



NUTRIENT INTAKE AND GROWTH PERFORMANCE OF YANKASA SHEEP FED DIFFERENT LEVELS OF AFRICAN BIRCH (*Anogeissus leiocarpus*) LEAVES AND WHEAT OFFALS

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ABSTRACT

The study was conducted to evaluate different levels of African birch (*Anogeissus leiocarpus*) and wheat offals on the growth performance of growing *Yankasa* rams. Four diets (16% protein) were formulated using varying levels of African birch (*Anogeissus leiocarpus*) at 0, 10, 20 and 30% in the diets and termed as diets 1, 2, 3 and 4 respectively. Twenty (20) growing *Yankasa* rams with average body weight of 17.2 kg were allocated to 4 treatments groups of five (5) animals each in a Completely Randomized Design. The experiments lasted for 12 weeks. Total feed intake differed significantly ($P < 0.05$) among the treatments, with treatments 2 and 4 having the highest values of 1057.98 g/day and 1051.53 g/day followed by 1035.24 g/day and 1006.97 g/day for T3 and T1 respectively. The result also revealed that weight gain differed significantly ($P < 0.05$) across the diets with animals on treatment 2 recording the highest value (126.19 g/day) compared to 59.52, 59.52 and 88.90 g/day for diets 1, 3 and 4 respectively. Feed conversion ratio (FCR) values were significantly ($P > 0.05$) different across the treatments with animal fed diet 2 recording the best FCR, (7.33) followed by those on treatment 4 (10.29). Animal on treatment 1 and 3 recorded lowest FCR values of 15.05 and 15.12 respectively. From the result of this study diet 2 (10% AL/20% WO) which gave the best average daily weight gain (126.19 g/day) and the best utilized diet (7.33) could be recommended for growing *Yankasa* rams.

Keywords: Birch, Leaves, Wheat, Offals, Growth, Performance.

INTRODUCTION

The estimate population of sheep, goat and cattle in Nigeria was 41.3 million, 72.5 million and 19.5 million respectively (FMARD, 2016). Small ruminants rearing in Nigeria like in any other developing world are important in supporting the livelihoods of poor resource farmers in terms of income generation and assets (Shittu, *et al.*, 2008). However, production of small ruminants is limited among other factors by inadequacy of year-round feed availability (Fasae, *et al.*, 2012). Attempts were made to augment animal feed deficits, which have become an increasingly critical component of the integrated food chain (FAO, 2004) of human and livestock need, which result in high cost and scarcity (Gebregiorgis *et al.*, 2011) as dry season progress, particularly, the conventional feedstuff (Ndemitso *et al.*, 2011). In addition, Nigeria has been classified as one of the vulnerable countries in terms of food security considering some silent factors that militate against her adequate food production especially in recent years. This has put the situation of these materials very critical in the country, which led to rises in the prices of the locally available feedstuff most especially the concentrates (Abubakar, *et al.*, 2015). Therefore, studies on alternative feedstuff to the conventional carbohydrate and protein sources are very important and very timely at this point (Abubakar, *et al.*, 2015).

In the Savannah zone of Nigeria, the basic diets of most ruminants in the dry season is based on crop residues and dry standing grasses on natural rangeland serves as the major sources of forages



for ruminant in Nigeria. While crop residues have imbalanced nutritional value and vary from year to year (Zemmelink, 1999), rangeland forages decline in both quality and quantity during the dry season, resulting in inadequate outputs of animal product for human consumptions (Bourn, *et al.*, 1994). There is the need to have a balance among the available feedstuff for optimum animal production. Therefore, it has become imperative to use agricultural by-products and fodder trees and/or shrubs in ruminants' nutrition to provide protein, minerals, vitamins and energy (Ickovoicz and Mbaye, 2001, Ouedraogo-Kone, 2008), which are relatively available in the Sudan savannah. As such, African birch and wheat offals are used as integral of supplements for this research. This research was, therefore, designed to study the effects of feeding various levels of *Anogeissus leiocarpus* and wheat offals on dry matter and nutrient intake and growth performance of growing *Yankasa* rams.

MATERIALS AND METHODS

Study Area

The study was conducted at Abubakar Tafawa Balewa University (ATBU) Teaching and Research farm Bauchi, Nigeria. Bauchi is strategically located between latitude 9.3⁰ and 12.3⁰ north of the equator. Longitudinally the state lies between longitudes 8.5⁰ and 11⁰ east of the Greenwich meridian and its vegetation zone is Sudan Savannah. Bauchi has a rainfall regime of 1,300 mm per annum, which starts in the month of April and ends in the month of October (BASGD, 2006).

Experimental Animals

About a month to the arrival of animals, experimental pens were cleaned, disinfected with *Rambo* (Pimethrin 0.60%) and labelled. Twenty (20) growing *Yankasa* rams approximately 12-20 months old were used for the experiment. On arrival the animals were weighed and averaged 17.20 kg and tagged for identification. The animals were quarantined for two weeks, during which they were treated with a broad-spectrum anthelmintic (Albendazole) against tape worms they were also vaccinated against **Petes des Petits Ruminantes** (PPR) and external parasites (Ivomestin) administered subcutaneously. During the quarantine period, feed and water were provided *ad libitum*. The animals were randomly divided into four groups of five animals each and kept in individual pens of 2.5 M X 2.0 M space in a completely randomized design (Steel and Torrie, 1980).

Experimental Diets and Animals Feeding

Four diets (16% Crude protein) were formulated using varying levels of African birch (*Anogeissus leiocarpus*) and wheat offals, such that the two ingredients collectively contributed 30% of the diets, other ingredients are cotton seed cake, maize offal, cowpea shell, bone meal and salt. The animals were allowed 14-day period of adaptation to confinement and feeds. During the experiment, feeding was done every morning at about 07:00 hours and 15:00 hours i.e. evening each day half at each time, an initially at approximately 10% in excess of individual consumption. Animals were provided good clean drinking water *ad libitum*. The feed and water intake of each animal were estimated. The animals were weighed at the beginning of the experiment and weekly thereafter. The experiment lasted for 84 days. Ingredients and chemical composition of the experimental diet are shown in Table 1 and 2.

Table 1: Ingredients Composition (%) of Experimental Diets

Ingredients (%)	T 1	T2	T ₃	T ₄
<i>Anogeissus leiocarpus</i>	0.00	10.00	20.00	30.00
Wheat offal	30.00	20.00	10.00	0.00
Maize offal	50.00	50.00	50.00	50.00
Cotton seed cake	12.50	12.50	12.50	12.50
Cowpea shell	5.00	5.00	5.00	5.00
Bone meal	2.00	2.00	2.00	2.00
Salt	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00

Growth Performance Evaluation

The Initial Body Weight (IBW) of individual animal was measured at the beginning of the trial, and then subsequently, on weekly basis. All measurement was done in the morning, before feeding, using a very sensitive weighing scale.

Also, the Daily Weight Gain, DWG was determined by measuring the initial and final body weights of the animals and their values difference was divided by the time frame. The Feed Conversion Ratio, FCR was computed using separation of weight gain from feed intake.

Chemical Analysis

The dry matter (DM) contents of experiment diets were determined by drying the sample in oven at 60⁰c for 48 hours the fibre fractions, Acid Detergent Fibre (ADF) and Neutral Detergent Fibre (NDF) were determined according to the method described by AOAC, (2005). Hemicelluloses contents were obtained by difference between NDF and ADF values (Church and Pond, 1982).

Statistical Analysis

Data obtained from the experiment were subjected to Analysis of Variance (ANOVA) in a complete randomized designed statistical package of social sciences SPSS version 21 (2012) Where there was significant difference between treatments the means were separated using Duncan Multiple Range Test (DMRT, 1952).

RESULTS AND DISCUSSIONS

Chemical Composition of Experimental Diets

The chemical composition of experimental diet was as presented in table 2.

Table 2: Chemical Composition of Experimental Diets

Parameters (%)	T1	T2	T3	T4
Dry matter	89.35	87.42	86.52	86.19
Organic matter	74.09	75.21	75.22	76.33
Crude protein	16.41	16.12	16.08	15.97
Ash	15.26	12.21	11.30	9.86
Neutral Detergent Fibre	39.52	42.65	44.22	45.77
Acid Detergent Fibre	30.68	32.69	34.73	36.52
Hemicelluloses	8.84	9.96	9.49	9.25

The result shows that dry matter was in the range of 86.19% in diet 4 to 89.35% in diet 1. Organic matter content was in the range of 74.09% in diet 1 to 76.33% in diet 4. Crude protein was in the range of 15.97% in diet 4 to 16.41% in diet 1. Ash ranged from 9.86% to 15.26% in diets 4 and 1 respectively. Neutral detergent fibre was in the range of 39.53% in diet 1 to 45.77% in diet 4. Acid detergent fibre was in the range of 30.68% in diet 1 to 36.52% in diet 4. Hemicellulose was in the range of 8.84% in diet 1 to 9.96% in diet 2.

Dry Matter and Nutrient Intake

Table 3 showed Dry matter and nutrient intake of *Yankasa* rams fed graded levels of *Anogeissus leiocarpus* leaves and wheat offals.

Table 3: Dry Matter and Nutrient Intake of *Yankasa* Rams Fed Graded Levels of *Anogeissus leiocarpus* Leaves and Wheat Offals.

Parameters (g/day)	Treatments				SEM
	T1	T2	T3	T4	
Total feed intake (g/day)	1006.97 ^c	1057.98 ^a	1035.24 ^b	1051.43 ^a	7.66*
DMI (g/day)	899.67	924.89	895.69	906.23	5.99
OMI (g/day)	666.57	695.61	673.74	691.73	4.97
CPI (g/day)	147.64	149.09	144.03	144.72	0.99
NDFI (g/day)	355.55 ^c	394.47 ^b	396.07 ^b	414.79 ^a	4.89*
ADFI (g/day)	276.11 ^c	302.35 ^b	311.07 ^b	330.96 ^a	5.46*



^{a,b,c}Means within each row with different superscripts are significantly different* ($P < 0.05$), T1-0% *A.leiocarpus*, T2-10% *A.leiocarpus*, T3-20% *A.leiocarpus*, T4-30% *A.leiocarpus*, DMI=dry matter intake, SEM= standard error mean, OMI-organic matter intake, CPI-crude protein intake, NDFI-neutral detergent fibre intake, ADFI-acid detergent fibre intake,

Total Feed Intake

The mean total feed intake obtained in the current study varied statistically ($P < 0.05$). Animals fed diets 2 and 4 (1057.98 g/day and 1051.43 g/day/animal) were similar and significantly higher than those fed diets 3 and 1 (1035.24 g/day and 1006.97 g/day/animal). and ranged from 1006.97 to 1057.98 g/day as shown in table 3, which was within the range of 959.95 to 1564.12 g/day/animal reported by Abubakar *et al.* (2015) for *Yankasa* sheep fed varying proportions of *Ficus polita* and *Pennisetum pedicellatum* supplemented with wheat offals. The result of the study was higher than those obtained by Abakura *et al.* (2017) (472.11 g/day) for goats fed browse mixture as supplement to sorghum stover. On the other hand, however, Jokthan *et al.* (2012) recorded slightly lower values of 815.41 to 865.32 g/day for *Yankasa* rams fed varied levels of *Acacia sayel del (Chenchilo)* leaf meal as a replacement for cotton seed cake.

Dry Matter Intake (DMI)

Dry matter intake values recorded in this study were statistically the same ($P > 0.05$) and ranged from 899.67 to 924.89 g/day. They were higher than that (480.01 g/day) obtained by Adamu *et al.* (2013) for *Yankasa* rams fed varying proportions of *Gmelina aborea* leaves. Garba *et al.* (2013) obtained DMI values 621.90 to 691.0 g/day/animal for *Yankasa* rams fed graded levels of *Tamarindus indica* leaves which was lower than DMI recorded in the present study.

Organic Matter Intake (OMI)

The organic matter intake recorded in this study did not vary and ranged from 666.57 to 695.61 g/day. It was lower than value reported by Abubakar *et al.* (2015) (828.82 to 924.23 g/day/animal) for sheep fed varying proportions of *Ficus polita* and *Pennisetum pedicellatum* supplemented with wheat offals.

Crude Protein Intake (CPI)

The crude protein intake (CPI) in the present study were similar ($P > 0.05$), which ranged from 144.03 to 149.09 g/day/animal is much higher than the 109 g/day reported by Hirut *et al.* (2011) for highland sheep fed urea treated maize stover. Jokthan *et al.* (2012) recorded a much lower 57.43 g/day/animal for sheep fed *Acacia sayel del (Chenchillo)* leaf meal as replacement for cotton seed cake. The higher CPI in the current study might have led to higher weight gain across the treatments for *Yankasa* rams.

Neutral Detergent Fibre Intake (NDFI)

The Neutral Detergent Fibre intake values in this study differed significantly ($P < 0.05$) across the diets. The NDFI values were higher for animals, fed diet 4 (414.79) while those fed diets 3, 2 and 1 had lower values (396.07, 394.47 and 355.55 g/day/animal) respectively. The values ranged between 355.55 and 414.79 g/day/animal which is comparable to the range of 315.37 to 393.70 g/day reported by Aime *et al.* (1999) for *Yankasa* rams fed sorghum straw based diet with supplement. The NDFI result is also similar to the value of 391.46 g/day/animal obtained by Abubakar *et al.* (2015) for *Yankasa* rams fed varying proportion of *Ficus polita* and *Pennisetum pedicellatum* supplemented with wheat offals.

Acid Detergent Fibre Intake (ADFI)

The Acid Detergent Fibre intake values in the current study were significantly ($P < 0.05$) different across the diets. The value was higher for animals fed diet 4(330.96 g/day) followed by those fed diets 3, 2 and 1 (311.07, 302.35, and 276.11 g/day/animal) respectively and ranged from 276.11 to 330.96 g/day/animal. This falls within to the range (305.00 to 323.00 g/day/animal) recorded by Hirut *et al.* (2011) for highland sheep fed urea treated maize stover.

Growth Performance of *Yankasa* Rams

The initial body weight of *Yankasa* rams fed experimental diet averaged in this study (17.20 kg). The highest final body weight recorded in this study was 28.40 kg.

Table 4: Growth Performance of *Yankasa* Rams Fed Graded Levels of *Anogeissus leiocarpus* Leaves and Wheat Offals

Parameters (kg)	Treatments				SEM
	T1	T2	T3	T4	
Initial body weight (kg)	17.40	17.80	16.80	16.80	0.34
Final body weight (kg)	22.40 ^b	28.40 ^a	21.80 ^b	24.20 ^b	0.81
Total weight gain (kg)	5.00 ^b	10.60 ^a	5.00 ^b	7.40 ^b	0.66
DMI (g/day)	899.67	924.89	895.69	906.23	5.99
Average daily weight gain g/day	59.52 ^b	126.19 ^a	59.52 ^b	88.09 ^b	7.98*
Feed conversion ratio	15.12 ^a	7.33 ^c	15.05 ^a	10.29 ^b	1.09*

^{a,b}, Means within each row with different superscripts are significantly different* (P<0.05), T1-0% *A.leiocarpus*, T2- 10% *A.leiocarpus*, T3-20% *A.leiocarpus*, T4-30% *A.leiocarpus*, DMI=dry matter intake, SEM= standard error mean

Average Daily Weight Gain (ADWG)

The average daily weight gain was significantly (P<0.05) higher in animals fed diet2 (126.19 g/day/animal) and lower for those fed diets 4, 3 and 1 (88.09, 59.52 and 59.52) respectively. The ADWG values ranged from 59.52 to 126.19 g/day/animal obtained in the present study correlated to the result obtained by Adamu *et al.* (2015) (86.31 to 110.01 g/day/animal) for *Yankasa* rams fed cowpea husk, urea and molasses treated with maize cobs it's also similar to the result obtained by Ashiru *et al.* (2017) (86.31 to 101.19 g/day/animal) for *Yankasa* sheep fed complete rations containing varying levels of ensiled sugarcane waste with poultry litter.

Feed Conversion Ratio (FCR)

The Feed Conversion Ratio (FCR) value was better for animals fed diet 2 (7.33) as compared to those fed diets 4, 1 and 3 with (10.29, 15.12 and 15.95) respectively. The values range obtained in the present study (7.33 to 15.05) were much higher than the range of 1.86 to 2.44 reported by Jokthan *et al.* (2012), indicating that the diets in treatment 2 (T2) was much more efficiently utilized than other treatments, T1, T3 and T4, efficiency might be due to the relatively higher nutrients composition in diet 2 and the consequent increased in body weight gain showing that, the diets that promote a high rate of gain will usually result in a greater efficiency than the remaining (T1, T3, T4) diets that do not allow rapid gain, since the total intake, maintenance and more of live weight gain were recorded in T2.

CONCLUSION AND RECOMMENDATION

It is therefore concluded that inclusion of up to 30% *Anogeissus leiocarpus* and wheat offals in the formulated diet had no adverse effects on performance of the animals, inclusion of 10% *Anogeissus leiocarpus* and 20% wheat offal in the diets gave the best daily weight gain (126.19 g/day/animal) and Feed Conversion Ratio (7.33).

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