

SERUM BIOCHEMICAL INDICES IN RED SOKOTO GOATS FED WOLLY FINGER (*Digitaria smutsii*) HAY SUPPLEMENTED WITH CASSAVA PEEL MEAL AND DIFFERENT NITROGEN SOURCES

¹Kperun, T. N., ²Otaru, S. M. and ³Yashim, S. M.

¹Department of Animal Science, University of Calabar, Calabar

²Department of Small Ruminant Research Programme, National Animal Production Research Institute, Zaria

³Department of Animal Science, Ahmadu Bello University, Zaria

Correspondence: kperunthaddeus@gmail.com: +2348067567264

ABSTRACT

This study was carried out to investigate the serum biochemical parameters in growing Red Sokoto bucks fed a basal diet of *Digitaria smutsii* hay supplemented with concentrate containing cassava peel meal and different nitrogen sources. A total of 28 Red Sokoto bucks with an average liveweight of 12.55 ± 1.25 kg were randomly assigned to four (4) dietary treatments of 7 animals per treatment in a Completely Randomised Design (CRD). The concentrate diets contained cottonseed cake (CON), Groundnut haulms (GHT), Poultry litter (PLT) and Brewers dried grains (BDGT) as nitrogen sources. The animals were kept in individual pens with a concentrate diet fed at 1.5% of their body weight, while a basal diet of *Digitaria smutsii* hay and water was offered *ad libitum* 90 days. Four mL of blood samples was collected from four randomly selected animals in each treatment at the beginning and end of the growth trial for determination of serum biochemical indices: Total protein, Blood urea nitrogen, blood glucose, creatinine, Aspartate aminotransferase (AST), Alanine aminotransferase (ALT) and alkaline phosphatase (ALP). The result showed that total protein did not differ ($p > 0.05$) statistically at the beginning but showed significant ($p > 0.05$) differences at the end of the experiment. No statistical ($p > 0.05$) difference was observed in creatinine, blood glucose level, blood urea nitrogen and liver function enzymes either at the beginning or end of the experiment. The parameters measured were within the normal physiological values. It can be concluded that the test ingredients did not have detrimental effects on the animals.

Keywords: Red Sokoto goats, Serum, Wolly finger grass, Nitrogen sources, Cassava peel meal

DESCRIPTION OF PROBLEM

Nutritional management of goats has a great impact on their health status and production performance, with protein supplementation being a critical factor in tropical and subtropical regions where basal forage quality is often low (1). Supplementation with conventional protein sources usually leads to a high cost of production, which has necessitated the utilisation of non-conventional sources to reduce the total cost of production (3). Serum biochemistry in animals is a crucial diagnostic tool that helps to understand the physiological and pathological processes occurring in an animal's body (3). Therefore, investigating the serum biochemical indices and liver function enzymes of goats fed *Digitaria smutsii* hay supplemented with various nitrogen sources will provide insights into the metabolic adaptations and health implications of these

dietary modifications. Red Sokoto goats are the most populous breed of goats in Nigeria and constitute about 60% of the Nigerian goat population, and are predominantly found in arid and semi-arid regions of the Northern Guinea savannah zone (4).

MATERIALS AND METHODS

Experimental site

The research was conducted at the Experimental Unit of Small Ruminant Research Programme of National Animal Production Research Institute (NAPRI), Shika- Zaria. Shika is located in the Northern Guinea Savannah on latitude $11^{\circ} 12'N$, longitude $7^{\circ} 33'E$, altitude 610m above sea level (5).

Sourcing and processing of experimental materials

Fresh Cassava peels were collected from local “Garri” and “Akpu” processing areas in Narayi, Kaduna South Local Government Area, Kaduna State. The peels were sundried for 5 days and milled before being incorporated into the concentrate diet. *Digitaria smutsii* hay was obtained from the Forage Production Unit of NAPRI. Groundnut haulms were purchased from Dumbi settlement situated along Zaria to Kaduna expressway. It was milled using a 3 mm sieve before being incorporated in the diet. Poultry litter was sourced from the Poultry Research Programme of NAPRI. The poultry litter (Broiler litter) was sun-dried for 5 days with the extraneous materials removed, then stored in a cool, dry place until required for incorporation in the diet. Brewers' dried grain was purchased from Labar Feed Mill, Samaru, Zaria.

Experimental Animals, Design and experimental diets

Twenty-eight (28) Red Sokoto bucks aged between 10-14 months with an average body weight of 12.55 ± 1.25 kg were used for this experiment. They were balanced for weight and randomly allotted into 4 dietary treatments in a Completely Randomised Design (CRD) with 7 animals per treatment. Four Iso-nitrogenous dietary treatments were formulated to contain 15% CP. Treatment one, designated as CON, was the control diet and contained cottonseed cake. Treatment two, designated as GHT, contained groundnut haulms. Treatment three, designated as PLT, contained poultry litter. Treatment four, designated as BDGT, contained brewers' dried grain. The ingredient composition of the experimental diets is shown in Table 1. The bucks were fed the supplementary concentrate diet at 1.5% of body weight, and a basal diet of *Digitaria smutsii* hay was given subsequently *ad libitum*. The feeding trial lasted for 90 days. 5 millilitres of blood samples were collected from four (4) randomly selected animals in each of the treatment groups at the beginning and at the end of the growth trial for the determination of serum biochemical indices.

Data Analysis

Data on serum biochemical parameters whose values were correlated because of repeated

measures were subjected to analysis of variance (ANOVA) for repeated measure analysis using the PROC MIXED procedure of Statistical Analysis System (6).

RESULTS AND DISCUSSION

Table 1 shows the ingredient composition of the experimental diets, whereas Table 2 shows the serum biochemical parameters of Red Sokoto goats fed a basal diet of *Digitaria Smutsii* hay supplemented with different nitrogen sources. Total protein ranged from 4.69 to 4.96 g/dL in CON and PLT at the beginning of the experiment and did not differ significantly ($P > 0.05$), while at the end of the experiment, the values ranged from 5.77 to 6.92 mg/dL in PLT and GHT, which differed significantly ($P < 0.05$) across dietary treatments. The total protein values obtained in this study compares with 5.10 – 7.45 g/dL reported by (7) and (8), The significantly higher total protein (TP) values obtained on animals fed GHT which contained urea agrees with the report of (9), who similarly obtained significantly higher total protein values in WAD goats fed urea - treated cassava peel diet over diets treated with other nitrogen sources. The total serum protein values in all the treatments fall within the normal values (5 – 7.45 g/dL), which is an indication that the proteins in the diets were well utilized and retained in the animal's body. The blood glucose level at the beginning of the experiment showed no significant ($p > 0.05$) differences. However, a significant ($p < 0.05$) difference was observed at the end of the experiment, and the values ranged from 17.83 to 26.35 mg/dL. Values for blood glucose level obtained in this study are higher than 40.18 - 46.00 mg/dL (2.30-3.77 Mmol/L) reported by (10), in West African Dwarf goats, but comparable to 41.82 - 68.55mg/dL reported by (11), for West African Dwarf goats fed a cassava peel-based diet. Age, differences in dietary composition, sex, environment, climate and health status could be responsible for the differences in blood glucose levels. Aspartate aminotransferase (AST) values ranged from 55.03 U/L to 63.43 U/L in CON and PLT at the beginning of the experiment, and 17.42 U/L to 19.00 U/L for treatments CON and BDGT at the end of the experiment. The values Alanine aminotransferase (ALT) across the treatments

ranged from 23.90 - 30.58 U/L, and 17.42 - 19.00 U/L at the beginning and end of the feeding trial, respectively. The values obtained for ALP at the beginning and end of the experiment ranged from 84.40 - 92.78 U/L and 112.35 - 129.20 U/L,

respectively. The values are comparable to the normal range of 58 - 196 U/L, 22 - 38 U/L and 27 - 210 U/L for AST, ALT and ALP reported for healthy goats (12;13).

Table 1: Ingredients composition of the concentrate supplements

Ingredient (%)	CON	GHT	PLT	BDGT
Wheat offal	48.88	0.00	0.00	0.00
Maize	24.44	0.00	0.00	0.00
Maize offal	5.00	5.00	5.00	5.00
Cassava peel meal	0.00	49.26	45.27	45.81
Cottonseed cake	19.68	0.00	0.00	0.00
Groundnut haulms	0.00	41.74	0.00	0.00
Poultry litter	0.00	0.00	47.73	0.00
Brewers dried grain	0.00	0.00	0.00	47.19
Urea	0.00	2.00	0.00	0.00
Bone meal	1.50	1.50	1.50	1.50
Salt	0.50	0.50	0.50	0.50
Total (Kg)	100	100	100.00	100.00
Calculated analysis				
CP (%)	15.00	15.00	15.00	15.00
ME (MJ/kg)	10.07	10.01	9.87	9.94

CON= Control treatment, GHT=Groundnut haulms treatment, PLT=Poultry litter treatment, BDGT=Brewer's dried grain treatment, CP=Crude protein, ME=Metabolizable energy, MJ/kg = Kilocalorie per Kilogram.

Table 2: Serum biochemical parameters of growing Red Sokoto bucks fed a basal diet of *Digitaria smutsii* hay supplemented with cassava peel-based concentrates of different nitrogen sources

Parameters	CON	GHT	PLT	BDGT	SEM
Total protein (g/dL)					
Beginning	4.69	4.84	4.96	4.93	0.15 ^{NS}
End	6.38 ^b	6.92 ^a	5.77 ^c	6.28 ^b	0.13
Creatinine (mg/dL)					
Beginning	1.11	1.18	1.25	1.23	0.04 ^{NS}
End	1.17	1.05	1.07	1.12	0.06 ^{NS}
Glucose(mg/dL)					
Beginning	51.41	51.71	58.58	50.74	3.52 ^{NS}
End	55.95 ^b	60.98 ^a	58.18 ^{ab}	60.13 ^a	1.60
BUN (mg/dL)					
Beginning	17.35	20.53	21.25	23.90	20.01 ^{NS}
End	17.83 ^b	22.36 ^{ab}	26.00 ^a	26.35 ^a	2.00
AST(U/L)					
Beginning	55.03	57.70	63.43	58.80	2.64 ^{NS}
End	68.13	76.46	75.29	75.40	3.67 ^{NS}
ALT(U/L)					
Beginning	23.90	27.28	24.80	30.58	1.27 ^{NS}
End	17.42	18.50	18.30	19.00	0.55 ^{NS}
ALP (U/L)					
Beginning	84.40	90.73	82.43	92.78	2.45 ^{NS}
End	129.20	124.51	127.85	112.35	7.09 ^{NS}

^{abc} means within the same row with different superscripts are significantly different (P<0.05) CON= control treatment, GHT= Groundnut haulms treatment, PLT= Poultry litter treatment, BDGT= Brewers dried grains treatment, BUN=Blood urea nitrogen, mg/dl=milligrams, NS= Not significant, AST=Aspartate aminotransferase, ALT=Alanine aminotransferase, ALP=Alkaline phosphatase, g/dl=grams per deciliter, mg/dl=milligrams per deciliter, U/l=Units per liter

CONCLUSION AND APPLICATION

It can be concluded that the different nitrogen sources and cassava peel meal did not have any detrimental effect on the animals and can therefore be used in diet formulation for ruminant animals.

REFERENCES

1. Zhao, X., Ali, S., Hassan, M. F., Bashir, M. A., Ni, X., Lv, C., Yang, H., Danzeng, B. and Quan, G. (2023). Effects of Graded Levels of Dietary Protein Supplementation on Milk Yield and Body Weight Gain in Lactating Ewes. *Frontiers of Veterinary Science*, 2: (10) 786-796.
2. Shittu, A. M., Bamiro, O. M., Aderemi, F. M. and Olayode, G. O. (2021). Effects of Using Non-conventional Feedstuffs on the Productivity and Cost of Egg Farms in Ibadan, Nigeria. *Nigerian Journal of Animal Production*, 31 (1), 65 - 78
3. Gradela, A., Souza, V. N., Queiroz, M. M. Constantino, A. C., Faria, M. D., Pires, I. C. and Correa, F. M. (2020). Serum Biochemistry of *Trachemys scripta elegans* and *Trachemys dorbignyi*. *Veterinary World*, 13:(6) 1083-1090.
4. FMARD (2016). *Livestock population data. National Agricultural Sample Survey Report. Federal Ministry of Agriculture and Rural Development*. Federal Republic of Nigeria. Retrieved from <https://www.premiumtimesng.com/news/to-p-news/204577-nigeriareleases-census-goats-sheep-pigs-livestocks-country.html>.
5. Ovimaps, (2024). Ovi location map: Ovi Earth Imagery data
6. SAS. (2002). INSTITUTE Inc. SAS/STAT user's guide. Version 9.0. Cary NC, USA.
7. Jiwuba, P. C., Jiwuba, L. C. and Udoha, M. (2017). Growth performance, haematology and serum biochemistry of West African Dwarf sheep fed cassava peel-oil palm leaf meal-based diets in hot humid tropics. *Agricultura*, 14(1-2): 37-44.
8. Oni, A. O., Oluwayemisi, A., Adebayo, K., Sowande, O. S., Iposu, S. and Onwuka, C. F. I. (2017). Effects of supplementing cassava peels with cassava leaves and cowpea haulms on the rumen environment and blood profile parameters of West African Dwarf goats *Archivos de Zootechnia*, 66(255):397 - 404.
9. Ajagbe, A. D., Aribido, S. O., Oyewole, B. O., and Egwuje, C. O. (2019). Haematology and serum Biochemistry of Growing West African Dwarf goats fed cassava peel with supplemental nitrogen Sources. *BR Nahata Smriti Sansthan Agricultural Extension Journal*, 3(3):171 - 176.
10. Kalio, G. A. and Anyanwu, N. J. (2016). Performance and haemato-biochemical profiles of West Africa Dwarf Does fed selected crop by-products in Nigeria. *Agrosearch*, 16(2): 41 - 50.
11. Anya, M. I., Ozung, P. O., Okah, U., Ayuk, A. A., and Igwe P. A. (2018). Blood profile of West African Dwarf (WAD) goats fed cassava peel meal-based diets supplemented with African Yambean concentrate. *Canadian Journal of Agriculture and Crops*, 3(2): 55 - 63.
12. Davis Clinical Reference Intervals (2009). Veterinary Medical Teaching Hospital, University of California, Davis.
13. Merck Veterinary Manual. (2016). Merck and the Merck Veterinary Manual. Merck and Co., Inc., Kenilworth, New Jersey, USA. Accessed on 15th March, 2017.