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Growth performance and blood profile of grazing Red Sokoto bucks fed X*ylopia aethiopica* seed meal diets

Ukanwoko*, A. I. and Uhumuavbi O. G.

Department of Animal Science, University of Port Harcourt, Rivers State, Nigeria.

***Corresponding Author**: ndutonia@yahoo.com, **Phone number:** +2347031126294*

***Target Audience**: Animal Scientists, students and livestock producers*

Abstract

This study was aimed at assessing the growth performance and blood profile of grazing Red Sokoto bucks fed Xylopia aethiopica seed meal diet. Nine (9) Red Sokoto bucks were apportioned to three (3) dietary treatments; T_1, T_2, and T_3 at 0%, 2.5% and 5% Xylopia aethiopica seed meal inclusion level in a completely randomized design. The weights of the animals were taken at the beginning of the experiment and done weekly to determine the live weight changes. Feed intake was calculated as the difference between feed served and refusals. The experiment lasted 8 weeks. At the end of the experiment, blood samples were collected from the jugular vein of the experimental animals and taken to the laboratory for haematological and biochemical analysis. Xylopia aethiopica supplementation did not statistically ($P<0.05$) affect performance. There were significant ($P<0.05$) differences in the Packed cell volume (PCV), haemoglobin (Hb), red blood cells (RBC), white blood cell (WBC), platelet, neutrophil, lymphocyte, aspartate aminotransferase (AST), chloride, urea and creatinine values of the goats though they all fell within the normal range for goats. Xylopia aethiopica seed meal diet had no deleterious effects on performance and health conditions of the Red Sokoto bucks and is recommended for use in goat production at 5.0% inclusion levels.

***Key words**: Creatinine; haemoglobin; negro pepper; packed cell volume and white blood cells.*

Description of problem

Goats being the most numerous ruminant animals with an estimated population of 72.5 million (1) is presently helping to solve the problem of protein malnutrition in Nigeria (2). In the order of importance, Red Sokoto goats ranked 50% followed by the West African Dwarf and Sahel goats and they contribute about 24% of animal protein consumed in Nigeria (3). Livestock including goats are faced with seasonal fluctuations in their weights (4) due to scarcity of good quality feed during the dry season. There is always a search for non- conventional feed ingredients (5) to replace the high cost and high demand conventional feed ingredients (6).

Negro pepper (*Xylopia aethiopica)* is known as uda (by the Igbos), sesedu (Yoruba), kimba (Hausa), Ethiopian pepper, African pepper, Hwenteaa (Ghanian) (7). It is a spice (8) grown in the rain forest areas (9) and used in several therapeutic preparations (10). It has many medicinal values due to the fact that it possesses anti-microbial, antifungal, analgesic, antihelminthic and immune boosting activities (8). In Eastern Nigeria, nursing mothers consume *Xylopia* after giving birth to enhance milk letdown and reduce post natal pains (11). The mature seed of *Xylopia aethiopica* is usually green in colour when fresh but becomes brownish black when dried. It contains 11.39% crude protein, 48.06%

carbohydrate, 30.30% fat, 3.80% fibre and minerals (12).

This study is therefore aimed at evaluating the growth performance and blood profile of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets.

Materials and method

Study Location

This study was carried out in the Livestock unit of the Faculty of Agriculture Teaching and Research farm, University of Port Harcourt, Choba, Rivers State. The farm was located on latitude 4º53'14'' N and longitude 6º 54' 00'' E of the equator (13). This farm is situated within the humid rain forest region of West Africa. It has a long duration of rainfall from March to November and a very short duration of dry season. The temperature of this place ranges from 25^0C to 28^0C with very high relative humidity of above 80% (13).

Experimental animal and Design

Nine (9) Red Sokoto bucks were used for this experiment. The nine (9) bucks were assigned to three (3) treatment diets; T_1, T_2, and T_3. They were housed individually in separate pens. The animals were taken out for grazing in the morning, fed the experimental diets afterwards and water was given *ad libitum*. The daily feed intake was recorded as the difference between feed served and refusals. The animals were weighed at the beginning of the experiment and weighed weekly throughout the experiment. The research was carried out for 8weeks. A Completely Randomized Design was used for this experiment.

Experimental Diets

Xylopia aethiopica seeds were used for this experiment. Dried *Xylopia aethiopica* seeds were purchased from the Market, then milled. After milling, they were incorporated into T_2 and T_3 diets at 2.5% and 5.0% inclusion respectively, while T_1 was the control at 0% inclusion. Other feed ingredients such as; wheat offal, palm kernel cake (PKC), brewers' dried grain, soyabean meal, bone meal and common salt were purchased and used for the formulation of the feed as shown in Table 1.

Table 1 Composition of Experimental diets

	Diets		
Ingredients (%)	**A**	**B**	**C**
Wheat offal	62.0	59.5	57.0
Xylopia aethiopica	0.0	2.5	5.0
Palm kernel cake	15.0	15.0	15.0
Brewers dried grain	15.0	15.0	15.0
Soya bean meal	5.0	5.0	5.0
Bone meal	2.0	2.0	2.0
Common salt	1.0	1.0	1.0
Total	100	100	100

Laboratory Procedures and Data Collection

Blood samples were collected from the jugular vein of the nine experimental animals with the use of a disposable syringe and sterile needles, then put into two plastic tubes in which one of the tubes contained an anticoagulant known as ethylene diamine tetra-acetic acid (EDTA), while the other plastic tube did not contain an

anticoagulant. The blood samples were carried to the laboratory for haematological analysis to determine the Packed Cell Volume (PCV), Haemoglobin (HB), Red Blood Cell (RBC), White Blood Cell (WBC), Neutrophil (N), Lymphocyte (L), Eosinophil (E), Monocyte (M) according to (14) and serum biochemical indices to determine the Aspartate aminotransferase (AST), Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), Total protein (TP), Albumin (ALB), Total bilirubin (TB), Conjugated bilirubin (CB), Sodium (Na), Potassium (K), Chloride (Cl), Bicarbonate ($HCO_{3)}$, Urea (UR), Creatinine (CR), Total cholesterol (TC), Triglycerides (TG), High density lipoproteins (HDL) using the method described by (15). The weight of the experimental animals were taken weekly using hanging measuring scale. Body weight gain was calculated at the end of the experiment by subtracting the initial body weight from the final body weight. Feed conversion ratio was determined by dividing the feed intake by the body weight gain. Data was collected on feed intake as the difference between the amount of feed served daily and the amount of feed refused. Also, samples of the feeds from the three (3) treatments were carried to the laboratory for proximate analysis (16).

Statistical Analysis

Analysis of variance (ANOVA) in Statistical Package for Social Science (SPSS) version 20 set at 95% confidence limit was used for the statistical analysis to determine the level of significance between the various treatments. While Duncan test was used for the mean separation (17)

Results and Discussion

The proximate composition of the experimental diets, *Xylopia aethiopica* and the grasses/legumes browsed by the goats is shown in Table 2. The crude protein contents of the experimental diets fell within the range of 14.00 – 15.06% which is well above the CP contents of 10.25% and 13.73% reported by (18) and (19) respectively for sheep and goat production. The crude fibre contents of the experimental diets ranged from 30.73 - 39.20% with higher values for the *Xylopia* based diets. This could be due to the fact that *Xylopia aethiopica* seed meal had high CF contents.

The growth performance of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets is shown on Table 3. There were no significant differences ($P>0.05$) in all the parameters monitored. Numerically, final body weight was highest in T_1 (16.86kg), followed by the goats on T_3 (16.55kg) and the least for goats on T_2 (16.03kg). Body weight gain was numerically highest in T_2 (3.23kg) and least for goats fed T_3 (2.88kg). The findings tended to be in line with (20) who conducted a trial to investigate the growth response of Red Sokoto bucks supplemented with *Xylopia aethiopica* and reported a weight loss at 7.5% inclusion level of *Xylopia aethiopica.* This also agrees with (6) who reported *Xylopia aethiopica* to be hypoglycemic at higher levels.

The haematological indices of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets are shown on Table 4. There were significant ($P<0.05$) differences in the PCV, Hb, RBC, WBC, platelet, neutrophil and lymphocyte values of the bucks. The PCV values were higher in bucks fed on T_3 (31.67%) and lowest in bucks fed on T_2 (25.67%).

Table 2. Proximate Composition of Experimental Diets, Xylopia aethiopica and browsed grasses/legumes.

Parameters (%)	T_1	T_2	T_3	*Xylopia aethiopica*	Browsed grasses/legumes
Dry matter	84.00	85.20	85.90	88.50	30.00
Crude Protein	14.00	15.06	14.58	9.19	21.44
Crude Fibre	30.73	34.03	39.20	44.04	0.50
Nitrogen Free Extract	30.90	32.94	31.75	20.80	72.09
Ether Extract	2.07	9.47	1.17	20.77	4.87
Ash	8.30	14.50	13.30	5.20	1.10
Carbohydrate	14.90	18.14	17.35	9.80	2.06

Table 3. Growth parameters of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets.

Parameters	Treatments			
	T_1	T_2	T_3	SEM
Initial body weight (kg)	13.83	12.80	13.67	2.53
Final body weight (kg)	16.86	16.03	16.55	2.65
Body weight gain (kg)	3.03	3.23	2.88	0.22
Total feed intake (kg)	16.90	18.57	16.05	1.03
Feed intake (kg/day)	0.98	1.01	0.97	0.03
Feed conversion ratio	0.09	0.09	0.09	0.01

Table 4. Haematological values of Red Sokoto Bucks fed *Xylopia aethiopica* seed meal diets.

Parameters	Normal range	Treatments			
		T_1	T_2	T_3	SEM
PCV (%)	21-35	29.00^{ab}	25.67^{b}	31.67^{a}	1.09
Hb (g/dl)	7-15	9.67^{ab}	8.57^{b}	10.57^{a}	0.37
RBC ($\times 10^6$/ul)	3.5-13.5	7.27^{ab}	6.77^{b}	7.77^{a}	0.18
WBC ($\times 10^3$/ul)	6.8-20.1	11.87^{ab}	13.63^{a}	10.07^{b}	0.61
Platelet ($\times 10^3$/ul)	*	187.67^{b}	235.00^{a}	174.00^{b}	10.93
Neutrophil (%)	17-52	28.67^{b}	30.67^{b}	40.00^{a}	1.99
Lymphocyte (%)	47-82	60.00^{a}	57.33^{a}	48.33^{b}	1.95
Eosinophil (%)	1-7	2.67	4.00	4.00	0.41
Monocyte (%)	0-10	8.67	8.00	7.67	0.31

^{abc} means in the same row with different superscripts differ significantly ($P<0.05$). Source (Normal range): (Tambuwal *et al*.2002). **Not available*

Where PCV= Packed Cell Volume, Hb= Haemoglobin, RBC= Red Blood Cell, WBC= White Blood Cell, SEM= Standard Error of Mean.

The PCV range of 25.67 – 31.67% reported for Red Sokoto bucks in this study fell within the PCV range of 21 – 35% reported by (21) showing that the protein contained in the experimental diets were adequate for the animals. Low PCV values are pointers to poor crude protein diets. Hb was highest in T_3 (10.57g/dl) and lowest in T_2 (8.57g/dl). Hb fell within the range of 8.57 – 10.57g/dl in this study and this compares favourably with the range of 7 – 15g/dl and 8.08 – 9.50g/dl reported by (21) for Red Sokoto goats and (22) for West African Dwarf goats, respectively. This might also be a pointer to the crude protein contained in the diets. Haemoglobin functions as an oxygen carrier from the lungs to every other parts of the body (23). The RBC value was highest in bucks on T_3 ($4.77x10^6$/ul) and lowest in bucks on T_2 ($3.77x10^6$/ul). The RBC range of 6.77 – $7.77x10^6$/ul in this study compares favourably with RBC ranges of 6.35 – $11.95x10^6$/ul and 6.62 – $9.74x10^6$/ul reported by (24) and (25), respectively for West African Dwarf goats but higher than that ($2.7\pm10x10^6$/ul) reported by (26) for Red Sokoto goats. The WBC range in this study fell within 10.07 – $13.63x10^3$/ul and this range fell within the normal range reported by (21) but lower than the range of 15.6 – 20.4x103/ul reported by (27). This showed that the experimental diets did not affect the immunity of the bucks negatively. Platelet was highest in T_2 ($235x10^3$/ul) and lowest in T_3 ($174x10^3$/ul). The range of 174 – $235x10^3$/ul platelet reported in this study fell within the normal range of 150 – $230x10^3$/ul reported by (28) but lower than that ($324x10^3$/ul) reported by (29). Platelets have been reported to maintain haemostatis. The range of neutrophil reported in this study was between 28.67 – 40.00% and this range fell within the normal ranges of 17 – 52% and 23.90 – 49.80% reported by (21) and (27), respectively for Red Sokoto goats. A range of 48.33 – 60.00% reported for lymphocytes in this study fell within the normal range of 47 – 82% reported by (21). There were more lymphocytes than neutrophils in this study. This agrees with (30) who reported that goats have more lymphocytes than neutrophils. Lymphocytes are the main WBC differential responsible for immunity.

The serum biochemical indices of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets is shown on Table 5. There were significant differences ($P<0.05$) in the AST, chloride, urea and creatinine values of Red Sokoto bucks that fed *Xylopia aethiopica* seed meal diets. AST value in this study was within the range of 91.67 – 96.67u/l and this range compares favourably with the normal range of 58 – 90u/l reported by (28). AST in goats reflects the functionality of the liver and increased AST signal liver malfunction and protein metabolism disorder (31). The chloride range of 77.67 – 95.00u/l reported in this study fell within the normal range of 50 – 95u/l reported by (28). The urea values in this were within the range of 4.23 – 9.23m/mol and this range fell within the range of 0.80 – 9.70m/mol reported by (21) for Red Sokoto goats. Amino acids in the proper balance give rise to normal urea levels (26). Creatinine values of 118.33 – 147.33m/mol reported in this study fell within the normal range of 60 – 140 m/mol reported by (28). Creatinine is known to have a link with kidney function and at high levels it is associated with kidney disease (32).

Table 5: Serum biochemical Indices of Red Sokoto bucks fed *Xylopia aethiopica* seed meal diets.

Parameters	Normal range	Treatments			
		T_1	T_2	T_3	SEM
AST (u/l)	58-90	96.00[a]	91.67[b]	96.67[a]	0.95
ALT (u/l)	10-30	4.43	5.10	4.60	0.43
ALP (u/l)	12-34	9.93	14.73	13.50	1.43
TP (g/l)	30-65	41.00	57.67	51.00	4.34
Albumin (g/l)	20-42	22.00	34.00	26.67	2.87
TB (m/mol)	8-11.5	11.33	10.43	10.87	0.28
CB (m/mol)	1.8-9.4	7.30	6.93	6.77	0.24
Sodium (m/mol)	1.30-6.0	120.33	125.67	126.00	1.62
Potassium(m/mol)	70-120	3.40	4.53	4.57	0.38
Chloride (m/mol)	50-95	95.00[a]	77.67[b]	90.00[ab]	3.44
HCO_3 (m/mol)	20 - 32	26.67	23.33	25.67	0.85
Urea (m/mol)	1-10.5	4.23[b]	9.23[a]	6.87[ab]	0.87
CR (m/mol)	60 - 140	118.33[b]	147.33[a]	133.33[ab]	5.07
TC (m/mol)	1-5	3.70	3.77	3.23	0.22
TG (m/mol)	0.2-0.8	0.35	0.53	0.36	0.04
HDL (m/mol)	1.0-3.2	1.40	1.40	1.08	0.16

[abc] means in the same row with different superscripts differ significantly ($P<0.05$). Source (Normal range): RAR, 2009. Where AST= Aspartate aminotransferase, ALT= Alanine aminotransferase, ALP= Alkaline phosphatase, TP= Total protein, TB= Total bilirubin, CB= Conjugated bilirubin, HCO_3= Bicarbonate, CR= Creatinine, TC= Total cholesterol, TG= Triglycerides, HDL= High density lipoproteins, SEM= Standard Error Mean.

Conclusion and Applications

From this study it is revealed that:

1. The utilization of *Xylopia aethiopica* seed meal diets has no deleterious effects on general performance of Red Sokoto bucks and is recommended for use in goat production systems
2. The haematological and serum biochemical indices of the Red Sokoto bucks on *Xylopia aethiopica* seed meal diets fell within the normal range of haematological and biochemical serum values for Red Sokoto goats.
3. Further studies should be carried out to check the effect of *Xylopia aethiopica* seed meal diets on the milk yield and composition of Red Sokoto goats.

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