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Performance of Grazing Dromedary Camels (*Camelus dromedarius*) Supplemented with Concentrate Diet Based on Percentage Body Weight.

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Abstract

The study was conducted to determine the performance of dromedary camels supplemented with a concentrate diet based on their percentage body weight. Nine (9) dromedary camels with an average body weight of 420±3 kg was used for the experiment. The camels were selected, weighed and randomly assigned into three (3) dietary groups consisting of three (3) camels per group in a completely randomized design (CRD). The camels were allowed to graze and supplemented with a diet based on 1, 1.5 and 2% of their body weight and the experiment lasted for 90 days. Data collected on weight gain, hematology and serum biochemistry of the camels were subjected to analysis of variance (ANOVA) using SAS software package while significant differences among means were compared using the Duncan Multiple Range Test. Camels on 1 and 1.5% body weight supplements recorded a higher (P<0.05) weight gain (37.33 and 43.00 kg, respectively) compared to those supplemented with a diet based on 2% (21.50 kg) of their body weight. The average body weight gain was also higher (P<0.05) in camel supplemented with a diet based on 1 and 1.5% (0.41 and 0.48 kg/day, respectively) of their body weight followed by those on 2% (0.24 kg/day) body weight. However, camels supplemented with diet based on 1% body weight have a better (5.46) feed conversion ratio than those on 1.5 (7.41) and 2% (19.11) body weight. Furthermore, camels on a 1.5% body weight supplement recorded a higher (P<0.05) red blood cells than those supplemented with a diet based on 1 and 2% (4.13 $\times 10^{12}$/L) body weight. Similarly, camels on 1.5% body weight supplement recorded a higher (P<0.05) total protein (61.00 g/L), albumin (37.00 g/L) and globulin (24.00 g/L) concentration in the blood compared to those supplemented with 1 and 2% of their body weight. There were no significant differences in calcium, sodium, chlorine and potassium concentration in the blood. It was concluded that camels supplemented with a diet based on 1 and 1.5% body weight performed better than those on 2% body weight supplement. Hence, it is recommended that farmers should give supplementary feed based on 1 and 1.5% of their body weight to grazing camels for efficient feed utilization as well as better growth performance.

Keywords: Camel, Concentrate diet, Percentage body weight

Description of problems

Dromedary camels were first domesticated centuries by the nomads who used them for multiple purposes, such as draught (physical labour or transport), production of milk and meat, clothing (wool, skin, and hairs) and also for racing and tourism (1). In Nigeria today, the role of dromedary camel as a sustainable livestock production system is becoming more important, hence the need to improve the livestock sectors, to meet the high demand for beef in the country. Dromedary camels are said to be an excellent candidate species for production because of their unique physiology and tolerance to ecosystems' climatic fluctuations (2). However, the dromedary camel's preferred habitat is desert conditions characterized by a long dry season and a short rainy season. The introduction of camels into other climates has proven unsuccessful as they are sensitive to cold and humidity (3). Also, camels' milk and meat are highly nutritional, sometimes they are deemed better than cattle milk and beef as proved by several researchers. For instance, (4), concluded in their research that camel' meat contains less fat than lamb or beef. Also, its protein quality assessed by the index of essential amino acids in meat is the highest among red meat (5). Camel's milk is said to contain between 3 to 10 times more vitamin C than cow's milk and also, it contains lower b-casein and no b-lactoglobulin, resulting in its hypo-allergic properties (6; 7). Despite the uniqueness and high contribution potentials of dromedary camels to food security, comparatively less attention has been put on camels compared to other livestock species (8).

In animal production generally, feed accounts for a major proportion of the entire cost of production. In intensive or semi-intensive camel production, the reduction in the feeding cost by replacing conventional forages (i.e., alfalfa hay) with Isonitrogenous and Isocaloric feeds, e.g., *Alhagi maurorum* (camel thorn), might guarantee the profitability of the system, as it is low in cost and readily available. Similarly, with the current global warming trend, desert encroachment, drought and low rainfall, the camel stands to be one of the animals that can withstand these adverse environmental conditions (9). Despite the promising prospects of camel rearing and its positive effects on boosting food security, very little interest has been shown in its nutritional practices. The seasonal variation in rainfall influences both the quantity and quality of pasture, affecting the nutritional status and the blood constituents of camels (10). Therefore, the broad objective of the study was to evaluate the effect of feed supplements based on percentage body weight on the performance of grazing dromedary camels

Materials and methods

Experimental Location

The experiment was conducted at the Experimental Pens of Equine and Camel Research Program, National Animal

Production Research Institute (NAPRI), Ahmadu Bello University, Shika, Kaduna State. Shika falls within latitudes 11o 8' 19.56" N and longitudes 7o 45' 51.22" E, with an altitude of 640m above sea level (11). Shika is located within the Northern Guinea Savannah Ecological Zone, with an average annual rainfall of 1,100mm which starts in late April/early May and ends in mid-October (12).

Management of Animal and Experimental Design

A total of nine (9) grazing dromedary camels with an average weight of 420±3kg, were used for the study. These camels were selected, weighed, and randomly, assigned into three (3) groups consisting of three (3) camels per group in a completely randomized Design. Before the commencement of the experiment, the animals were dewormed orally with Sambezole(R) suspension and sprayed with Amitrix(R) against internal and external parasites, respectively as reported by (13). The animals were allowed to go for grazing from 8:00 am to 5:00 pm and then supplemented with diet based on 1, 1.5, and 2% of their body weight. This experiment lasted for 90 days.

Experimental Diet

This diet was formulated with ingredients such as maize, maize offal, rice offal, cotton seed cake, bone meal, salt, and premix obtained from the Feed and Feeding Unit, National Animal Production Research Institute, Shika–Zaria. The gross composition of the experimental diets is presented in Table 1

Table 1: Gross composition of the experimental diet

Feed ingredients	Percentage
Maize	24
Maize offal	31
Rice offal	22
Cotton seed cake	17
Bone meal	3.5
Salt	1.5
Premix	1.0
Total	**100**
Proximate analysis	
Dry matter (%)	93.21
Crude Protein	14
Crude fiber (%)	23.33
Ether extract (%)	5.40
Metabolizing Energy (Kcal/Kg)	2509.10

Blood Sample Collection and Evaluation

Seven (7) mills of blood samples were collected from each camel through the jugular vein using 10 ml plastic disposable syringes. Blood samples collected were placed into two separate sets of Vacutainer tubes; in which two (2) ml were placed into an EDTA (Ethylene Diamine Tetra Acetic Acid) bottle while the remaining five (5) ml were placed into a plain bottle.

Laboratory Analysis of Diets

A Sample of the formulated diet was taken to the National Animal Production Research Institute, central laboratory for proximate analysis. The chemical composition of the diet used for the study has 93.21% dry matter, 14% crude protein, 23.33% crude fiber, 5.40% ether extract, and 2509.10 kcal Metabolizable energy.

Data Collection

Growth Performance

Feed intake was recorded throughout the experimental period, lasting 90 days. The supplementary feed was given to camels based on 1, 1.5, and 2% of their body weight and the refusal was collected and weighed using a digital weighing scale before releasing the animals for grazing. The animals were weighed at the beginning of the study and fortnightly throughout the experimental period using a walkthrough (1,000 kg capacity) weighing scale. The quantity of feed was adjusted according to the changes in the body weight of the animals. Weight gain was computed by subtracting the initial weight of the animals from the final weight. The average daily weight gain of the animals was calculated by dividing the weight of the animal by the number of days of the feeding trial as reported by (14). The feed conversion ratio was calculated based on the unit of feed consumed to a unit of weight gain.

Hematology and serum biochemical profile of the camels

The plain blood samples were allowed to clot by leaving them undisturbed at room temperature for 30 minutes. Clotted blood was centrifuged at 1000-2000 rmp for 10 minutes in a refrigerated centrifuge (15). The serum was analyzed Spectro photochemically for sodium, calcium, potassium, chlorine, total protein, albumin, and globulin (16). Although, the globulin was calculated by subtracting the concentration of albumin from the concentration of total protein as described by (17) and (16). The anti-coagulated blood samples were used immediately for the determination of Erythrocyte (RBC) count, Packed Cell Volume (PCV), Hemoglobin (Hb) concentration and Total Leukocyte (WBC) count as described by (18) at Ahmadu Bello Teaching Hospital Shika – Zaria.

Data Analysis

Data generated on weight gain, hematology, and serum biochemistry were subjected to analysis of variance (ANOVA) using SAS software (19) while significance differences ($P<0.l05$) among means were compared using (20).

Results and discussion

Performance of grazing dromedary camels supplemented with concentrate diet based on percentage body weight

The result for the growth performance of dromedary camels supplemented with diet based on percentage body weight is presented in Table 2. The result obtained

showed that the total weight gain recorded by the camels ranged from 21.50 to 43.00 kg. The range of daily weight gain and feed conversion ratio of the camels used in the study were 0.24 to 0.48 kg/day and 5.46 to 19.11, respectively. There were significant (P<0.05) differences in total and daily weight gain of the animals with those supplemented with a diet based on 1.5% of their body weight having a significantly higher (P<0.05) total and daily weight compared supplemented with 1 and 2% (43.00 kg and 0.48 kg/day, respectively) of their body weight. The lower weight recorded by those supplemented with a diet based on 2% of their body weight might be associated with the frequency of feeding. The higher the frequency of feeding decreases the nutrient produce in the rumen following digestion of the diet. It's an indication of low digestion which might in turn leads to lower weight gain recorded by the camels. Similarly, camels supplemented with a diet based on 1 and 1.5% body weight had a better feed conversion ratio compared to those on a 2% body weight supplement, which might also be associated with the quantity of the feed given to camels as a lower feed conversion ratio indicates higher efficiency.

The highest (P<0.05) daily weight gains recorded in this study on camels supplemented with a diet based on 1 and 1.5% (0.41 g/day and 0.48 kg/day, respectively) body weight were lower than the values (0.74 kg/day) reported by (21) during a 90-day feeding trial of Saudi camel calve fed 75% concentrate and 25% hay. A study on feedlot performance of dromedary camels fed different dietary regimes reported by (22) recorded an average daily gain of 0.81, 0.59, and 0.67 kg in dromedary camels fed kenana pellets, cotton seed cake and groundnut cake-based diets, respectively. These values were higher than the values obtained in this study. Similarly, the daily weight gain range (0.24 to 0.48 kg) recorded in this study were lower than the values (0.72-0.86 kg/day) reported by (23). These differences in weight gain might be attributed to differences in diet, age, management, level of physical activities and or environment, etc.

Table 2: Effect of graded levels of concentrate diet on growth performance of grazing dromedary camels

	Concentrate diet based on % body weight			
Parameters (kg)	**1**	**1.5**	**2**	**SEM**
Initial weight	417.00	420.33	418.00	13.77
Final weight	454.33^{a}	463.33^{a}	439.50^{b}	13.13
Total weight gain	37.33^{b}	43.00^{a}	21.50^{c}	2.03
DWG	0.41^{b}	0.48^{a}	0.24^{c}	0.03
TCI	204.00^{c}	318.67^{b}	410.90^{a}	25.16
ACI	2.27^{c}	3.54^{b}	4.57^{a}	0.28
FCR	5.46^{a}	7.41^{b}	19.11^{c}	0.50

Key: $^{a, b, c}$ Means along the same row bearing different superscripts differ significantly (P< 0.05). DWG= Daily weight gain; TCI= To tal concentrate intake; ACI= Average concentrate intake; FCR= Feed conversion ratio; SEM=Standard error of mean

The haematological parameters of grazing dromedary camels supplemented with a concentrate diet based on percentage body weight

The haematological parameters of grazing dromedary camels supplemented with diet based on percentage body weight are presented in Table 3. The haematological components recorded in this study ranged from 3.14 to 4.13 ($\times 10^{12}$/L), 9.36 to 9.76 ($\times 10^{9}$/L), 30.30 to 37.50 (g/dL), and 10.10 to 12.50 (g/dl) for red blood cell (RBC), white blood cell (WBC), parked cell volume (PCV) and hemoglobin, respectively. There were significant differences ($P<0.05$) in RBC recorded in this study. Camels on 1.5% body weight feed supplement had the higher ($P<0.05$) RBC (4.13 $\times 10^{12}$/L) compared to those on 1 and 2% body weight supplement. The differences observed might be attributed to the variations in the rate of metabolism in individual camels. However, the RBC value (3.14 to 4.13 $\times 10^{12}$/L) recorded in this study was higher than the value (3.03±0.08 $\times 10^{12}$/L) reported by (24), although, lower than the value (15.05±2.10 $\times 10^{12}$/L) reported by (25). There were no significant ($P>0.05$) differences in WBC, PCV and hemoglobin concentration recorded in this study.

Table 3: Effect of graded levels of concentrate diets on hematological parameters of grazing dromedary camels

	Concentrate diet based on % body weight			
Parameters	**1**	**1.5**	**2**	**SEM**
RBC (10^{12}/l)	3.52^{b}	4.13^{a}	3.14^{c}	0.06
WBC (10^{9}/l)	9.71	9.36	9.76	0.44^{NS}
PCV (g/dl)	35.25	36.35	35.30	1.55^{NS}
Hb (g/dl)	11.83	12.50	12.10	1.87^{NS}

Key: $^{a, b, c}$ Means along the same row bearing different superscripts differ significantly ($P< 0.05$), RBC= red blood cells; WBC= white blood cells; PCV= Parked cells volume; Hb = Hemoglobin; SEM= Standard error of the mean;

Serum biochemical profile of grazing dromedary camels supplemented with concentrate diet based on percentage body weight

The serum constituents of grazing dromedary camels supplemented with diet based on percentage body weight are presented in Table 4. The total protein (TP), albumin (ALB), and globulin (GLO) concentrations recorded in this study ranged from 49.00–61.00 g/L, 31.33–38.00 g/L and 17.67–24.00 (g/L), respectively. There were significant ($P<0.05$) differences in TP across the groups. Camels supplemented with concentrate feed based on 1.5% body weight recorded the higher (61.00 g/L) TP, followed by those on 2 (57.33 g/L) and 1% (49.00 g/L) body weight feed supplement. The values of TP (49.00-61.00 g/L) obtained in this study were slightly similar to the values (57±2 and 51±2 g/L) reported by (30) in their study on weaned camel calves of six and nine months of age, respectively. Similarly, (31) reported a TP of 62.6±6 g/L, slightly higher than the value recorded in this study. However, (26) and (32) reported a 96.3 and 71±3 g/L TP,

respectively. These values were higher than the values obtained in this study. Differences in the TP of animals might be attributed to differences in the management system, diet, age and ecological zones. No significant ($P>0.05$) differences in albumin concentration among the camels across the groups existed. The higher ($P<0.05$) globulin concentrations were recorded in camels on 1.5% (24.00 g/L) feed supplement which is higher compared to the values (4.59-5.50 g/dL and 2.7-3.7 g/L) reported by (26) and (33), respectively. However, the values obtained were within the normal levels reported by (32). There were no significant differences in calcium, sodium, chloride and potassium levels across the groups

Table 4: Effect of graded levels of concentrate diets on serum biochemical parameters of grazing dromedary camels

	Concentrate diet based on % body weight			
Parameters	**1**	**1.5**	**2**	**SEM**
Total protein (g/l)	49.00^{c}	61.00^{a}	57.33^{b}	1.03
Albumin (g/l)	31.33	37.00	38.00	4.34^{NS}
Globulin (g/l)	17.67^{b}	24.00^{a}	19.33^{b}	1.97
Calcium (mmol/l)	1.64^{c}	1.74^{b}	2.11^{a}	0.03^{NS}
Sodium (mmol/l)	154.00	152.63	153.33	1.29^{NS}
Chlorine (mmol/l)	109.00	108.00	108.00	1.17^{NS}
Potassium(mmol/l)	4.70	5.83	5.90	0.83^{NS}

Key: $^{a, b, c}$ Means along the same row bearing different superscripts differ significantly ($P< 0.05$), SEM = Standard error of the mean;

Conclusion and recommendation

Based on the results obtained it can be concluded that Camels supplemented with a diet based on 1 and 1.5% body weight performed better (100%) than those on 2% (50%) body weight supplement.

It is therefore recommended that; camel farmers should offer supplementary diet to their grazing camels base on 1 and 1.5% of their body weight for efficient feed utilization and better growth performance.

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