



Original Article

**Effect of Feeding Different Supplements on the Performance of
Yankasa Rams Offered a Basal Diet of Groundnut Haulms**

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ABSTRACT

The experiment was conducted at the Department of Animal Science Teaching and Research Farm, Modibbo Adama University of Technology, Yola, Nigeria with 12 Yankasa rams aged 6-12 months and live weight of about 15.5-20.5kg. The experiment was a Completely Randomised Design in which the rams were randomly divided into 4 treatments with 3 animals per treatment. The treatments were: T₁ (groundnut haulms only *adlib*, control). T₂ (groundnut haulms *adlib* + Cotton Seed cake). T₃ (Groundnut haulms *adlib* + brewers waste). T₄ (Groundnut haulms *adlib* + maize bran). Inadequate quantity and quality of feeds during the dry season lead to reduced feed intake and weight loss of small ruminants in the tropics. Due to some constraints highlighted it calls for supplementation of feeds which will increase feed intake and reduce loss weight of small ruminants. The experiment lasted a period of 74 days plus two weeks adjustment period. Results showed that the highest dry matter intake and live weight gain (850.53g/head/day) and (96.4g/a/d) respectively was recorded in rams fed groundnut haulms supplemented with cotton seed cake. The highest dry matter digestibility (63.3%) was recorded in T₄ while Water intake ranged from 2.9 – 3.4 litre/head/day. Thus, Groundnut haulms supplemented with cotton seed cake is highly efficient in feeding small ruminants in the Zone.

Keywords: Adlib, Brewer's waste. Groundnut haulms, cotton seed cake, Maize bran, Live weight gain, Yankasa.

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INTRODUCTION

In most developing countries, ruminant animals suffer from under feeding especially during the dry seasons characterised by poor quality and unavailability of sufficient forage crops and farm waste. The available crop residues such as maize stover, corn cob, maize husk and cereal straws are not able to meet the nutritional requirements of ruminants (Ibrahim

and Yashim, 2014). During the dry season grazing land is scarce and pastures are deficient in energy, protein and minerals. This is worsened by inadequate alternative feeds during this critical period (Okello *et al.*, 2005). In the savanna zone of Nigeria the basal diets of most ruminants in the dry season is based on crop residues and dry standing grasses, most of the

diets are imbalanced in nutritional value and vary from year to year (Zemmelink, 1999).

In order to develop a sustainable ruminant production system, efforts should be directed to making the best use of local resources by adjusting the production system according to local conditions. The use of appropriate supplements and basal diets is a fundamental component of the feeding strategy in order to balance nutrients at the level of rumen and the animal (Lakpini, 2002).

Farmers do not have much knowledge on appropriate feed combination or variety of basal diets and supplements to feed ruminants in the Zone. In addition, because of the high cost of treatment of cereal crop residues with chemicals to improve their nitrogen content and its associated risks, and the reluctance of the local farmers to adopt the technology (Kiangi *et al.*, 1981) it has become very important to supplement groundnut haulm as basal diet. These basal diets are available and cheap to obtain in the Zone.

The seasonal effect (long dry season November – June) on native forages is another problem that leads to feed shortages since feeds are abundant only during the wet and will dry out in the dry season (Phanepaseuth and Inger, 1997). The objective of the research was to determine the dry matter intake, growth rate and appropriate feed combination for Yankasa Rams fed a basal diet of Groundnut haulms with different supplements (cotton seed cake, brewers waste and maize bran) in the Semi-arid Zone of Nigeria.

MATERIALS AND METHODS

Experimental Site

The study was conducted at the Teaching and Research Farm of the Department of Animal Science and Range Management, Modibbo Adama University of Technology, Yola in Adamawa State, located at the North Eastern part of Nigeria. It lies between latitude $9^{\circ} 14'$ North of the equator and longitude $12^{\circ} 38'$ East. Adamawa State is within the Sudan and Guinea Savannah Zones of West Africa and it is characterised by relatively short period of rainy season. The mean annual rainfall ranges between 700mm to 1,600 mm per annum and mean minimum temperature of 39°C (Adebayo, 1999).

Experimental Animals and Management

Twelve (12) Yankasa rams weighing between 18.5 – 20.5 kg and age between 6- 12 months were used. All the animals were fitted with neck bands for easy identification. Each animal was tethered to a peg with a short rope to its leg which allowed easy rotation of animals. Separate feeding and watering troughs and blocks of minerals licks were provided to each animal. The animals were quarantined for a period of two weeks during which they were dewormed with Banminth F against endoparasites. Animals of similar average weights were randomly allocated to 4 treatment combination of 3 animals per treatment arranged in a completely randomized design (CRD). The treatments were: T₁ groundnut hay only *adlib*, T₂ groundnut hay *adlib* + cotton seed cake, T₃ groundnut haulms *adlib* + brewers wastes and T₄ groundnut haulms *adlib* + maize bran. Each animal was offered 300 g of supplement daily in 2 allocations of 150g in the morning at 8:00 am and 150g at 3:00pm in the afternoon. The supplement was fed 30 minutes before the basal feed was given. The basal feed was fed *ad-libitum*. The leftovers were collected the following morning and weighed before fresh feed was offered. This was to determine feed intake. Animals were provided with fresh drinking water in graduated plastic containers. Amount of water consumed by each animal daily was recorded. Salt lick was provided *ad-libitum*. The experiment lasted for seventy four (74) days including two weeks of adaptation. The animals were weighed at the beginning of the experiment and subsequently at weekly intervals. The difference between the previous and the current weight gave the changes in live weight gain.

Digestibility Study

The digestibility study commenced after the end of the feeding trial. Four (4) rams were selected and confined in different metal metabolism crates to determine intake and digestibility of nutrients. One (1) ram was selected and each represented each treatment and the rams were fed the four (4) experimental diets. The same procedure of feeding and recording was done as that of feeding trial. The animals were weighed at the beginning and at the end of the experimental period. The crates had facilities for collection of faeces and urine

separately. Removable fine wire mesh on the floor of the crates trapped all the faeces and allowed passage of urine, which drained into a funnel placed much closed to the bottle below the crate in which urine was collected. The bottle contains 10mls of concentrated sulphuric acid to prevent decomposition of nitrogenous compounds in the urine by microorganism. Feeding and water troughs were fixed to the crate tightly. The animals were adapted for ten (10) days and the collection period was for seven (7) days. Total faecal output was collected daily, weighed and sub-sampled for chemical analysis.

Chemical Analysis

Feed samples collected were oven dried at 70°C to constant weight. The chemical composition for Crude protein (CP), Crude fibre, Ether extract (EE) and Ash were carried out according to AOAC (2004).

Statistical Analysis

Collected data were subjected to Analysis of Variance for completely Randomized Design.

Significant means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The chemical composition of the experimental diets is shown in Table 1. The dry matter (DM) content of groundnut haulms (91.6%) did not agree with the values (94.5%) reported by Yahaya *et al.* (2001), and the DM content of maize bran (91.7%) was higher than (90.6%) reported Yahaya *et al.*, (2001), brewers waste and cotton seed cake were close to those reported by Tuah *et al.*, (1985) The crude protein (CP) content of groundnut haulms (9.87%) is higher than 5.6 – 9.2% reported by FAO (1981) respectively. The 8.3% CP content of maize bran recorded was lower than 9.2% reported by Yahaya *et al.*, (2001) while that of cotton seed cake (36.5%) was lower than 43.28% reported by Ikrior and Fetuga (1985). The CP (12.7%) for brewers waste was higher than (11.2%) reported by Yahaya *et al.*, (2001).

Table 1: Chemical composition of experimental diets

Chemical Composition (%)	Supplementary			
	Basal Groundnut Haulms	Maize bran	Brewers waste	Cotton Seed Cake
	T1	T2	T3	T4
Dry Matter	91.60	90.70	94.30	93.40
Crude Protein	9.87	8.30	12.70	36.50
Crude fiber	24.20	10.40	4.30	14.00
Ether Extract	2.80	3.00	1.60	2.30
Ash	5.00	3.10	15.60	5.20
Nitrogen Free Extract	49.53	67.10	60.10	64.60

Table 2: Nutrient utilization of Rams fed groundnut haulms with different supplements

Indices	Treatments				SEM
	T1	T2	T3	T4	
Dry Matter intake (g/head/day)	766.70 ^c	850.53 ^c	775.56 ^{dc}	797.08 ^c	0.41
Water intake (litre/head/day)	2.90 ^a	3.40 ^a	3.10 ^a	3.40 ^a	0.23
Dry Matter Digestibility (%)	53.96 ^a	57.10 ^{ab}	57.40 ^{ab}	57.40 ^a	0.32
Crude Protein Digestibility (%)	63.80 ^a	68.10 ^a	64.10 ^a	60.30 ^a	0.42
Crude Fibre Digestibility (%)	54.10 ^c	56.10 ^b	59.10 ^b	56.10 ^{ab}	0.30

Means within the same row and with same letters are not significantly different (<0.05). BW= Brewer's waste, MB=Maize bran, CSC= Cotton Seed Cake

T1 = Groundnut hay only, T 2= Groundnut + CSC, T3 = Groundnut hay + BW, T4 = Groundnut hay + MB

Table 3: Nutrient utilization of Rams fed groundnut hay with different supplements

Indices	Treatments				SEM
	T1	T2	T3	T4	
Initial weight (kg)	19.00 ^a	19.00 ^a	19.10 ^a	19.10 ^a	0.10
Final weight (kg)	24.20 ^b	24.50 ^{ab}	22.80 ^c	24.30 ^b	0.21
Mean weight gain (kg)	5.20 ^{cd}	5.40 ^c	3.70 ^d	5.30 ^c	0.20
Daily weight gain (g)	66.07 ^c	96.40 ^c	92.90 ^c	94.60 ^d	7.49

Means within the same row and with the same letter are not significantly different (p>0.05)

T1 = Groundnut hay only, T2= Groundnut + CSC, T3 = Groundnut hay + BW, T4 = Groundnut hay + MB

The ether extract (EE) percentage of groundnut haulms (2.8%) was higher than 1.5% reported by Yahaya *et al.*, (2001) while that of maize bran (3.0%) was within the range of 1.5% and 6.1% reported by Njei and Reid (1995). The ash content (5.0%) for groundnut haulm was higher than 2.5% reported by Yahaya *et al.*, (2001) and ash content of maize bran (3.10%) is slightly higher than 2.4% reported Njei and Reid (1995), the ash content of cotton seed cake (5.20%) was lower than that reported by Adegbola (2002).

The crude fiber content in groundnut haulms (24.20%) was similar to 24.4% reported by Yahaya *et al.*, (1999). The CF for maize bran (10.40%) was lower compared to Yahaya *et al.*, (1999). The crude fiber percentage for brewers waste was lower (4.30%) while cotton seed cake (14.00%) was higher than 11.32% as reported by Siulapwa and Simukoko (2001). The EE (1.6%) for brewers waste agrees with Yohanna and Nyako (2012) and the EE (2.3%) for CSC was lower than (23.9%) reported Yohanna and Nyako (2012). The Ash content (15.6%) for brewers waste was higher than (5.2%) revealed Yohanna and Nyako (2012)

The NFE (49.53%) for groundnut haulms in contrast with 45.00% reported Smith (2001). The NFE (67.10%) for maize bran was higher than (54.2%) opined Nyako *et al.*, (2012) while the NFE for brewers waste (60.0%) was higher than (40.1%) revealed Nyako *et al.*, (2012). For the CSC the NFE as shown in Table 1, a value of 64.6% was reported which was higher than 47.2% (Nyako *et al.*, 2012)

The results of the dry matter intake (g/head/day) of the diets of rams fed groundnut haulms are shown in Table 1. The dry matter intake between the treatments given to Yankasa Rams ranges within 766.70 to 850.53g/head/day. The highest DMI was recorded (850.53g/head/day) in T2 while least dry matter intake was recorded in T1 (766.7g/head/day). This experiment shows that rams supplemented consumed more feeds than the unsupplemented. The results supported the report of (Nyako *et al.*, 2012) who recorded a significant ($p < 0.05$) increased in DMI (118g/head/day) when Yankasa rams were fed a basal diet of Gmelina leaves hay supplemented with cowpea hay as against the unsupplemented (66.6g/head/day). The authors observed that the DMI of the diet and efficiency of its utilisation is

largely determined by essential nutrients absorbed by the animals. The presence of cotton seed cake in T2 could also have influenced intake. Yahaya *et al.*, (1999), had reported positive effective of cotton seed cake on intake in the diet of ruminants. Similarly, supplementation of 175g of cowpea hay to a basal diet of Gamba grass fed *ad lib* to Yankasa rams was reported by Nyako *et al.*, (2012) to have significantly ($p < 0.05$) increased DMI (441.9g/head/day) as compared to those rams that were not supplemented (226.6g/head/day). Also, the authors reported an increased in organic matter intake (411.7g/head/day) in the supplemented rams as against (209.4g/head/day) in the control; and an increased in Crude protein intake (51.7g/head/day) compared to unsupplemented (25.2g/head/day). This is in consistent with the reports of Bailey and Sim (1998) that an increase in organic matter intake in sheep fed diet supplemented improved palatability of the basal diet thereby increasing dry matter intake. The increased dry matter intake and growth rate of rams suggested that supplementation improved the nutritive value of grass and crop residues. This could be accounted for by the higher CP content and digestibility of supplemented diets compared to control diets.

Daily water intake ranged from 2.9 – 3.4 litres/head/day with T2 and T4 having the highest (3.40 litres/head/day) while T1 had least (2.9 litres/head/day) water intake. Thus, supplemented rams had increased daily water intake than rams on the control (unsupplemented). The range of values recorded in this study (2.9 – 3.4 Litre/head/day) was within 2.0- 3.0 Litres/head/day reported by ARC (1984). All the rams performed better in terms of water intake as compared to control, showing that the supplements increased DMI and ultimately more water was consumed.

The DM digestibility across the treatments T1, T2, T3 and T4 based diets (Table 2) were good and ranged from 53.96% to 57.40%. The low DM digestibility in T1 could be associated with low rate of degradation (Okoruwa *et al.*, 2013) of nutrients in the treatment (T1). The DM digestibility values of the present study were lower than the values (65.2%) reported (Yahaya *et al.*; 2001) when the authors fed Groundnut haulms and supplemented with maize offal. Supplementation increases the digestibility of feeds which is in agreement with Hossain *et*

al., (2003) who reported an increased in dry matter digestibility, organic matter and crude fibre.

The crude protein digestibility of groundnut haulms fed to rams with different supplements varied from 60.0% to 68.10% (Table 2). Crude protein digestibility was significantly ($p < 0.05$) affected across dietary treatments with Yankasa rams on T2 being significantly ($p < 0.05$) higher (68.10%) than those on T1, T3 and T4, respectively. The CP digestibility value of this experiment almost agrees with the value (67.2%) reported (Yahaya *et al.*, 2001) when the authors fed Groundnut haulms and supplemented with maize offal.

Crude fibre (CF) digestibility values were 54.0%, 56.0%, 59.0% and 56.0% for treatments T1, T2, T3 and T4, respectively with Yankasa rams on dietary treatment T3 being significantly ($p < 0.05$) highest followed by T2 and T3 and T1 was the least, (Table 2). Crude fibre digestibility followed a similar trend with DM digestibility showing that DM digestibility of the diets were largely a reflection of fibre digestibility in the diets and improved microbial activity in the rumen (Okoruwa *et al.*, 2013) (of rams on treatments T2, T3, T4 and T1), respectively. This present study falls within (58.0%) reported Yahaya *et al.*, (2001) when the authors fed Yankasa rams a basal diet of groundnut haulms supplemented with maize offal. Fibre digestibility increased in all the treatments where basal feeds were supplemented. This result agrees with the findings of Owen (1993), who reported increased crude fibre digestibility with supplementation. Hence, rams supplemented with CSC, MB and BW had higher digestibility values and better performance. The high digestibility values (more than 55% for dry matter, crude fibre and crude protein) obtained in this experiment for the nutrients in all the diets, suggest that the basal diet and all the supplements are highly degraded in the rumen.

Daily live weight gain of rams fed groundnut haulms is shown in Table 3. The mean live weight gain ranged from 66.07 to 96.40 g/head/day with a significant difference among all the treatments. Rams fed Groundnut haulms supplemented with cotton seed cake T2 (96.40g) recorded the highest daily live weight gain, followed by T4 (94.60g), T3 (92.90g) and T1 (66.07g) was the least. The higher live weight

gains observed in Yankasa rams on dietary treatments T2, T4 and T3 was an indication of nutrient intake from the diets that were well utilized consequently improved total live weight gain (Okoruwa *et al.*, 2013). The value (96.40g/head/day) agrees with (90.0g/head/day) revealed Yahaya *et al.*, (2001) where the authors fed groundnut haulms supplemented with cotton seed cake to Yankasa rams. The observed values (92.90 to 96.40g/head/day) fall within (80.0 to 93.0g/head/day) previously reported for Yankasa ram fed Gamba grass supplemented with cowpea vines (Nyako *et al.*, 2012). An increase in the live weight gain of the rams indicated that nutrients in the diets were adequate for growth performance. The results of this experiment are in line with the report of Siulapwa and Simakoko (2001) who observed nitrogen source supplements increased growth rate of ruminants.

CONCLUSION AND RECOMMENDATION

This experiment revealed that Groundnut haulms *adlib* supplemented with 150g (Morning) and 150g (evening) cotton seed cake is sufficient for better dry matter intake, daily live weight gain and water intake. Therefore it is recommended that groundnut haulms should be supplemented with cotton seed cake for small ruminants feeding in the zone

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