
Serum Biochemistry of West African Dwarf Goats Fed, Some Browse Species Supplemented with a Concentrate Diet

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Abstract: Sixteen West African dwarf bucks) were allotted into four (4) treatments of four goats each. The goats were fed leaves from Gmelina, (Gmelina arborea) Tamarind, (Tamarindus indicus), Neem (Azadirachta indica) and Teak (Tectona grandis) at 300g/goat/day for Treatments 1, 2, 3 and 4 respectively and a concentrate supplement diet at 100g per goat/day for a duration of thirty five (35) days. The experimental design was a completely randomized design, data were analysed using a one way analysis of variance and least significant difference to separate the significant means. Concentrate and browse samples were analysed using the methods of AOAC, the blood samples for serological studies were collected in sample bottles from the jugular veins of the goats, using needles and syringes. Values for daily supplement intake (75.33 – 94.43g), daily browse intake (134.22 – 245.44g) and total daily feed intake (225.53 – 339.87g) were significantly different at 5% level, values for urea (0.84 – 1.38mmol/l), cholesterol, (4.83 – 6.02) creatinine (16.00 – 18.50mol/l, and blood sugar (38.96 – 44.32mg/dl) were significantly different, alkaline phosphate values ranged from 56.93 – 58.20 and were not significantly different. It was therefore concluded that the four browse species were safe for the goats, nutrients in the concentrate diets and the four browse species were adequate for the goats. Gmelina arborea was the most preferred by the goats in terms of intake, The four browse species were therefore recommended for goat feeding especially during the long dry season. Further research using other breeds and classes of goats as well as other species of ruminants such as sheep and cattle was also recommended.

Keywords: Serum, Bio-chemistry, Feed Intake, Concentrate, West African Dwarf Goats, Browse

1. Introduction

Inadequate feeding is a major setback to ruminant livestock production in Nigeria. This has also led to low milk and meat production, high mortality of young stock and low growth rate. [1]. The use of agro by-products as well as some

browse plants that tend to retain their leaves during the dry season were recommended by Ocheja et. Al [2].

Blood biochemical constituents reflect the physiological response of animals to its internal and external environments, which include feeds and feeding, [3] Blood biochemistry studies are usually undertaken to establish the

diagnostic baseline of blood characteristics for routine management practice of farm animals [4]

When using non conventional feeds, it is important to assess the health status of the animals because some are known to affect blood parameters. [5] A readily available and fast means of assessing the clinical and nutritional health status of the animals in feeding trial may be the use of blood analysis.

Endogenous substances might manifest through reduced protein utilization thereby, increasing the catabolism of amino acids which would be subsequently degraded into urea and creatinine [6].

Accurate determination of creatinine clearance is crucial to rational drug therapy because many drugs are either partially or totally eliminated by the kidney [7].

From the foregoing blood bio chemical constituent analysis is imperative considering the fact that many by-products are now used to feed ruminant animals.

The aim of this work therefore was to assess the blood bio chemical profile of West African dwarf goats fed some browse species, supplemented with a concentrate diet

2. Materials and Methods

2.1. Experimental Location

The experiment was conducted at the Sheep and Goat unit of the Livestock Teaching and Research farm, Kogi State University, Anyigba. Anyigba is located in the derived Guinea Savannah zone of Nigeria on latitude 7°15' and 7°29' N of the equator and longitudes 7°11' and 7°32'E of the Greenwich meridian. The zone lies in the warm humid climate of the tropics with clearly marked wet and dry season in April to October and November to March respectively with annual rainfall ranging from 1400-1500mm and an ambient temperature of about 25°C with the highest in March and April. The average altitude is 420 meters above sea level [8].

2.2. Feed preparation, Experimental Animals and Management

Sixteen growing West African dwarf bucks were used for the study. The animals were housed individually and treated with Ivomec, for endo and ecto parasite control at 0.3ml each and oxytetracycline, hydrochloric and procaine penicillin at 2.0ml each as prophylactic treatment. To provide a common health status. The browse species used for this experiment were obtained from within Kogi State University campus Anyigba, and wilted for 24 hours to reduce the moisture content before feeding. The concentrate components were cashew nut shell, Maize offal (MO), Bambara nut offal (BO), Fish offal (FO), Rice offal (RO), Wood ash (WA), Bone meal and Table salt as shown in Table 1 below. These ingredients were ground to desired texture. The goats were allotted to four (4) treatments in a Completely Randomized Design (CRD) Each treatment had four (4) goats. Each goat was fed 100g of the supplement diet per day.

The leaves, *Gmelina*, (*Gmelina borea*) *Tamarind*, (*Tamarindus indicus*), *Neem* (*Azadirachta indica*) and *Teak*

(*Tectonagrandis*) were wilted for 24 hours and fed at 300g /goat/day for each treatment. The concentrate was fed 1 hour later.

Feed served the goats was weighed daily and the left over was also weighed and subtracted from the quantity of feed served to determine the feed intake. The goats were weighed in the morning before feeding each week. The study duration was thirty five (35) days, after a preliminary feeding period of 7 days.

Table 1. Composition of Supplement Diet (% Dry matter).

FEED INGREDIENTS	COMPOSITION
Cashew nut shell (CNS)	10.00
Maize offal (MO)	27.00
Bambara nut offal (BO)	48.00
Fish offal (FO)	5.50
Rice offal (RO)	5.00
Wood ash (WA)	1.00
Bone meal	2.00
Table salt	1.50
Total	100
<i>Calculated nutrient content:</i>	
Crude protein	18.50
Gross energy (Kcal/kg diet)	3083.00
Crude fibre	14.00
Calcium	0.40
Phosphorus	1.20

2.3. Blood Sample Collection

The blood samples for serological studies were collected in sample bottles from the jugular vein of each goat using needles and syringes. The sample bottles contained ethylene diamine tetra acetic acid (EDTA) anticoagulant, the blood samples were centrifuged thus allowing the clear sample to be separated for testing.

The Serum was analyzed for creatinine, urea, alkaline phosphate cholesterol and blood sugar according to the method of Baker and Silverton [9].

2.4. Proximate and Mineral Analysis

Samples of browse species and the supplement diet were analyzed for their proximate and mineral composition using standard procedure according to AOAC [10]

2.5. Experimental Design and Statistical Analysis

The experimental design was a completely randomized design (CRD). Data were analyzed using a one-way analysis of variance (ANOVA) and significant differences were separated using least significant difference (LSD) with the aid of SPSS version 16. 2006 edition at 5% level of significance. [11]

3. Results and Discussion

3.1. Proximate Composition of Browse and Concentrate Diet

The proximate composition of the browse and concentrate diet is summarized in Table 2.

The protein content of the browse and concentrate diet were within the values of 12-18% recommended for growing ruminants in the tropics [12]. The ether extracts values for the

browse were within recommended values, while that of the concentrate diet was above the values of 5-6% which if exceeded may impede appetite and fibre digestion [13].

Table 2. Proximate Composition of browse and supplement (Dry matter basis) (%).

Treatments	T1	T2	T3	T4	
Parameters	<i>Gmelina</i> , (<i>Gmelina aborea</i>)	<i>Tamarind</i> , (<i>Tamarindus indicus</i>)	<i>Neem</i> (<i>Azadirachta indica</i>)	<i>Teak</i> (<i>Tectona grandis</i>)	Concentrate diet
Crude Protein	10.98	16.55	15.68	14.64	18.23
Crude Fibre	10.80	17.50	15.66	14.88	16.80
Nitrogen Free Extracts	51.12	52.06	54.01	52.23	53.85
Ether Extracts	7.10	6.89	8.05	8.35	7.70
Ash	19.10	15.80	16.60	15.25	3.42

3.2. Feed Intake Records

The feed intake record of the experimental goats is presented in Table 3.

Values for daily supplement intake, daily browse intake and total daily feed intake were significantly ($p < 0.05$) different.

The daily supplement intake of 75.33 – 94.43 g, and total

daily feed intake of 253 – 399.87g were higher than 44.65 – 91.54g and 216.75 – 258.99g reported by Baker and Silverton [9] but lower than 130.74 – 210.37g (TDFI) reported by Arigbede *et al.* [14] who fed cassava leave based diets to West African dwarf goats, these discrepancies could be due to the type of concentrates and browse fed to the goats.

Table 3. Feed Intake Records.

Parameters	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
Daily Supplement Intake (g)	94.43 ^a	91.30 ^a	75.33 ^b	82.40 ^b	3.66
Daily Browse Intake (g)	245.44 ^a	134.22 ^c	180.44 ^b	175.24 ^b	17.98
Total Daily Feed Intake (g)	339.87 ^a	225.53 ^b	255.76 ^b	257.63 ^b	18.56

a, b, c Treatment means on the same row with different superscripts differ significantly ($p < 0.05$)
SEM Standard Error of Means

3.3. Serum Biochemical Profile of Experimental Goats

The serum biochemical profiles of the experimental goats are presented in Table 4. The values for blood sugar, creatinine, urea and cholesterol showed significant ($p < 0.05$) differences. However values for Alkaline phosphate ranged from 56.93 – 58.20m/l and were not significant ($p > 0.05$). All the biochemical parameters evaluated were within normal ranges reported for goats by Blood *et al.* [15] significant, values for urea and cholesterol, as well as non significance ($p > 0.05$) for creatinine, cholesterol and alkaline phosphate were reported for west African dwarf goats fed sun-dried cashew pulp meal based diets by Okpanachi *et al.* [17]. Significant ($p < 0.05$) values for blood sugar, urea, alkaline phosphate and cholesterol as well as non significance ($p > 0.05$) for creatinine were reported for West African dwarf

goats fed diets containing graded level, of cashew nutshell. By Ocheja *et al.* [18.], ranges of 51.30 – 84.36 m/l for alkaline phosphate and 17.17 – 20.40 mmol/litre for creatinine. were also reported by Ocheja *et al.* [18]

Alkaline phosphate values of 98.15 – 116.95 m/l was reported for West African dwarf goats fed cassava peels meal supplemented with African yam bean by Ozung *et al.* [16], normal values for alkaline phosphate range from 42 – 77.5 μl^{-1} [15], higher creatinine values suggests muscular wastage.

Abnormally high alkaline phosphate is indicative of bone disease, liver disease, bile obstruction. Variation could also be due to feed, collection and handling of blood samples, genetic, environment, sex and age of animals. Abnormally high urea values indicate poor protein quality as well as poor protein utilization in animals. [16]

Table 4. Serum Biochemical Profile of Experimental Goats.

Parameters	Treatments				SEM
	T ₁	T ₂	T ₃	T ₄	
Blood Sugar (mg/dl)	44.32 ^a	38.96 ^b	39.76 ^b	40.00 ^b	1.05
Creatinine (mol/l)	16.00 ^a	18.35 ^b	18.50 ^b	18.16 ^b	0.58
Urea (mmol/l)	0.84 ^a	1.32 ^b	1.36 ^b	1.38 ^b	0.30
Alkaline phosphate m/l	56.93	58.20	57.60	57.30	0.05
Cholesterol (mmol/l)	6.02 ^a	4.85 ^b	4.83 ^b	4.88 ^b	0.32

ab, Treatment means on the same row with different superscripts differ significantly ($p < 0.05$)
SEM Standard Error of Means

4. Conclusion and Recommendations

4.1. Conclusion

The nutrients in the concentrate diets were adequate for the goats *Gmelina arborea* was the most preferred by the goats in terms of intake, it also had the best array of nutrients

All the browse species fed to the goats had no adverse effect on the blood biochemistry parameters tested in this study.

4.2. Recommendations

The browse species evaluated are recommended for feeding goats especially during the long dry season, further research should be carried out using other species of ruminants such as sheep and cattle.

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