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NUTRITIONAL COMPOSITION OF SOME FORAGE SPECIES CONSUMED BY ONE-HUMPED CAMELS (*Camelus dromedarius*) IN ZARIA SUB-HUMID REGION OF NIGERIA

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ABSTRACT

The nutritional compositions of leaves from eight different forage species were analyzed. The forages include: *Dalbergia sisso, Ziziphus mauritania, Khaya senegalensis, Lephatadenia hastala, Ziziphus var-spinachristi, Acacia hoskii* and *Dichrostachys cineria*. The forages were analyzed for Dry Matter, Crude Protein, Crude Fiber, Ether Extract, Neutral Detergent Fiber, Acid Detergent Fiber and Nitrogen of their leaves. The dry matter content of the selected forage plants ranged from 94.99% to 97.34% and 89.72% to 97.77% with a mean value of 96.42% and 94.55% in wet and dry season, respectively. The crude protein content ranged from 9.44% to 23. 56% and 9.21% to 18.87with mean value of 16.99% and 15.27% in wet and dry season respectively. The ash contents ranged from 4.23% to 7.99% and 3.49% to 6.28% with a mean of 5.98% and 4.84|% in wet and dry season. The ether extract content obtained in this study ranged from 0.94% to 7.96% and with the mean value of 4.18% in the wet season and 1.03% to 7.66% with a mean of 4.04% in dry season. The crude fiber content ranged from 26.54% to 38.22% and a mean value of 31.21% in wet season and 22.63% to 36.40% with the mean value of 28.8%. These differences in the composition of the forage plants were attributed to the soil type and plant components such as pod, leaf, stem, and season at which the plants were harvested.

Key words: Forage species, nutritional composition, camels

INTRODUCTION

During the dry season, ruminant diets are limited by shortages in total amount and quality of available forage (Shelton, 2004), crop residues or by products (Babayemi *et al.*, 2004a) which result in reduced livestock productivity in the tropical countries (Odenyo *et al.*, 1997). Tree fodders are important in providing nutrient to grazing ruminants in arid and semi-arid environments, where inadequate feeds are a major constraint to livestock production (Aganga and Tshwenyane, 2003). Tree fodders maintain higher protein and mineral contents during growth than do grasses, which decline rapidly in quality with progress to maturity (Shelton, 2004). Tree fodders are important source of high quality feed for grazing ruminants and as supplements to improve the productivity of herbivores fed on low quality feeds. Tree fodders form part of the complex interactions between plants, animals and crops (Aganga and Tshwenyane, 2003). They help to balance a plant-animal soil ecosystem and from which there is a sustainable source of feeds (Devendra, 1994). The availability of a variety of these feeds and the selection process enable the herbivores, especially the goats to extend as well as meet their feed preferences. Traditional farmers in the semi-arid region of Nigeria allow their goats, sheep and cattle to browse on tree forages, in the range lands and they also cut and feed these tree foliages as supplements based on experience and convenience.

In the arid and semi-arid zones of the world, it is inevitable for livestock to be well adapted to the harsh grazing conditions (Abbas *et al*., 1995). Camels are able to survive in such environments due to their unique morphology and physiology. The physiology of camels enables them to survive on very fibrous and low protein diets (Kuria *et al*., 2005). They reportedly retain such feed material for longer periods in the rumen and thus utilize these better than cattle, sheep and goats (Mousa *et al*., 1983). The height of camels allows them to utilize feed resources inaccessible to other livestock species (Kuria *et al*., 2005). The cleft upper lip enables camels to select diets better than other livestock species (Rutagwenda *et al*., 1990).

To determine the nutritive value of feed stuff for camel, the first step is to identify and analyse the chemical composition of the different species of plants which are consumed by the camels (Towhidi, 2007). Chemical compositions of many feedstuffs have been obtained from different ecosystem in the Arab region in Asia and Africa (Wardeh *et al*., 1990). In India, nutritive value of different tree leaves and green lucerene fodder for camels in north semi-arid zone were determined and suggested that the tree leaves were palatable to camel and can serve as good and nutritive fodder for camel (Bhagwat *et al*., 1998).

However, little information is known about the nutritive value of forage species consumed by camel in the Northern Guinea Savannah of Nigeria. Therefore, the main objective of this study were to determine the chemical and mineral composition of the forage species consumed by camels in the study area

MATERIAL AND METHODS

Study Area

This study was carried out at the National Animal Production Research Institute, Ahmadu Bello University, Shika-Zaria, Nigeria on latitude $11^0 12^0$N, longitude $7^0 33^0$E and on altitude of 610m above sea level (Mohammed *et al*., 2007).

Sample collection, preparation and chemical analysis

The forage species consumed by the camels in the study area were collected and properly labeled. Observed plants parts consumed by the camels were the leaves, stems and pods and were included in the samples taken. Sampling was done in both dry and wet seasons.

The forage samples were cut into small pieces (1cm) and allowed to dry at 65^0C for 72 hours in an oven as reported by Temesgen and Mohammed (2012). All the dried samples were milled separately to pass through 1mm sieve. The milled samples were stored in plastic bags before they were analyzed.

RESULTS AND DISCUSSION

Chemical Composition

The dry matter content of the selected browse plants for wet and dry seasons were presented on (Table 1 and 2). The values ranged between 94.99% to 97.34% and 89.72% to 97.77% with the mean value of 96.42% and 94.55% in wet season and dry season, respectively. The crude protein content also ranged between 9.44% to 23. 56% and 9.21% to 18.87% with mean value of 16.99% and 15.27% in wet and dry seasons, respectively. These values were higher than the values (13.85% to 16.65%) reported by Njidda (2010) on some browse plants in the North-Eastern part

of Nigeria. Thus, the values are above 7% crude protein requirement for ruminant which will provide ammonia required by rumen microorganisms to support optimum microbial activity as reported by Njidda (2010). The ash contents ranged between 4.23% to 7.99% with a mean of 5.98% in the wet season and 3.49% to 6.28% and a mean of 4.84|% in the dry season. In a similar study, Njidda (2010) reported ash content (8% to 18%) with the mean value of 14% which are higher than the values obtained in this study. The ether extract content obtained in this study ranged from 0.94% to 7.96% with the mean value of 4.18% in the wet season and 1.03% to 7.66% with a mean of 4.04% in the dry season. The crude fiber content ranged from 26.54% to 38.22% and a mean value of 31.21%. Dupe *et al.* (2015) reported a crude fiber content of some browse plants in southern Guinea savannah as 13.87% to 39.36%. Dupe *et al.* (2015) observed that the differences in the composition of the browse plants may be attributed to the soil type the plant components (pod, leaf, stem) and season at which the plants were harvested.

Mineral Elements

Although minerals are needed in a very small quantity as dietary nutrients, they are very important in camel nutrition programs for proper animal function, such as bone, joint and ligament development, immune function, muscle contractions and nervous system functions, growth and reproductive performance (Al-juboori and Jiji, 2012). The mineral content obtained in this study will be compared with mineral requirements of camel in subsequent studies.

Table 1: Nutritional Composition of some Selected Forage Species fed to Camels during wet season

Forage species	%DM	%ASH	%EE	%CF	%CP	%NDF	%ADF	%N
Dalbergia sisso	96.52	5.49	5.73	36.79	13.56	59.07	48.91	2.17
Khaya senegalensis	96.66	7.95	7.96	29.79	9.44	56.92	43.97	1.51
Ziziphus Mauritania	94.99	4.56	3.79	30.35	17.69	45.02	30.96	2.85
Gmelina arborea	95.92	7.99	6.87	26.54	15.06	56.43	45.58	2.41
Lephatadenia hastala	96.80	6.54	2.55	38.22	17.75	64.60	45.00	2.84
Ziziphus var-spinachristi	96.58	5.43	4.19	26.72	18.81	56.16	48.76	3.01
Acacia hoskii	96.56	4.23	1.39	32.14	23.56	44.92	32.64	3.77
Dichrostachys cineria	97.34	5.62	0.94	29.13	20.06	54.01	47.74	3.21

Key: DM= Dry matter, EE= Ether extract, CF= Crude fiber, CP= Crude protein, NDF= Neutral detergent fiber, ADF= Acid detergent fiber, N= Nitrogen

Table 2: Nutritional Composition of some Selected Forage Species fed to camels during dry season

Forage species	%DM	%ASH	%EE	%CF	%CP	%NDF	%ADF	%N
Dalbergia sisso	93.42	3.49	4.53	26.79	13.36	52.04	44.89	2.11
Khaya senegalensis	95.34	5.85	6.67	24.92	9.21	50.73	41.57	1.31
Ziziphus Mauritania	91.67	4.26	3.22	29.51	14.87	43.04	28.56	2.55
Gmelina arborea	89.72	6.28	7.66	24.45	14.03	51.23	48.45	2.51
Lephatadenia hastala	96.38	6.14	2.25	36.11	17.35	59.40	43.33	2.72
Ziziphus var-spinachristi	94.76	4.20	4.12	22.63	17.11	53.22	45.09	2.81
Acacia hoskii	96.42	4.02	1.24	31.06	18.87	42.72	29.34	3.64
Dichrostachys cineria	95.43	5.52	1.03	27.33	18.62	51.11	40.83	3.16
Acacia albida	97.77	3.84	5.68	36.40	14.00			2.24

Key: DM= Dry matter, EE= Ether extract, CF= Crude fiber, CP= Crude protein, NDF= Neutral detergent fiber, ADF= Acid detergent fiber, N= Nitrogen

Table 3: Minerals content of some Selected Forage Species fed to Camels during wet and dry seasons (g/100gDM).

Forage species	Wet season	Dry season	Wet season	Dry season	Wet season	Dry season	Wet season	Dry season
	Ca	Ca	Mg	Mg	K	K	P	P
Dalbergia sisso	1.04	0.68	0.24	0.56	0.88	1.22	0.10	0.20
Khaya senegalensis	1.02	0.46	0.25	0.29	0.62	1.67	0.21	0.13
Faidherbia albida			0.41	0.51	0.23	1.23	0.36	0.22
Gmelina arborea	0.62	0.34	0.38	0.42	0.20	0.79	0.21	0.82
Lephatadenia hastala	0.56	0.64	0.23	0.53	0.42	0.97	0.33	0.38
Ziziphus var-spinachristi	1.43	0.82	0.24	0.33	0.22	0.93	0.25	0.33
Acacia hoskii	0.60	0.88	0.37	0.34	0.31	0.98	0.11	0.22
Dichrostachys cineria	0.64	0.93	0.36	0.32	0.25	1.33	0.51	0.39

Ca= Calcium, Mg= Magnesium, K= Potassium, P= Phosphorus

CONCLUSION AND RECOMMENDATION

Generally, the chemical composition of the forage species available for camels in the study area at the time of sampling were within the maintenance and production level for camels and therefore expected to have a positive impact on the dry matter intake, dry matter digestibility and

productive performance. Further studies should be conducted on digestibility and mineral requirement of camel considering the most preferred forages by camels in this study.

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