel farmers are living in vicious circle of poverty.

Balochistan province holds the largest share of camel heads, approximately 41%, followed by Sindh (30%), Punjab (22%), and KPK (7%) (2). Of Pakistan's twenty recognized breeds, seven breeds (Brahvi, Kachhi, Kharani, Lassi, Makrani, Pishin, and Rodbari) found in Balochistan (3). Camels love to graze a wide variety of plants, including trees, bushes, and halophytic (salty) and hard-thorny plants. Typically, they graze on leaves, tender twigs and shoots, fruits, flowers, and pods. In ideal conditions, camels are able to

make effective food choices and prefer to feed on trees over grass (4). Camels are attracted to these plants because of their unique physical features, which include their long tongue, elongated neck, extended head, and movable and prehensile split upper lip. Their specific anatomical features enable them to be preferentially browsers rather than grazers (5,6).

In general, camels rely on natural vegetation to provide them with nutrition. Top feeds such Acacia nilotica, Morus alba, Zizyphus jujuba, etc. are available in hilly places (7). In general, camels prefer to browse high moisture vegetation like Prosopies sineraria, Zizyphus nummularia, and Callygonum polygonodes during the summer, but they also prefer plants rich in electrolytes and oxalate content during the rainy season, such as Capparis deciduas and Lasirus sindicus (8, 9). Camels' preferences for plants are influenced by a number of variables, including the type of plant, its nutritional value, its moisture content, its flavor and aroma, and the quantity of fodder available (10). It is well studied that the nutritional need of camels strongly correlated with their production and performance. Camels by preference are browsers of a broad spectrum of forage plants including trees, shrubs and hard-thorny, bitter and halophytic (salty) plants that naturally grow. Therefore, they must be provided with easy access to these vegetation (11).

In Balochistan, rangelands (93% of total land area of the province) are grazing areas for livestock, especially sheep, goats, and camels. It typically meets the livestock's maintenance needs in accordance with the grazing pressure, rainfall, nutritional composition, and probably other variables. The other main factors that have impacted the productivity of different types of rangelands are atmospheric nitrogen deposition and climate change (12). The nutritional profile of a few rangeland species from Harboi, Kalat, Balochistan, shrubs typically had higher levels of ash, crude protein, ether extract, and nitrogen contents than grasses, while grasses typically had higher levels of dry matter (DM), crude fiber (CF), nitrogen free extract (NFE), neutral detergent fiber (NDF), acid detergent fiber (ADF), and hemicelluloses (13).

In Balochistan, the range vegetation types shift from south to north according to the distribution of rainfall. Grazing management has the potential to revitalize an area and hasten the spread of species that are desired (14). Depending on likeness of camels, different rangeland plant species may be used for grazing. These rangeland species might meet livestock maintenance needs, but understanding the nutritional makeup of rangeland species in a given area is crucial for balancing nutrient requirements and choosing the right feeding plan. In light of these considerations, the purpose of this study was to determine the nutritional makeup of rangeland plant species preferred by Makrani camels in its habitat (Lasbela and Makran regions).

METHODOLOGY

The Makran and Lasbela regions are considered as habitat of Makurani breed of camels in Balochistan. In these regions, camel preferred rangeland plant species were collected respectively from habitat of Makurani camels (Gwader/Turbat and Lasbela). Makurani camel preferred rangeland plant samples were identified by panel of three botanical experts. After identification, these samples were grinded and nutritiously evaluated for following profiles.

All collected samples from both areas of the habitat were chemically analyzed for dry matter (DM), ash, crude protein (CP) and crude fat contents (15). The fiber contents (NDF, ADF and Hemicellulose) in all these collected samples of both regions were also determined through detergent procedure (16).

Data obtained on proximate analysis were statistically analyzed (17). Computer based statistical software (SPSS, version 23) was used for statistical analysis.

RESULTS

The collected camel preferred rangeland plant species, their identification in local as well as botanical name and nature of pant of Lasbela region is presented in Table I. Devi, Kanda, Ber, Lai, Chabber, Jaar, Babur, Lanni and Kerer were botanically identified as *Prospis Juliflora, Prosopis Cineraria, Ziziphus Mauritiana, Tamarix Aphylla, Cynodon Dactylon, Salvadora Persica L, Accacia Nilotica, Suaeda Fruticose, Capparus Decidua,* respectively.

Table I. Botanical identification of rangeland species preferred by Makurani camels in Lasbela region

S. #	Local name	Botanical name	Nature of plant
1	Devii	*Prospis Juliflora*	Shrub/ tree
2	Kanda	*Prosopis Cineraria*	Tree
3	Ber	*Ziziphus Mauritiana*	Tree
4	Lai	*Tamarix Aphylla*	Tree/Shrub
5	Chabber	*Cynodon Dactylon*	Grass
6	Jaar/Khabber	*Salvadora Persica L*	Shrub/ tree
7	Babur	*Accacia Nilotica*	Tree
8	Lanii	*Suaeda Fruticose*	Shrub
9	Kerer (Dala)	*Capparus Decidua*	Shrub/Tree

Table II. Botanical identification of rangeland species preferred by Makurani camels in Makran region

S. #	Local name	Botanical name	Nature of plant
1	Kahoor	*Prospis Cineraria*	Tree
2	Chish	*Acacia nilotica*	Tree
3	Ber	*Ziziphus Jujuba*	Tree
4	Ashag	*Rhazya Stricta*	Herb
5	Rigat	*Suaeda Monoica*	Herb
6	Jaar/Khabber	*Salvadora Oleoide*	Tree
7	Posho/Puzo	*Ehretia Obusiferum*	Herb

The collected camel preferred rangeland plant species, their identification in local as well as botanical name and nature of plant in Makran region is presented in Table II. Kahoor, Chish, Ber, Ashag, Rigat, Khabber, and Posho were botanically identified as *Prosopis Cineraria, Acacia Nilotica, Ziziphus Jujuba, Rhazaya Stricta, Suaeda Monoica, Salvadora Oleoide, Ehretia Obusiferum*, respectively.

Chemical composition of rangeland species of Lasbela region preferred by Makurani camels is given in Table III. Of the collected samples, maximum CP obtained in *Tamarix Aphylla* (18.16%) whilst minimum CP (11.76%) is recorded in *Capparus Decidua*. CP contents in rest of the collected samples ranged from 12.11 to 17.44%. Maximum E.E contents found in *Prosopis Cineraria* (4.13 %) whilst minimum E.E obtained in *Suaeda Fruticosa* (1.32%). E.E contents in rest of the collected samples ranged from 2.11 to 3.66 %. In ash contents, highest value obtained in *Salvadoa Persica L.* (33.29%) whilst lowest ash contents observed in *Prosopis Cineraria* (05.13%). Ash contents in rest of the collected rangeland species ranged from 5.45% to 20.76%.

Table III. Chemical composition (Mean± S.E) of rangeland plant species preferred by Makurani camels in Lasbela region

S. #	Botanical name	DM%	% of DM*		
			CP**	E.E***	Ash
1	*Prospis Juliflora*	93.11±0.53	15.54±0.58	3.66±0.72	10.12±0.30
2	*Prosopis Cineraria*	96.33±0.34	14.89±0.86	4.13±0.24	05.13±0.41
3	*Ziziphus Mauritiana*	91.10±0.65	17.44±0.78	2.12±0.33	10.96±0.76
4	*Tamarix Aphylla*	91.18±0.83	18.16±0.90	2.19±0.50	20.76±0.85
5	*Cynodon Dactylon*	96.12±0.81	15.87±0.82	2.11±0.42	05.45±0.51
6	*Salvadora Persica L*	94.66±0.93	14.19±0.28	2.15±0.59	33.29±0.40
7	*Accacia Nilotica*	91.33±0.26	12.11±0.44	3.49±0.19	14.77±0.15
8	*Suaeda Fruticosa*	89.67±0.39	15.78±0.34	1.32±0.33	9.01±0.55
9	*Capparus Decidua*	92.39±0.42	11.76±0.21	3.76±0.79	10.30±0.66

*DM=Dry matter; **CP= Crude protein; ***EE= Ether extract

Chemical composition of rangeland species of Makran region preferred by Makurani camels is given in Table IV. Of the collected samples, maximum CP obtained in *Ziziphus Jujuba* (17.11%) whilst minimum CP (10.19%) is recorded in *Rhazaya Stricta*. CP contents in rest of the collected samples ranged from 10.74 to 15.44 %. Maximum E.E contents found in *Suaeda Monoica* (7.22 %) whilst minimum E.E obtained in *Ziziphus Jujuba* (1.10%). E.E contents in rest of the collected samples ranged from 2-3.91 %. In ash contents, highest value obtained in *Salvadora Oleoide,* (22.89%) whilst lowest ash contents observed in *Prosopis Cineraria* (04.07%). Ash contents in rest of the collected rangeland species ranged from 11.88 % to 17.28%.

Table IV. Chemical composition (Mean± S.E) of rangeland plant species preferred by Makurani camels in Makran region

S. #	Botanical name	DM%	% of DM*		
			CP**	E.E***	Ash
1.	*Prosopis Cineraria*	96.5±0.63	14.1±0.21	2.0±0.22	4.70±0.45
2	*Acacia Nilotica*	89.28±0.28	10.89±0.64	3.91±0.38	14.44±0.44
3	*Ziziphus Jujuba*	91.40±0.80	17.11±0.74	`1.10±0.30	12.21±0.72
4	*Rhazya Stricta*	90.95±0.58	10.19±0.53	3.19±0.83	11.88±0.80
5	*Suaeda Monoica*	86.19±0.93	10.74±0.71	7.22±0.49	17.28±0.42
6	*Salvadora Oleoide*	90.89±0.33	15.44±0.48	3.78±0.36	22.89±0.53

*DM= Dry matter; **CP= Crude protein; ***EE= Ether extract

Table V. Fiber contents (Mean± S.E) in rangeland species preferred by Makurani camels in Lasbela region

S.#	Botanical name	NDF %	ADF %
1	*Prospis Juliflora*	32.56±0.96	20.17±0.60
2	*Prosopis Cineraria*	34.14±0.69	19.99±0.47
3	*Ziziphus Mauritiana*	31.10±0.85	20.32±0.76
4	*Tamarix Aphylla*	52.26±0.72	25.44±0.58
5	*Cynodon Dactylon*	40.96±0.68	28.18±0.77
6	*Salvadora Persica*	27. 73±0.66	17.45±0.93
7	*Accacia Nilotica*	30.43±0.74	15.33±0.81
8	*Suaeda Fruticose*	34.21±0.95	25.78±0.69
9	*Capparus Decidua*	50.98±0.90	43.16±0.73

NDF= Neutral Detergent Fiber; ADF= Acid Detergent Fiber

Fiber contents in rangeland species of Lasbela region preferred by Makurani camels is given in Table V. Of the collected ten rangeland species, maximum NDF contents obtained in *Tamarix Aphylla* (52.26 %), followed by *Capparus Decidua* (50.98%) whilst minimum NDF contents found in *Salvadora Persica* (27.73%). NDF contents in rest of the collected samples ranged from 30.43% to 50.98%. In ADF contents, highest value obtained in *Capparus Decidua* (43.16 %) whilst lowest value obtained in *Acccia Nilotica* (15.33%). ADF contents in rest of the collected samples ranged from 17.43 % to 28.18%.

Table VI. Fiber contents (Mean± S.E) in rangeland species preferred by Makurani camels in Makran region

S. #	Botanical Name	NDF %	ADF %
1	*Prosopis Cineraria*	46.23±0.91	30.78±0.57
2	*Acacia Nilotica*	30.33±0.87	17.19±0.61
3	*Ziziphus Jujuba*	31.21±0.81	20.45±0.75
4	*Rhazya Stricta*	42.70±0.76	27.94±0.49
5	*Suaeda Monoica*	39.40±0.83	27.20±0.55
6	*Salvadora Oleoide*	25.66±0.75	16.51±0.74

NDF= Neutral Detergent Fiber; ADF= Acid Detergent Fiber

Fiber contents in rangeland species of Makran region preferred by Makurani camels is given in Table VI. Of the collected ten rangeland species, maximum NDF contents obtained in *Prosopis Cineraria* (46.23%), followed by *Rhazaya Stricta* (42.70%) whilst minimum NDF contents found in *Salvadora Oleoide* (25.66%). NDF contents in rest of the collected samples ranged from 30.33% to 42.70%. In ADF contents, highest value obtained in *Prosopis Cineraria* (30.78%) whilst lowest value obtained in *Slvadora Oleoide* (16.51%). ADF contents in rest of the collected samples ranged from 17.19 % to 27.94%.

DISCUSSION

In our work, we studied two different habitats of Makurani camels i.e., Lasbela and Makran regions. Both regions have different landscapes where availability of grazing area widely differs. Lasbela region have good forests for grazing of camels whilst Makran regions (Turbat/Dasht) area has desert landscape having sparse vegetation resulting in long travels for search of vegetation, low nutrients availability and less production. These differences of vegetation also led to difference in preference of rangeland plant species. For example, in Lasbela region (Uthal and Liari areas) camels mostly preferred Jaar whislt in Makran region i.e., Turbat/Dasht areas camel preferred Kahoor. The carrying capacity and nutritional composition of these regions were apparently and chemically also varied. The rangeland plant species in Lasbela region were observed comparatively in better condition than Makran region (poor state). In literature (18), it is found that rangelands of Balochistan can be categorized into three major classes i.e., poor, medium and high potential areas depending on annual productivity. It is explained that poor, medium and high productivity areas yield dry matter per hectare 50 kg, 60-190 kilogram and 200-250 kg, respectively. The north zone is considered as better site of rangeland of Balochistan, which are situated in of the north region i.e., Khuzdar, Pishin, Quetta, Kalat, Zhob, Loralai, Nasirabad, Kohlu and Sibi districts of Balochistan. The above-described zones are equal to 18% of all area of the province and carry 76.5% of livestock provincial population. The south zone of the province is considered as the poor zone for rangeland i.e., Lasbela, Turabat, Gawadar, Chagi, Kharan, Panjgur and remaining part of Khuzdar district that cover 62% of total area and 23.5% of the total population of livestock. However, an improvement in community rangelands is possible if an integrated approach of range livestock management and improvement is made compulsory by involving all stakeholders and community (18). In our case, based on survey of preferred rangeland plant species, it is suggested that rangeland area may be optimally utilized through rotation so that availability of nutrients can be ensured for longer durations.

As discussed above, availability of rangeland species differs with landscape of the area. Uthal/Liari areas have dense vegetation which were well supporting camel population, their health and production whilst Turbat/Dasht areas had least vegetation which was affecting camel health and production. Hence, supplementation strategy required for both areas and particularly for Makran region. The nutritional profile of camel preferred plant species also revealed that these rangeland species (CP ranged from 11.34- 27.28 %) will fulfill crude protein requirements of the camels however, there is need to evaluate availability of metabolizable energy per kg from these rangeland species.

Our finding revealed that fiber (NFD and ADF %) requirements of Makurani camels were well satisfied form its habitat. This animal species, in common practice, is let free for grazing all the time (day and night) specifically in Lasbela region and hence their belly is always filled with grazed feed. However, Makran region varied in management system of camel husbandry where camels were kept on search of grazing all day and were tied during evening time. The fiber contents in different plant species were found in similar range in same species however, preferred plant species of Makurani camels were found different in both regions. Among preferred plant species of both regions, Capparus Decidua (shrub) was found with maximum NDF and ADF contents. In earlier study, rangeland species collected from Harboi Balochistan were evaluated which revealed that grasses generally had more NDF, ADF and hemicelluloses than shrubs (13). Generally, DM, CF, NDF, ADF, acid detergent lignin, carbohydrate and hemicellulose contents increased with the maturity of plants whilst ash, CP, EE, N and declined with maturity of plants. It is also reported that advancing plant maturity is accompanied by an increase in dry matter, which is reflected in the increase of cell wall contents, and a decrease in cell contents (16).

CONCLUSION

In both, Lasbela and Makran regions of Makurani camels' habitat, the preference of rangeland plant species varied due to availability of different rangeland plant species. In Lasbela region, Jaar was the preferred plant species whilst in Makran region, Kahoor was the most preferred plant species. Ber (Zizyphus) was the common species in both regions with good crude protein contents.

Acknowledgment:

The financial support of QASWA Foundation (particularly QASWA-Camel milk Ice cream startup) is highly acknowledged.

Conflict of interest:

There are no conflicts of interest for the authors.

Authors' contribution:

BM & IBM Conceived the idea, designed research and conducted writeup; BC & AHB Reviewed writeup and language editing; M, MH, SR & IAS Reviewed recent literature, sample collection and data analysis, GFE & SSS Conducted compilation, referencing, critical revision of the draft.

Declaration of generative AI and AI-assisted technologies in the writing process:

While the article was being prepared, the authors used Chat GPT to make it easier to read. The authors accepted full responsibility for the publication's content after using this tool or service, reviewed it, and made any necessary revisions.

References:

1. Food and Agriculture Organization (FAO). FAOSTAT database. Statistics Division; 2013.
2. Government of Pakistan, Ministry of Finance. Economic Survey of Pakistan 2022–23. Economic Advisor's Wing; 2023. Islamabad (Pakistan).
3. Younus M, Iqbal A. Handbook of Cholistan. Bahawalpur (Pakistan): The Islamia University of Bahawalpur; 2001.
4. Birhane E, Balehegn M, Kiros D, Tsegaye D. Distribution, animal preference and nutritive value of browse species in the rangelands of Afar, northern Ethiopia. Ethiop J Biol Sci. 2014;13(2):135–148.
5. Amin AS, Abdoun KA, Abdelatif AM. Observations on the seasonal browsing and grazing behaviour of camels (Camelus dromedarius) in southern Darfur, Sudan. Res Opin Anim Vet Sci. 2011;1(4):213–216.
6. Laudadio V, Tufarelli V, Dario M, Hammadi M, Seddik MM, Lacalandra GM, Dario C. A survey of chemical and nutritional characteristics of halophyte plants used by camels in southern Tunisia. Trop Anim Health Prod. 2009;41(2):209–215.
7. Younas M, Yaqoob M. Feed resources of livestock in the Punjab, Pakistan. Livest Res Rural Dev. 2005;17(2):20–26.
8. Iqbal A. A socio-economic profile of camels in Pakistan with special emphasis on management and production aspects. In: Proceedings of the International Workshop on Camel Research and Development; 2005; Wad Medani, Gezira State, Sudan. p. 45–50.
9. Chaudhary SA, Le Houérou HNL. The rangelands of the Arabian Peninsula. Secheresse. 2006;17(1):179–194.
10. Shaheen G. Seasonal variation in nutritional and anti-nutritional components of native shrubs and trees grown in Hazargangi Chiltan National Park, Karkhasa and Zarghoon [PhD dissertation]. Quetta (Pakistan): University of Balochistan; 2009.
11. Dokata MD. Factors influencing camel milk production in central division of Isiolo District: a case of three camel milk women self-help groups in Isiolo County, Kenya [MA dissertation]. Nairobi (Kenya): University of Nairobi; 2014.
12. Han W, Fang J, Guo Y, Zhang Y. Global patterns and climatic drivers of above- and belowground net primary productivity in grasslands. Sci China Life Sci. 2020;64(5):738–751.
13. Hussain F, Durrani MJ. Forage productivity of arid temperate Harboi rangeland, Kalat, Pakistan. Pak J Bot. 2007;39(5):1455–1470.
14. Vallentine JF. Range development and improvement. 2nd ed. Provo (UT): Brigham Young University Press; 1980.
15. Association of Official Analytical Chemists (AOAC). Official methods of analysis. 17th ed. Washington (DC): AOAC; 2000.
16. Van Soest PJ, Robertson JB, Lewis BA. Methods for dietary fiber, neutral detergent fiber, and non-starch polysaccharides in relation to animal nutrition. J Dairy Sci. 1991;74:3583–3597.
17. Steel RGD, Torrie JH, Dickey DA. Principles and procedures of statistics: a biometrical approach. 3rd ed. New York (NY): McGraw-Hill; 1997.
18. Thomson EF, Rodriguez A. Land and range resource management issues and food security in Balochistan. Aleppo (Syria): International Center for Agricultural Research in the Dry Areas (ICARDA); 1994.