

SERUM ELECTROLYTES AND LIVER ENZYMES OF RED SOKOTO BUCK KIDS SUPPLEMENTED WITH SELECTED BROWSE PODS IN A SEMI-ARID ENVIRONMENT

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ABSTRACT

The study was conducted to evaluate the influence of supplementation of four selected browse pods on serum electrolytes and liver enzymes of twenty (20) growing Red Sokoto buck kids (GRSBK). The animals were randomly allocated to five dietary treatments: T1 (control), T2 (*Faidherbia albida*), T3 (*Vachellia tortilis*), T4 (*Acacia nilotica*) and T5 (*Piliostigma reticulatum*) in a completely randomized design (CRD) for 12 weeks (84 days). The results revealed no significant differences ($P>0.05$) across the treatments for all the serum electrolytes concentrations analyzed such as Chloride (Cl), Potassium (K) and Sodium (Na). Similarly, no significant differences ($P>0.05$) were recorded on the liver enzymes such as Alkaline Phosphate (ALP), Alanine Aminotransferase (ALT) and Aspartate aminotransferase (AST). The study, therefore, concluded that the browse pods are fit and safe to be used as dry season supplements for growing red sokoto buck kids to curb seasonal fluctuations in productivity.

Keywords: Buck kids, Browse pods, Serum electrolytes, Semi-Arid zone.

INTRODUCTION

Goats are reared traditionally at subsistence level in Nigeria and in most sub-Saharan countries. They often depend largely on the exploitation of natural rangelands, containing a variety of grasses and vegetation dominated by browse species for their own nourishment. However, early in the dry season, the feed quality of these rangelands deteriorates rapidly, followed by a reduction in quantity, as a result of high grazing pressure (Sikosana *et al.*, 2014). Serum electrolytes concentrations and liver enzymes indices serve as an important indicator of physiological state and accurate reflection of health status of animals, predisposed by, stress, nutrition and environmental factors (Kurechiya *et al.*, 2021). Therefore, information obtained from the blood examination could help determine the extent of tissue and organ damage, the response of defense mechanism of the animal and aid in proper clinical predictions of the possible disorder (Njidda *et al.*, 2014). In line with the above, this study was designed to evaluate the serum electrolytes and liver enzymes of growing Red Sokoto buck kids supplemented with selected browse pods in a semi-arid environment

MATERIALS AND METHODS

Experimental Location

The research was conducted at the Teaching and Research Farm of the Department of Animal Science, Federal University Dutse, Jigawa State, Nigeria. Dutse is located between latitude 11° 45' 22.25" and longitudes 9° 20' 20.26"E, at an altitude of 485 m above sea level. The state is situated within the Sudan Savannah vegetation zone, but there are traces of Guinea savannah in the southern region of the State. (Olofin, 2008).

Experimental Materials and Processing

Four different browse pods were selected and sourced from the range lands in Jigawa and Yobe states, these include; *Faidherbia albida* pods, *Vachellia albida* pods, *Acacia nilotica* pods and *Piliostigma reticulatum* pods. The pods were filled in 50 kg jute bags and conveyed to the laboratory of the Department of Animal Science, Federal University Dutse, where they were sun dried and crushed for proximate analysis.

Proximate Composition

The determination of dry matter, crude protein, crude fiber, ether extract, nitrogen free extract and ash of the browse pods and faecal samples were carried out according to the methods of AOAC (2000). While, Fiber fraction: acid detergent fiber, nitrogen detergent fiber, lignin and hemicellulose were determined according to the procedure put forward by Van soest *et al.* (1991).

Experimental Animals and Management

A total of 20 growing Red Sokoto buck kids between 6-8 month weighing 10 ± 1.5 kg were obtained from local markets in Kiyawa and Dutse local governments of Jigawa state, (Shuwarin, Hammayayi and Sakwaya markets) for the study. The animals received prophylactic treatment with Oxytetracycline, (5%) and Multivitamins against bacterial related infections and to boost appetite, respectively. The animals were also dewormed using Broad-spectrum anthelmintic (1 ml per 5kg), while Ecto-parasites were controlled using Ivermectin injection (*Ivomec* 1%). The Kids were housed in an individual pen 1.25 m² in a well-ventilated room with sloppy concrete floor.

Experimental Design and Treatment

Twenty (20) growing red Sokoto kids were divided into five groups in a Completely Randomized Design (CRD). Animals in treatment one (control) were supplemented with wheat offal, while T2, T3, T4 and T5 were supplemented with *Faidherbia albida*, *vachellia tortilis*, *Acacia nilotica* and *Piliostigma reticulatum* pods, respectively. Crush sorghum stalk was given to the experimental animals as basal diet *ad libitum* between 10:00 am and 12:00 pm daily. The supplements: 200 g/day/head were offered to the animals at 8:00-9:30 am daily as protein supplement for 12 weeks. Fresh drinking water was also supplied to the kids *ad libitum* throughout the period of the experiment (12 weeks).

Blood Sampling and Analysis

Blood samples were collected from 3 Animal per treatment. About 10 ml of blood samples were drawn through the jugular vein of each kid using a 10 milliliters disposable syringe and 23 G needle between 07:00 and 08:00 hours in the morning. The blood sample was deposited into a plain container and allowed to clot at room temperature within three hrs of collection so as to harvest the serum separately. The samples were placed in a cold box containing ice packs and transported to the laboratory for analysis.

Serum Electrolytes

Serum electrolytes concentration (K and Na) was analyzed using plasma atomic emission spectrophotometer and plasma chloride (Cl) concentration was analyzed by the means of chloride meter.

Data Analysis

The data analyses were run using the Statistical Analysis System (SAS) 9.4 Version (SAS Institute, Cary, NC, USA). The statistical model used is: $Y_{ij} = \mu + T_i + e_{ij}$, where Y_{ij} is the mean of the j th observation of the i th treatment; μ is the sample mean; T_i is the effect of the i th treatment, and e_{ij} is the effect of the error. The data were analyzed by the General Linear Model (GLM) procedure of SAS and Duncan Multiple Range Test was used to separate means (Obi, 1990). The significance of the statistical difference between the treatments was established at ($p < 0.05$) level.

RESULTS AND DISCUSSION

Proximate Compositions of Selected Browse Pods in Semi- Arid Environment.

The proximate composition of the selected browse pods in semi- arid environment is presented in table 1. The results revealed significant differences ($P < 0.05$) in all the parameters analyzed. The DM content varied in browse pods such as *Vachellia tortilis* and *Acacia nilotica* indicates their potential for use in dry seasons when forage availability is limited (Olafadehan *et al.*, 2014). High Crude protein (CP) levels in *Piliostigma reticulatum* highlight its potential as a high-protein supplement for ruminants. This aligns with findings by Khan *et al.* (2021), who reported that browse species with higher CP content can enhance microbial activity in the rumen and improve livestock productivity. The ash content indicates the mineral composition, which is essential for the physiological functions of livestock (Adegbeye *et al.*, 2020). High Neutral detergent fiber (NDF) content in *Piliostigma reticulatum* indicates lower potential intake due to bulkiness, while lower NDF in *Faidherbia albida* suggests higher palatability and digestibility (Van Soest, 1994).

Table 1 Proximate Compositions and Fibre Fractions of the Selected Browse Pods in Semi- Arid Environments.

P (%)	Browse Pods				P- Value
	<i>Faidherbia Albida</i>	<i>Vachellia Tortilis</i>	<i>Acacia Nilotica</i>	<i>Piliostigma Reticulatum</i>	
DM	87.79 ± 3.46^b	91.60 ± 0.01^a	91.09 ± 0.03^{ab}	90.83 ± 0.04^{ab}	0.0098
CP	18.18 ± 0.02^b	16.33 ± 0.08^c	15.46 ± 0.05^d	24.86 ± 0.01^a	0.0001
ASH	6.65 ± 0.03^a	6.52 ± 0.02^b	5.83 ± 0.01^c	4.89 ± 0.01^d	0.0001
EE	9.67 ± 0.02^a	3.38 ± 0.01^c	3.89 ± 0.02^b	3.15 ± 0.02^d	0.0002
CF	10.41 ± 0.01^d	17.17 ± 0.01^c	18.18 ± 0.03^b	21.70 ± 0.04^a	0.0001
NFE	44.88 ± 0.09^c	48.19 ± 0.07^a	47.70 ± 0.07^b	36.21 ± 0.10^d	0.0001
NDF	9.73 ± 0.00^d	16.05 ± 0.00^c	16.99 ± 0.01^b	23.86 ± 0.02^a	0.0003
ADF	7.96 ± 0.00^d	13.13 ± 0.00^c	13.90 ± 0.01^b	19.52 ± 0.01^a	0.0001
ADL	4.57 ± 0.00^d	7.54 ± 0.00^c	7.97 ± 0.00^b	11.20 ± 0.00^a	0.0001

Means on the same row with different superscripts are significantly ($P < 0.05$) different. P-Parameters, DM- dry matter, CP-crude protein, EE- ether extract, CF- crude fibre, NFE- nitrogen free extract, NDF- nitrogen detergent fibre, ADF- acid detergent fibre, ADL- acid detergent lignin.

Serum Electrolytes of Growing Red Sokoto Buck Kids

Table 2 shows the Serum electrolytes profile of Growing Red Sokoto Buck Kids supplemented with selected browse pods in a Semi-Arid environment. The result showed no significant differences ($P > 0.05$) across the treatment groups on chloride, potassium and sodium. The values of chloride were in agreement with the values (106 ± 2.33 mmol/l) reported by Njidda *et al.* (2013) for Red Sokoto Buck Kids. Similarly, the result is in line with the findings of Olafadehan *et al.* (2017) who recorded (97.8-99.7 mmol/l) values of chloride for red sokoto goats fed urea treated ensiled cowpea husk-based diets. However, the values were lower than those found by Abdurrahman *et al.* (2015) who reported (120.00-153.25 mmol/l) for red sokoto bucks fed diet with graded levels of *Piliostigma reticulatum* (dc.). This may be due to differences in age of the animal used and season during which the experiments were conducted.

The potassium (K) concentration was within the normal range of (5.2-5.3 mmol/l) reported by Bhat *et al.* (2011) for buck kids. Similarly, the values were comparable to (4.39-5.73 mmol/l) reported by Njidda and Enoch (2020) for Red Sokoto Bucks Fed *Gmelina arborea* leaf meal as a substitute for soya bean meal. The results of sodium (Na) were comparable with the values (124.00-146.00 mmol/l) found by Anya *et al.* (2018). Potassium and sodium ion are known to regulate osmotic pressure, maintain membrane potential, acid base equilibrium and nerve impulse transmission in body system. Therefore, low concentrations of K^+ and Na^+ in the system could result in alteration of gastric secretions, sluggishness, kidney disease and low nerve response (Muhammad, 2014).

The values of alkaline phosphate (ALP), alanine aminotransferase, (ALT) and aspartate aminotransferase (AST) recorded during this finding ranged from 103-148 μ /l, 19.50-35.50 μ /l and 19.00-33.5 μ /l respectively. Therefore, all the liver enzymes were within the normal range. Normal liver enzymes (ALT, AST and ALP) values among the experimental animals imply no damage to the liver and kidney and no adverse effect on the functions of organs associated with blood metabolism (Vakili *et al.*, 2013).

Table 2 Serum Electrolytes and Liver Enzymes of Growing Red Sokoto Buck Kids Supplemented with Selected Browse Pods in a Semi-Arid Environment

Parameters	Treatments					P-Value
	Wheat offal	<i>Faidherbia albida</i>	<i>Vachellia tortilis</i>	<i>Acacia Senegal</i>	<i>Piliostigma Reticulatum</i>	
Chloride (mmol/l)	94.50 $\pm$ 1.5	100.00 $\pm$ 0.0	91.00 $\pm$ 2.0	101.00 $\pm$ 1.0	112.00 $\pm$ 6.0	0.250
Potassium (mmol/l)	4.65 $\pm$ 0.3	5.30 $\pm$ 0.6	4.25 $\pm$ 0.3	4.60 $\pm$ 0.7	4.05 $\pm$ 0.3	0.491
Sodium (mmol/l)	135.00 $\pm$ 1.0	144.00 $\pm$ 1.0	144.50 $\pm$ 5.4	146.56 $\pm$ 3.5	146.56 $\pm$ 1.5	0.177
ALP (μ /l)	106.50 $\pm$ 8.5	148.00 $\pm$ 35.0	103.50 $\pm$ 0.5	120.50 $\pm$ 0.5	147.00 $\pm$ 15.0	0.327
ALT (μ /l)	20.00 $\pm$ 3.0	22.00 $\pm$ 11.0	19.50 $\pm$ 1.5	22.50 $\pm$ 3.5	35.50 $\pm$ 1.5	0.332
AST (μ /l)	19.50 $\pm$ 8.5	19.00 $\pm$ 1.0	23.50 $\pm$ 9.5	33.5 $\pm$ 4.5	23.50 $\pm$ 4.5	0.558

T₁ = Wheat offal, T₂ = *Faidherbia albida*, T₃ = *Vachellia tortilis*, T₄ = *Acacia nilotica*, T₅ = *Piliostigma reticulatum*

CONCLUSION

In conclusion, the selected browse pods (*Faidherbia albida*, *vachellia tortilis*, *Acacia nilotica* and *Piliostigma reticulatum* pods,) supplemented to the Growing Red Sokoto Buck Kids in this study revealed no adverse effect on the serum electrolytes and liver enzymes of the experimental animals and the values of the parameters observed are comparable with the values obtained in previous findings. Therefore, the browse pods are safe to be used as dry season supplements for Growing Red Sokoto buck kids to curb seasonal fluctuations in productivity.

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