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Effect Of Feeding Different Supplements On The Performance Of Yankasa Rams Offered A Basal Diet Of Cowpea Hay In The Semi Arid Region Of Nigeria.

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ABSTRACT

The research was conducted at the Department of Animal Science Teaching and Research Farm Modibbo Adama University of Technology, Yola, Nigeria. A total of 12Yankasa rams aged 6-12 months and weighed 15.5-20.5kg were studied. The rams were randomly divided into 4 treatments of 3 animals/treatment in a completely randomised design (CRD). The treatments were :T_1 (cowpea hay only *adlib*, control), T_2 (cowpea hay *adlib* + cotton seed cake), T_3 (cowpea hay *adlib* + brewers waste) and T_4 (cowpea hay only *adlib* + maize bran). Inadequate quantity and quality of feeds during the dry season lead to reduced feed intake and weight loss in small ruminants in the tropics. Therefore it calls for supplementation of feeds which will increase feed intake and reduce loss weight of small ruminants. The research aimed at evaluating the dry matter intake, water intake, weight gain and appropriate feed combination of feeding small ruminants in the Semi-arid Region. The research lasted for 74 days plus adjustment period of two weeks. Results showed that the highest dry matter intake (947.7g/a/d/) was recorded in rams fed cowpea hay supplemented with cotton seed cake while the lowest (844.69/h/a/d) was obtained in rams fed cowpea hay only. The dry matter digestibility ranged from 52.4% - 61.7%, CF varied from 51.0%-59.3% and CP digestibility ranged between 60.3% -68.2%. The highest live weight gain (115.3g/h/d) was recorded in those rams that were fed cowpea hay supplemented with cotton seed cake and the least in T_1 (control 85.7g/h/d). Water intake ranged from 2.9 – 3.4 lit/h/d. Cowpea hay supplemented with cotton seed cake is highly recommended for feeding small ruminants in the Region because these feed combinations gave highest dry matter intake and live weight gain.

KEY WORDS: *Adlib, Brewer's waste(BW). Cowpea hay, cotton seed cake(CSC) Maize bran(MB), Live weight gain, Yankasa,*

INTRODUCTION

Forages have always provided the base upon which ruminants nutrition is built. Ruminants can utilize a wide range of feed resources but the bulk of their feeds come from forages hence they are primarily considered as forage consumers. In the tropics the natural pasture which supply the bulk of ruminants' feed becomes dry and of low nutritive value during the dry season leading to a marked decrease in voluntary intake and digestibility Yusuf *et al.* (2013).

The low productivity of sheep among smallholder farmers during the dry season due to seasonality of the major feed resources which is the natural grassland has become a serious problem (Fasae, 2014). 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 in 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). Little information is available on appropriate feed combination of variety of basal diets and supplements to ruminants in the Region. Due to 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 cowpea hay as a basal diet and this basal diet is available and cheap to obtain in the region after farm harvest.

The objective of the research was to determine the effect of feeding different supplements (cotton seed cake, maize bran and brewers waste) to a basal diet of cowpea hay on dry matter intake, growth rate and appropriate feed combinations of Yankasa Rams in the semi-arid region of Nigeria.

Materials and Methods

Study Area: The study was conducted at 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 9^0 14^1 North of the equator and longitude 12^0 38^1 East. Adamawa State is within the Sudan and Guinea Savannah Zones of West Africa and it's characterised by relatively short period of rainy season. Rainy season commences in April and ends in late October while dry season commences in late October and ends in April. The mean annual rainfall ranges between 700mm to 1,600 mm and mean minimum temperature of 39^0C (Adebayo, 1999).

Experimental Animals

A total number of twelve (12) Yankasa rams that weighed between 18.5 – 20.5 kg and aged between 6- 12 months were used for the study. The rams were given prophylactic treatments, made up of intra-muscular injection of Oxytetracycline (LA: 1ml/10kg body weight). They were dewormed with Banminth F^R (12.5g/kg body weight) and bathed with $Asuntol^R$ powder solution (3g/litre of water) to remove ectoparasites.

Treatments and experimental design

Animals of similar average weights were randomly allocated to 4 treatment combinations of 3 animals/ treatment arranged in a completely randomized design (CRD). The treatments were: T_1 Cowpea hay only *adlib*, T_2 cowpea hay *adlib* plus cotton seed cake, T_3 cowpea hay *adlib* plus brewer's wastes and T_4 cowpea hay *adlib* plus maize bran.

Housing and Management

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; it was to stimulate the activities of microorganisms so as to act on the basal feed properly. Feed refusals were collected, weighed and recorded. Fresh drinking water was provided in graduated plastic containers. Amount of water consumed by each animal daily was recorded. Salt lick was provided *ad libitum*.

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 change in live weight gain. The rams were provided with separate feeding and drinking troughs. Each pen was kept very clean off from faeces and urine.

Digestibility study

The digestibility study commenced after the end of the feeding trial. Four (4) rams were selected and confined in metal metabolism cages to determine the intake and digestibility of nutrients. The cages were designed to facilitate the collection of urine and faeces separately. .Wire mesh served as the floor which allowed the animals to stay comfortably. The urine was collected into a funnel which was kept below the cage. The bottle had 10mls of concentrated sulphuric acid which prevented decomposition of nitrogenous compounds in the urine by microorganisms. Feeding and drinking troughs were kept firmly by the sides of the cage. The rams were adapted for 10days and collection period was for 7 days, feed offered and refusals were weighed daily. Total faecal output (10g) and (15mls) of urine were collected daily, weighed and stored in a deep freezer for subsequent chemical analysis.

Feed samples collected were oven dried at 70^0C to contant weight. The chemical composition for Dry matter (DM), Crude fibre (CF) crude protein (CP), 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 compared using Duncan's New Multiple Range Test (Duncan, 1955).

Results and Discussion

Table 1: Chemical composition of experimental diets

Chemical Composition(%)	Basal Cowpea Hay	Supplementary		
		Maize bran	Brewers waste	Cottonseed Cake
	T1	T2	T3	T4
Dry Matter	91.70	90.70	94.30	93.40
Crude Protein	14.00	8.30	12.70	36.50
Crude fiber	28.00	10.40	4.30	14.00
Ether Extract	2.00	3.00	1.60	2.3
Ash	5.60	3.10	15.60	5.20
Nitrogen Free Extract	42.10	67.10	60.1	64.60

The chemical composition of the experimental diets is shown in Table 1. The dry matter (DM) content of cowpea hay (91.7%) slightly agrees with the values (91.5%) reported by Nyako *et al.* (2012). The DM content of maize bran (90.70%) was higher than (90.6%) reported by Yahaya et *al*. (2001). The DM content of brewer's waste (94.30%) was close to (93.5%) reported by Siulapwa and Simukoko (2001). While the DM content for cotton seed cake (93.4%) tallies with (93.0%) revealed Addass,(2011). Also, the CP (36.50%) for CSC obtained in Table 1 was lower than (41.o%) opined Addass (2011) and CF for CSC(14.0%) recorded in Table 1was higher than (11.0%) revealed Addass (2011). The EE content of cotton seed cake (2.3%) did not agree with (1.5%) reported by Addass(2011) and the NFE (64.6%) was lower than(60.5%) reported Siulapwa and Simukoko(2001). The CP (12.70%) for brewers waste was higher than (11.3%) opined Yohanna and Nyako (2012). The CF for brewers waste (4.3%) was higher than (1.3%) revealed Yohanna and Nyako (2012) while the EE for brewers waste (1.6%) tallies with (1.6%) Yohanna and Nyako (2012) and the Ash content for brewers waste (15.6%) agrees with (15.6%) Yohanna and Nyako (2012)

. The crude fibre value of cowpea hay (28.0%) was within 25-30% reported Smith (2001). The CF of maize bran (10.4%) was lower compared to 11.2% reported by Yahaya *et al.* (2001). The crude protein (CP) content of cowpea hay (14.0%) is much higher than (10.7%) reported by Yahaya *et a*l. (2001). That of maize bran (8.30%) was lower than (9.2%) opined Yahaya *et al.(*2001) , while that of cotton seed cake (36.5%) was lower than 43.28% reported by Ik urior and Fetuga (1985). The Ether extract (EE) percentage (2.0%) of cowpea hay was almost similar to (2.1%) reported by Yahaya *et al*.(2001),The ether extract (EE) percentage of maize bran (3.0%) was within the range of 1.5% and 6.1% reported by Njei and Reid (1995). The ash content of maize bran (3.1%) is slightly higher than 2.4% reported Njei and Reid (1995); the ash content of cotton seed cake (5.2%) was lower than that reported by Adegbola (2002). This Ash content of cowpea hay in Table 1 shows a figure of 5.6% which was lower than 8.10% revealed by Smith (2001). The NFE (42.10%) as shown in Table 1 did not tally with 45.0% reported Smith (2001).

Dry matter intake

The results of the dry matter intake (g/h/day) of the diets of rams fed cowpea hays are shown in Table 1. The dry matter intake obtained showed a significant difference ($p<0.05$).Yankasa Rams on cowpea hay supplemented

with cotton seed cake recorded the highest value (947.69g/h/d) while those on control diet, that is ,no supplementation, had the least value (844.69g/h/d). This is comparable with the values (870g/h/d) reported by Yahaya *et al.(*2001) whenYankasa rams were fed cowpea hay and supplemented with maize offal. A positive effect on supplementation was previously reported by Nyako *et a*l. (2012) when the authors recorded a DMI of Yankasa rams fed Gamba grass supplemented with cowpea vines ranging from 318.5g/h/d to 441.9g/h/d. The result of this study shows that rams supplemented consumed more feeds than the unsupplemented. This is in consistent with the reports of Bailey and Sim (1998) that an increase of organic matter intake in sheep fed diets supplementation improved palatability of the basal diet thereby increasing dry matter intake.

Table 2: Performance of Rams fed cowpea hay with different supplements.

INDICES	TREATMENTS				
	T1	T2	T3	T4	SEM
Dry Matter intake (g/d)	844.69^{c}	947.69^{a}	850.49^{c}	883.18^{b}	0.40
Water intake (litre/day)	2.90^{a}	3.40^{a}	3.20^{a}	3.30^{a}	0.23
Dry Matter Digestibility (%)	52.40^{b}	61.70^{a}	59.30^{a}	59.30^{a}	0.31
Crude Protein Digestibility (%)	60.50^{a}	68.10^{a}	63.30^{a}	68.20^{a}	0.47
Crude Fibre Digestibility (%)	51.00^{c}	59.30^{a}	56.80^{b}	57.1^{ab}	0.31

Means within the same row and with same letters are not significantly different (<0.05)

T1 = Cowpea hay only *adlib*

T 2= Cowpea hay *adlib*+ CSC

T3 = Cowpea hay *adlib*+ BW

T4 = Cowpea hay *adlib* + MB

Dry matter digestibility of rams fed cowpea hays with different supplements is presented in Table 2. The digestibility across the treatments T1, T2, T3 and T4 were good and ranged from 52.40% to 61.70%. The highest dry matter digestibility (61.70%) was obtained where cowpea hay was supplemented with cotton seed cake while the lowest was recorded in rams fed cowpea hay only i.e. control (52.4%). The value reported in the present study was comparable with (61.70%) revealed by Yahaya *et al.*(2001) when cowpea hay was supplemented with maize bran; a previous higher value (77.4%) was recorded by Nyako *et al* .(2012) where the authors offered a basal diet of Gamba grass and supplemented with cowpea hay to Yankasa rams. This result indicates that supplementing the basal diet had significant difference ($p<0.05$) on dry matter digestibility. Supplementation increases the digestibility of feeds which is in agreement with Hossaain *et al.* (2003),who reported an increased in dry matter digestibility, organic matter and crude fibre .

Crude protein digestibility was significantly ($p<0.05$) affected across dietary treatments with rams onT2 being significantly ($p<0.05$) higher than those on T3 and T1 (Table 2). The highest crude protein digestibility was obtained in rams fed cowpea hay supplemented with maize bran (68.2%) and cotton seed cake; while the lowest was recorded in rams fed cowpea hay only control (60.5%). The crude protein digestibility values obtained in

this study was lower (78.7%) than what was recorded by Nyako *et al* (2012). Similarly, the result obtained from this study was within the value (66.2%) reported by Yahaya *et al*., (2001), where Yankasa rams were fed cowpea hay supplemented with maize bran.

Crude fibre(CF) digestibility values recorded were 51.00,.59.30,56.30 and 57.10% for treatments T1,T2,T3 and T4 respectively with Yankasa rams on dietary treatment T2 (59.30%)being significantly ($p<0.05$) highest, followed by T4(57.10) , T3(56.80%) and T1(51.30%) was the least. 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). This present study falls within (50.9.0%) reported by Yahaya *et al*. (2001) when the authors fed Yankasa rams a basal diet of cowpea hay 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 an increase in crude fibre digestibility with supplementation (Table 2).

Water intake

Table 2 shows the daily water intake ranging from 2.9 – 3.4 litres/h/d for Yankasa rams fed cowpea hay with different supplements. Animals fed cowpea hay + cotton seed cake had the highest (3.4lit/h/d) water intake, while rams on fed cowpea hay only (2.9lit/a/d/) recoded the lowest water intake. There was an increased in daily water intake recorded in those rams that were supplemented than control (unsupplemented). The range of values recorded in this study (2.9 – 3.4 L/day) was within 2.0 3.0 L/d 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.

Live weight gain

The daily live weight gain of rams fed cowpea hay with different supplements (Table 3) showed a significant difference ($p<0.05$) ranging from 66.07 to 115.3g/h/d. These values were comparable to values ranging from 80.0 – 93.0g/head/day for Yankasa rams fed cowpea vines as supplement to Gamba grass (Nyako *et al* ; 2012).The daily live weight gain was high in rams fed cowpea hay supplemented with cotton seed cake. An increase in the weight 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 that nitrogen source supplements increased growth rate. Treatment T_2 had the highest daily live weight gain, showing that CSC with high dietary nitrogen (CP) served as the best supplement in this study. Similarly, previous reports by Ajiji *et al*.(2013) revealed a significant ($p<0.05$) higher live weight of Yankasa rams fed Gamba grass hay supplemented with acacia pods was recorded.

Table 3: Growth performance of Rams fed cowpea hay with different supplements.

INDICES	TREATMENTS				
	T1	T2	T3	T4	SEM
Initial weight (kg)	19.10^{a}	19.10^{a}	19.00^{a}	19.00^{a}	0.10
Final weight (kg)	23.90^{b}	26.02^{a}	24.00^{a}	25.30^{a}	0.20
Mean weight gain (kg)	4.80^{cd}	6.92^{a}	5.0^{b}	6.20^{b}	0.21
Daily weight gain (g)	86.70^{d}	86.70^{d}	89.30^{cd}	110.70^{d}	3.74

T1 = Cowpea hay only

T 2= Cowpea hay + CSC

T3 = Cowpea hay + BW

T 4= Cowpea hay + MB

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

Conclusion and recommendation

It can be concluded that supplementation of cowpea hay increase dry matter intake, live weight gain and digestibility of Yankasa rams. Therefore cowpea hay fed *adlib* supplemented with 150g(morning) and 150g(evening) of cotton seed cake is recommended for feeding small ruminants in the semi-arid zone because it gave a better performance in terms of dry matter intake and growth rate

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