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COMPARATIVE APPRAISAL OF THE ACACIA (*ACACIA NILOTICA* L.) AND MESQUITE (*PROSOPIS JULIFLORA*) ON THE BASIS OF MINERAL CONTENTS AND CONTAMINANTS FOR THE CAMEL FEEDS

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ABSTRACT

This study evaluates the nutritional value and quality of feed and forage for camel husbandry and productivity. It focuses on two forage plant species, Acacia and Mesquite, based on mineral nutrients and contaminants for grazing and camel health benefits. The study was conducted in Jam Mahar and Tharo Mari locations of Hyderabad, contaminated lands of Oil and Gas Development Company Limited. Leaf tissue samples were collected from three trees of each plant species, oven-dried at 70°C for 48 hours, and analyzed for crude protein, fats, fiber, and ash. The plant material was digested using diacetic acid and filtered properly. The filtrate of digested samples was analyzed on Atomic Absorption Spectrometer (Nova 400) Analytik Jena, Germany. The findings of the study revealed that Acacia leaf, including pod samples, illustrated more crude protein (20.1%), fats (16%) and crude fiber (16.4) in comparison to mesquite (Devi). Findings from macro and the micronutrients of the study revealed that mesquite leaf tissues contained 36.7% and 3% more K. and Ca as compared to acacia leaf samples. Inversely to K and Ca, the Mg and Fe contents of Acacia leaf tissues were 77% and 59% higher than mesquite leaf tissue. The study found that acacia leaves have potential to meet the nutritional needs of camels and address feed shortage issues during the monsoon dry season. The findings suggest further research on the benefits of acacia leaves as fodder and their potential use in combination with other grasses to enhance various nutrients, including protein, lipids, fiber, macronutrients, and micronutrients

Key words: Chemical analysis, Feed, Macro and Micronutrients, *Acacia nilotica* (Babur), *Prosopis juliflora* (devi).

Introduction:

The thorny wattle Acacia nilotica (L.) Del is indigenous to India, Pakistan, and many African nations. They are widely used as firewood, browse, and lumber in Africa and the Indian subcontinent (Habtamnesh et al., A., 2023; Islam et al., 2013; Gupta, 1970). They are also utilized for forestry or the rehabilitation of degraded land, tanning, and as aphrodisiacs (Purl and Islam et al., 2013, Khybri, 1975). Domesticated animals, including cattle, sheep, goats, and camels consume Acacia bushes and seed pods in Asia and Africa. Many scientists believe that using Acacia species used to feed animals can be more economically viable (Uguru 2014).

Prosopis juliflora thrives on soils that are unsuited for cultivation, such as stony, sandy, or saline places with little or no rainfall. Twigs and leaves are not eaten by livestock, and mesquite is a useful fuel wood. Twice a year, it produces pods. All ruminant species eagerly devour ripe pods that fall to the ground. Particularly in South America, Africa, and India, mesquite pods have been used as feed for cattle, sheep, camels, buffalo, rabbits, fowl, and rodents. The mesquite plant can withstand droughts and is widely known for its appropriateness as a windbreaker and soil binder (Mendes, 1986). Due to its tolerance to heat and dryness, the Propsopis juliflora plant may thrive in arid and semi-arid environments. It also offers a wide range of potential applications of various phenolic and anti-inflammatory compounds (Joshi et al., 2022; Kankara 2017; Mendes, 1986; Nasir and Ali, 1973).

The camel is one of the most common and adapted animals in the desert. Of all the terrestrial animals, it is the most patient since it can withstand starvation and dehydration for several days. (Ali and colleagues, 2016). It is a cherished companion, a source of milk and meat, a supplier of transportation services, and a racing or dancing animal for Pakistani desert nomads, contributing significantly to the socioeconomic development of the surrounding villages (Ahmed et al., 2010). There are four main ecological zones in Pakistan where the majority of camels currently reside: sand dunes (Thal and Cholistan in the Punjab and Thar in Sindh), coastal mangroves (Thatta , Badin, and Karachi districts of Sindh), and irrigated plains (most irrigated districts of Punjab and Sindh). Pagot I (1992) reported that the camel's grazing or browsing habit consists of a variety of actions connected to the consumption of feed, including grazing, sorting, and ingesting. Similar to other ruminants, camels appear to eat bones, charcoal, and mummified juvenile gazelles, head and all. The selection process and diet quality were both severely constrained by the lack of suitable plant species (Ganguli et al., 1994).

In order to offset the decreasing forage availability, camels increase their consumption of vegetation, herbs, debris, bushes, and branched twigs during the dry seasons. Regardless of the season, camels choose a diet higher in protein than that of other animal species and spend more than 80% of their total feeding time on dicotyledons. The dromedary loves to graze bushes and trees while choosing feed that is highly nutritious, especially one that is rich in fermentable carbohydrates and high water contents on typical grazing grounds in the arid tropics and subtropics.

According to research, camels may use a wide range of plants in open-range environments by quickly migrating from one feeding site to the next. Ingestion percentages are still higher where desirable or recommended vegetation is abundant, but they are significantly lower for spiny species with few leaves. Typically, feeding occurs between 15 and 18 hours per day. Camel in Pakistan typically relies on the open, grazing rangelands for food. El-Keblawy et al. (2009) showed that camels, with their special digestive and anatomical features, graze on a variety of plant species, including some that other domestic herbivores would often reject. Therefore, the current study was designed to examine the availability and choice of several camels for vegetation in Hyderabad, Sindh.

MATERIALS AND METHODS

Location of Study: The current study was conducted in the district of Hyderabad in three ecological camel habitat zones, like sandy desert, irrigated, and coastal mangrove zones of Sindh province (Quraishi et al., 1993).

S**tudy months:** Plant samples were collected during the study period in 2019 from different ecological habitats of camels.

Samples Collection: Samples were collected from several places within the research area over the year 2019. A sample of leaves was obtained from each sampling location. The field notebook was used to number the samples and record the names of the places, Tharo Mari and Jam Mahar, as they were collected. The recorded samples were collected and placed in plastic bags marked with the appropriate numbers. All of the polyethylene bags were washed with distilled water and 5% nitric acid before to the investigations, and they were then left to air dry. Three samples of each ecotype of plant were taken from each setting, and the presence of heavy metals was investigated.

Moisture content (%): The moisture content of the leaf tissues of the composite sample was determined according to American Association of Cereal Chemists (AACC, 2000) method No. 44-15A by using the oven drying method with little modification. A twenty-gram (20 g) fresh sample was taken (W 1) and kept in an air-forced draft oven at 105±5°C till the constant weight (W2) was attained. The moisture percentage was calculated as:

$$\text{Ash content (\%)} = \frac{\text{Fresh weight } (W_1) - \text{Dry weight } (W_2)}{\text{Fresh weight } (W_1)} \times 100$$

Moisture (%) = $W_1 - W_2 / W_1 \times 100$

Crude Protein Content (%): The protein content in the leaf tissues of both species was quantified according to method No. 46–10 described in AACC (2000) using the Kjeltec nitrogen distillation unit. Two grams of dried grinded leaf tissues were put into the digestion tube, 12.5 ml of concentrated sulfuric acid was added, and two nitrogen catalysts and digestion tablets were added to the tubes. The temperature of the digestion block was gradually increased to 380–400 °C. The contents of the tubes were digested for 3–4 hours until the contents became transparent. The digested material was left to cool at room temperature, and then 10 ml of D.W. was added to prevent the material from solidifying. Fifty ml of 40% concentrated NaOH was added to liberate ammonia trapped by sulfuric acid. Five ml of D.W. were added in a conical flask. Containing Toshiro indicator or 4% boric acid, ammonia liberated by NaOH was collected in a conical flask (170 ml), and the content of the flask was titrated against the standard 0.1 N H 2 SO 4/HHCl. The A factor of 5.70 was used to convert nitrogen (%) into crude protein contents of composite plant. leaf tissues, respectively.

Total Ash Content (%): The total ash content of the sample was determined by taking 3.0 g of grind leaf tissues in crucibles. The crucibles were kept on a hotplate till the content became black in color, then transferred to a muffle furnace, where the temperature gradually rose to 550 °C and the content was kept for 5 to 6 hours till the content turned to white ash or a gray color. The total ash content was quantified according to AACC (2000), following method No. 08-01 with some modifications

$$\text{Ash content (\%)} = \frac{\text{Weight of ash (g)}}{\text{Weight of dried leaf tissues (g)}} \times 100$$

Crude Fat Content (%): Three grams (3 g) of ground leaf tissues were passed through the Soxhlet apparatus for 2–3 hours using petroleum ether as a solvent to determine the crude fat content. All the steps used in determination were followed by protocols described in AACC (2000), Method No. 30–10. The following formula was used to calculate the crude fat percentage:

$$\text{Crude Fat (\%)} = \frac{\text{Weight of fat (g)}}{\text{Weight of dried leaf tissues (g)}} \times 100$$

Crude Fiber (%): For determination of crude fiber (%) A 3 g ground leaf tissue composite sample was taken and digested first with 1.25% sulfuric acid, then washed with distilled water and filtered. The washed content was digested with 1.25% NaOH, again washed with D.W., and filtered. The filtrate residues were ignited and kept in a muffle furnace at 550 to 650 °C for 4-5 hours continuously. The procedure was followed as described by AACC (2000) in Method No. 32–10. The crude fiber (%) can be calculated using the following formula:

$$\text{Crude Fiber (\%)} = \frac{\text{Weight loss on ignition (g)}}{\text{Weight of dried leaf tissues (g)}} \times 100$$

Mineral contents / Heavy metal analysis: The plant samples, Acacia nilotica (Babur) and Prosopis juliflora (devi), were dried for 48 hours at 50 °C. Before analysis, the dried samples were stored in plastic bags. 2 g of the dried material was combined with 25 mL of nitric acid. It was carefully heated on a heater for 30 minutes before being allowed to cool. After that, 15 mL of perchloric acid was added, and it was heated in a magnetic heater for nearly an hour until it turned colorless. 50 mL of deionized water was added after chilling. Prior to analysis, the samples were stored in plastic bottles at 4 °C in a refrigerator. Samples taken from several locations in Hyderabad were used to calculate the concentrations of copper, iron, manganese, zinc, lead, nickel, cadmium, and chromium. ICP-OES conducted an analysis of the components in the plants (Perkin Elmer, Optima 8000 DV).Macro- and micronutrients were determined by using the Perkin Elmer Analyzer 700 single-beam atomic absorption spectrometer. The data was obtained in parts per million (ppm). Laboratory procedures for the preparation and determination of macro- and micronutrients were used as outlined by Shah et al. (2009).

Statistical analysis: The data was subjected to statistical analysis utilizing the ± standard error bars to evaluate any significant differences between the two plant species (Acacia and Mesquite). MS Office Excel version 2019 and the Statistical Package for Social Sciences (SPSS) version 27 were used to establish mean comparisons.

RESULTS AND DISCUSSION

Animal production has a key position in the GDP (gross domestic production) of the country; it can play an important role in the development of rural communities. A shortage of food (both quantity and quality) during the dry season is a major constraint on camel production, as reported by rural people. In our country, 34 species of Acacia are grown, and some species, such as A. cyanophylla and A. victoriae, have been introduced in Pakistan by the Forest Research Institute, Peshawar (Nasir and Ali, 2016). Acacia is a source of chemicals, proteins, fats, fiber, and minerals; hence, it is known as a food for livestock. Every part of Acacia has unique characteristics and economic importance, such as leaves, stems, heart wood, and bark, which also contain flavonoid compounds (Clark-Lewis, 1967). Plant tree foliage (shoots, leaves, and small twigs) has a high nutritive value for camel grazing. Acacia (Acacia nilotica L.) and mesquite (Prosopis juliflora) can overcome the problem of food shortages in rural areas. Both tree species, particularly acacia, contain sufficient quantities of nutritional organic components, viz., protein, fats, fiber content, and inorganic mineral nutrients such as K, Ca, Mg, Fe, Zn, Cu, etc. Statistical analysis of the data revealed that most of the parameters recorded were significantly different from each other by observing the standard error means (Fig. 1 and Fig. 2).

Moisture (%): Moisture content is an important parameter that directly affects the dry matter tissue contents of both tree species. Table 1 and Fig 1 depict that the moisture percentage showed a 15% higher value in Acacia (19.51%) than Mesquite (16.5%). The camel thorn pods contained moisture. (9.4%), ash (3.3%), fats (1.6%), fiber (31%), and crude protein (11.4%). Moreover, the pods of camel thorn contained Ca 0.6%, P 0.1%, and K 1.0%, respectively (Pedro et al., 2023; Zapat-Campos et al., 2020).

Organic parameters:

Crude Protein Content (%): Proteins are important characteristics of organic components and are formed by amino acids, which are the building blocks of life. For camel growth and development, the protein content in the feed is essential; however, acacia and mesquite (Devi) showed variable concentrations. Protein the contents of Acacia nilotica L. varied from 9.8 to 11.12% and Prosopis juliflora from 7.5 to 9.15% (Table 1 and Fig. 1). The data showed that acacia showed 20.1% more protein content in comparison to mesquite (Devi) (Fig. 1). Findings of studies carried out on Acacia revealed that green pods contained a high protein content of 6.93% and 13.9% on a dry matter basis (Habtamnesh and Agena, 2023; Pedro et al., 2023; Zapat-Campos et al., 2020). The palatability of the leaves of Acacia nilotica was good enough for animals, especially camels, because different species of Acacia showed variable concentrations of nutrients. Acacia caesia illustrated an oil and protein content of 8.8% and 11.7%, respectively, by weight (Rao et al., 1983).

Total Ash Content (%): The ash content of green pods and shoots illustrates the mineral and metal concentrations in Acacia tissues because organic compounds such as proteins, fats, and fibers are lost on ignition in furnace. Ash contents of Acacia nilotica L. varied from 3.2 to 3.65% and Prosopis juliflora from 3.8 to 4.2% (Table 1). The data revealed that Mesquite (Devi) pods displayed 15.2% more ash content as compared to Acacia pods and shoots (Fig. 1). Many studies have shown similar findings, and they reported an ash content of 4.24 to 6.08% in Acacia pods (Uguru et al., 2014; Habtamnesh and Agena, 2023; Pedro et al., 2023).

Crude Fat Content (%): Crude fat content is an important component of a diet as an energy source. Fats contribute to satiety, flavor, and palatability in the diet. Fats are essential organic compounds that play a crucial role in development and productivity. The fat contents of Acacia varied from 10.7 to 11.2% and Prosopis juliflora from 38.9 to 9.34% (Table 1). The data revealed that Acacia nilotica L. pods illustrated 16% more fat content as compared to Mesquite (Devi) pods and shoots (Fig. 1). Similar results were reported by Rathee et al., 1979; Uguru et al., 2014; Habtamnesh and Agena, 2023; Pedro et al., 2023, they stated that the fat contents of green and dried pods ranged between 6.6%, 8.2%, 7.8%, and 9.2%, respectively. Harrison and co-workers examined the Acacia giraffe (camel thorn) pods. (green and dry) in detail and reported that these species contain abundant fats (8.2%)). Acacia Albida seed oil contained a coronaric acid content of 7.8% of the glyceride oil as analyzed liquid chromatography (Zapat-Campos et al., 2020).

Crude Fiber (%): Fibers are carbohydrates made up of sugar molecules that are linked together; they are bound together in such a way that they cannot be easily digested in the small intestine. Dietary fiber minimizes the risk of heart disease. In this study, the fiber contents of Acacia nilotica L. varied from 5.2 to 5.8% and Prosopis juliflora from 4.4 to 4.82% (Table 1). The fiber data further depicted that Acacia nilotica L. pods illustrated 16.4% more fiber content as compared to Mesquite (Devi). Pods and shoots (Fig. 1). Many studies were conducted by various scientists and researchers findings are in conformity with the findings of this study. They reported fiber that was green and dried pods of Acacia species contained fibers of 10.7%, 17.1%, and 47.2%, as reported by (Uguru et al. 2014; Habtamnesh and Agena, 2023; Pedro et al., 2023).

Mineral nutrients (Ca, Mg, K, Na, Fe, Zn, Co & Cu) mg kg^{-1}: Mineral nutrients are pivotal for the physiological, structural, reproductive and regulatory functions of animals. The mineral having metabolic role in animal body, hence, are known as "essential elements or nutrients". There are 21 elements are listed as essential according to literature (Cherian, 2019), and on the basis of their abundance in diet are known as macronutrient (concentration in diet is > 0.01%) and micronutrient (concentration in diet is < 0.1%).

Macronutrient (Ca, Mg): From above stated minerals, Ca and Mg are considered as macronutrient. Calcium (Ca) contents of both plant species varied from 26.9 mg kg -1 to 28.4 mg kg -1 . Mesquite leaf tissues contained 3% more calcium in comparison to acacia plant species. Inversely to Ca, the Mg contents of Acacia leaf tissues was 77% (2.40 mg kg -1) higher than Mesquite leaf tissue (0.54 mg kg -1), however, it varied from 0.49 mg kg -1 to 2.61 mg kg -1 (Table 2, Fig: 2). Calcium and Mg content of tree leaf tissues is depending on soil calcite (CaCO3) and dolomite (CaCO3 . Mg, CO3) minerals. Calcium is important element of camel body, about 99% Ca occurs in bones, teeth as a hydroxyapatite only rest of 1% is found in cellular fluids which it is involved in the different metabolic and physiological functions (Cherian, 2019). The Mg is 3rd most abundant elements in camel's body, is found in animal bone as phosphates and carbonates and skeletal muscles cells. Usually dietary Mg is absorbed in ileum and carrier is needed for Mg absorption. The findings Pedro et al (2023) are in conformity with the findings this study, they reported that Acacia spp., have showed high contents of Ca & Mg in tissues (pods).

Electrolytes (K & Na): Potassium and Na are known as electrolytes, these electrolytes help in creating an ionic balance and keeping cells alive. The one of the pivotal functions of these electrolytes are to maintain pH in blood and tissues, cell membrane signal transduction and osmotic pressure of fluids in animal body. Potassium content of Acacia and Mesquite varied from 10.9 mg kg-1 37.10 mg kg-1. Mesquite contained 36.7% more K in leaf tissues in comparison to Acacia species. In contrasting to K, the Na content of Acacia leaf tissues is 18% higher than the leaf tissues Mesquite. The Na contents varied 8.7 mg kg -1 to 11.1 mg kg -1 of dry matter (Table 2 and Fig 2). Electrolytes (K + and Na +) are important for animal muscle contraction and nerve impulse. Sodium functions in conjunction with other ions to maintain cell permeability in the active transport of nutrients across the membrane. Potassium in the form of ionization provides osmotic force, which maintains the fluid volumes of camel body (Cherian, 2019). The content of both the electrolytes in Acacia leaf tissues is dependent of irrigation water or soil moisture and soil parent material where plants grow. Acacia spp., are well known as salt and drought tolerant trees, due to its unique characteristics of fast-growing nature, ensuring enough wood supply to sustain the country wood demand of industry (Islam., 2013). Sodium and potassium content in phyllodes and roots increased with increasing the level of soil salinity (Rahman et al., 2017).

Micronutrients (Fe, Zn, Co & Cu): The micronutrient (Fe, Zn, Co & Cu) are inevitable for camel health, these play important role in metabolic and physiological functions of the camels. Iron (Fe) content in leaf tissues of Acacia and Mesquite from ranged from 0.51 mg kg -1 to 1.32 mg kg-1. Acacia species illustrated 59% more Fe content in comparison to Mesquite species. Zinc content of leaf tissues showed antagonistic effect with Fe content in both the plant species. The Zn concentration in both the plant species ranged between 1.07 mg kg -1 to 2.77 mg kg -1 , however, Mesquite species contained 60% more Zn in leaf tissues in comparison to Acacia (Table 2 and Fig 2). Like Fe and Zn, Co is essential micronutrient of animal health (camel), rumen microorganisms utilize Co for the synthesis of vitamin B 12. The Co content of Acacia and Mesquite species varied from 0.48 mg kg - 1 to 0.81 mg kg -1 in leaf tissues. Acacia species accumulated 24% higher concentration of Co in comparison to Mesquite leaf tissues. Copper is one of the essential micronutrients required for camel health .The Cu contents of leaf tissues of Acacia and Mesquite species ranged between 0.29 mg kg -1 to 0.82 mg kg -1 . Like Co content Cu concentration in Acacia leaf tissues was 12% higher than Mesquite leaf tissues. Tahir and Alkheraije (2023) reported that besides other factors affecting nutritional value of Acacia leaf tissues, plant population, soil management, climate change, tree growth stage and assay method also affecting the mineral composition (Mapiye et al., 2011). Similarly, another study reported that Acacia leaf tissues contained high protein, mineral concentrations (Zn, Fe, Cu, Mn, Co) for animal supplement.

Table 1: Organic nutrient contents in *Acacia nilotica* L. (Babur) and *Prosopis Juliflora* in district Hyderabad

PARAMETERS	***Acacia nilotica* L.**			**Mean**	**SD**	***Prosopis Juliflora***			**Mean**	**SD**
	R_1	**R_2**	**R_3**			**R_1**	**R_2**	**R_3**		
Moisture content	18.2	20.76	19.56	19.51	0.739	16.15	18.54	17.35	17.35	0.690
Protein content	11.12	10.78	9.88	10.59	0.370	7.58	8.65	9.15	8.46	0.463
Ash content	3.22	3.65	3.42	3.43	0.124	3.75	3.88	4.22	3.95	0.140
Fat content	11.12	10.88	10.78	10.93	0.101	9.34	8.98	9.22	9.18	0.106
Fiber content	5.84	5.24	5.54	5.54	0.173	4.82	4.66	4.42	4.63	0.116

Table 2: Mineral contents (replicated data) of *Acacia nilotica* L. and *Prosopis juliflora*

PARAMETRES	***Acacia nilotica* L.**			**Mean**	**SD**	***Prosopis juliflora***			**Mean**	**SD**
	R_1	**R_2**	**R_3**			**R_1**	**R_2**	**R_3**		
Ca (mg kg-^{1})	27	26.9	27.1	27.00	0.10	27.30	28.30	28.40	28.00	0.608
Mg (mg kg-^{1})	2.61	2.16	2.43	2.40	0.23	0.49	0.54	0.59	0.54	0.050
K (mg kg-^{1})	10.9	11.1	11	11.00	0.10	37.10	37.00	36.90	37.00	0.100
Na (mg kg-^{1})	11.1	10.9	11	11.00	0.10	9.40	8.70	8.90	9.00	0.361
Fe (mg kg-^{1})	1.32	1.29	1.23	1.28	0.05	0.52	0.53	0.51	0.52	0.010
Zn (mg kg-^{1})	1.07	1.09	1.08	1.08	0.01	2.72	2.74	2.77	2.74	0.025
Co (mg kg-^{1})	0.62	0.67	0.81	0.70	0.10	0.48	0.52	0.49	0.50	0.021
Cu (mg kg-^{1})	0.31	0.68	0.82	0.60	0.26	0.29	0.64	0.58	0.50	0.187
Cd (mg kg-^{1})	0.051	0.03	0.051	0.04	0.01	0.07	0.06	0.08	0.07	0.011
Cr (mg kg-^{1})	0.54	0.46	0.51	0.50	0.04	0.54	0.52	0.49	0.52	0.025

Contaminants (Cd and Cr) mg kg-^{1}: Cadmium (Cd) and chromium (Cr) are toxic elements for camel health. In camels Cd and Cr levels in tissues are largely dependent on concentration of both toxic metals in feed and drinking water. The Cd concentration in leaf tissues of both (Acacia and Mesquite) plant species ranged between 0.03 mg kg - 1 to 0.08 mg kg -1. The Mesquite leaf tissues contained 57% more Cd as compared leaf tissues of Acacia. The Cr concentration in leaf tissues of both the plant species are statistically parallel, its concentration in leaf tissues varied from 0.46 mg kg - 1 to 0.54 mg kg -1 . The leaf tissues of Mesquite plant species displayed negligible only 1% higher quantities of Cr contents as compared to Acacia plants leaf tissues (Table 2 and Fig 2). Heavy metals can cause cell dysfunction and toxicity by attaching to protein sites and displacing the original metals from their native binding sites, toxicity of heavy metal is depending on age of the animal or tree, how it interacts with other metals and physiological functions of animals and trees species (Lane et al., 2015; Patrick, 2003). In camels' heavy metals affected the respiratory system, gastrointestinal systems, where they accumulated before these are taken by blood and shifted to other body organs (Selina, 2023; Briffa et al., 2020, Vardhan KH. 2019, Ali and khan 2018, Singh et al., 2011).

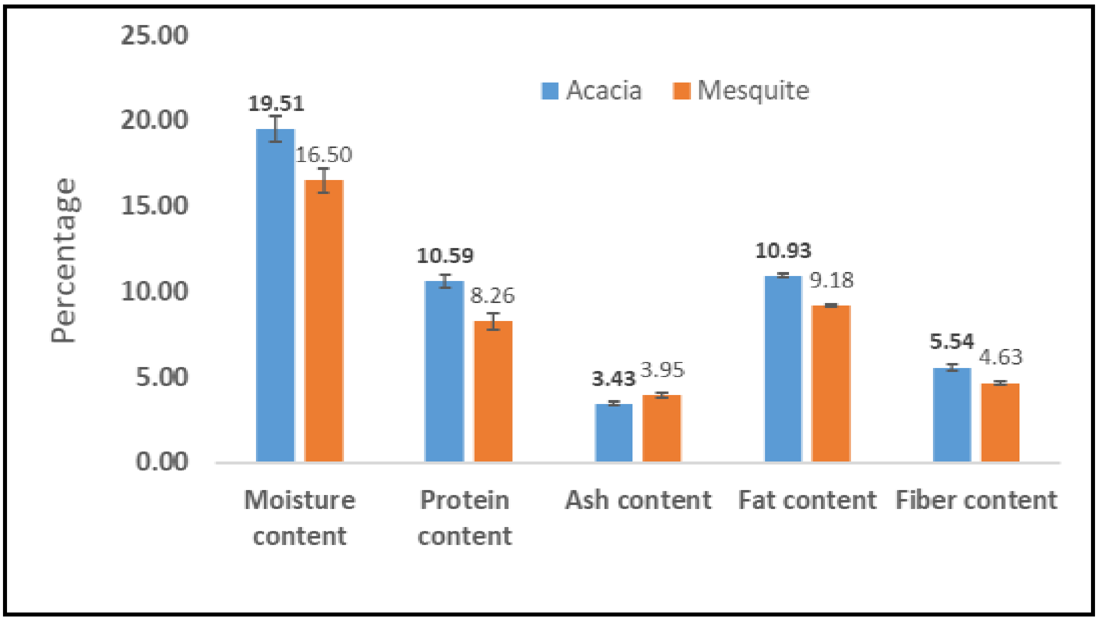

Fig: 01: - Comparative nutrient contents of Acacia (*Acacia nilotica* L.) and Mesquite (*Prosopis juliflora*)

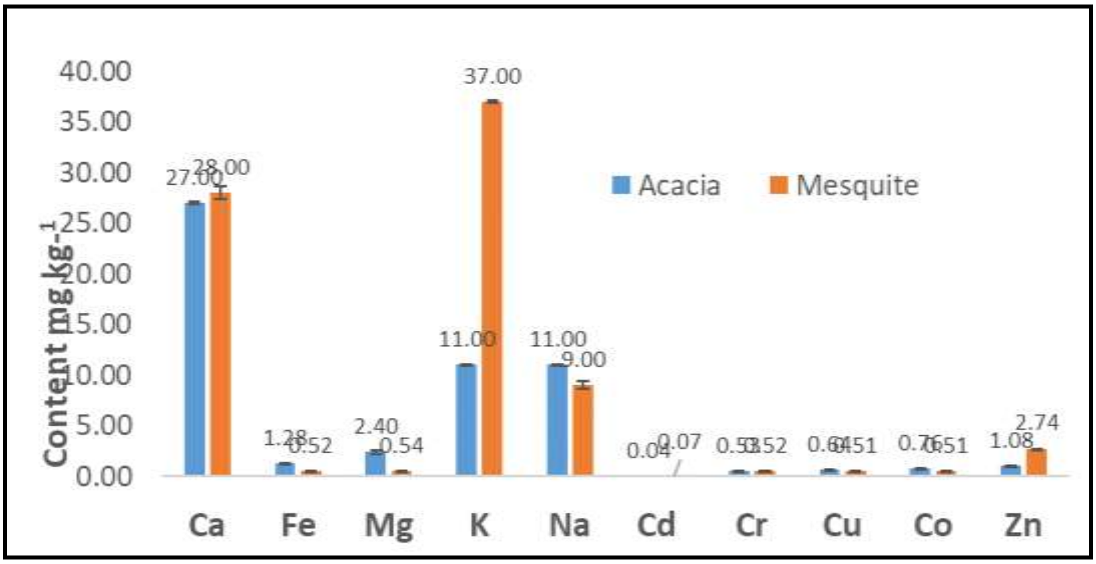

Table 3: Comparative values of mineral elements and heavy metals with WHO standards found in *Acacia nilotica* L. in district Hyderabad

Sr. No.	**Parameters**	**WHO Standard Values**	***Acacia nilotica* L.**
		--------------- **mg kg^{-1}**	---------------
01	Cu	6-10	0.02
02	Fe	100-200	0.01
03	Cd	0.3-0.7	0.3
04	Mg	2000 -20000	2.5
05	Zn	20-50 mg/kg	1.08
06	Pb	0.3-0.7 mg/kg	BDL*

BDL = Below detection limit

Table 4: Comparative values of mineral elements and heavy metals with WHO standards found in *Prosopis juliflora* in district Hyderabad

Sr. No.	Parameters	WHO Standard Values	*Prosopis juliflora*
		-------------- mg kg^{-1} ---------------	
01	Cu	6-10	10
02	Fe	100-300	310
03	Cd	0.3-0.7	1.0
05	Mg	2000 - 15000	100
06	Zn	20-50	40
07	Pb	0.3-0.7	BDL*

BDL = Below detection limit

When compared to WHO recommended values, the mineral composition of Acacia nilotica differs. While the iron (Fe) content is rather low, the magnesium (Mg) value is above the necessary threshold. Acacia nilotica has appropriate amounts of cadmium (Cd), copper (Cu), and zinc (Zn), among other minerals. When compared to the WHO standard values, Prosopis juliflora's mineral content differs. Iron (Fe) content is slightly higher, even if magnesium (Mg) content is below recommended values. Prosopis juliflora has adequate quantities of cadmium (Cd), copper (Cu), and zinc (Zn) in terms of other minerals (Table 4 and 5).

CONCLUSION

Based on the analytical findings of the study, it is concluded that Acacia leaf tissues including pods samples illustrated more crude protein (20.1%), fats (16%) and crude fiber (16.4) in comparison to Mesquite (Devi). Findings of macro and micronutrient of the study revealed that Mesquite leaf tissues contained 36.7% and 3% more K and Ca as compared to acacia leaves samples. Inversely to K & Ca, the Mg and Fe contents of Acacia leaf tissues were 77% and 59% higher than Mesquite leaf tissue. Mesquite has less nutritional value than Acacia nilotica but having high antifungal activity and K antioxidant which beneficial against animal diseases. Farmers or growers may be educated that Acacia leaves have the great potential to overcome camel feed shortage issues and nutritional deficiency of animals during monsoon dry season. Therefore, more studies can be conducted to evaluate acacia leaves as fodder in different seasons by growing acacia as commercial feed or it may be used in combination with other grasses to enrich the nutrients such as protein, fats, fiber, macro and micronutrients, however, heavy metals are below the safe limit.

RECOMMENDATION

Integrated use of acacia leaf tissues and small branches into camel feeding as component of feed formulation may increase the quality of feed due to presence of protein, fats, fiber and minerals; hence, it's suggested as feed stock for camels.

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