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Performance of Yankasa RAM lambs fed graded levels of RMW and SBMR combination in the semi-arid zone, Nigeria

M.G. Garba^{a,*}, S.A. Maigandi^b, I.R. Muhammad^c

^aDepartment of Animal Production and Health, Federal University Dutsin-ma, Katsina State- Nigeria.

^bDepartment of Animal Science, Usmanu Danfodiyo University, Sokoto-Nigeria.

^cDepartment of Animal Science, Bayero Univeristy, Kano- Nigeria.

*Corresponding author; Department of Animal Production and Health, Federal University Dutsin-ma, Katsina State- Nigeria +234(0)8034655789.

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ABSTRACT

This experiment was conducted at Bayero University Kano, to determine the performance of Yankasa ram lambs fed complete diet containing graded levels of SBMR and RMW at 5, 10, 15 and 20% representing treatments B, C, D and E, respectively. Treatment A served as the control with 0% inclusion of both SBMR and RMW. Twenty entire males Yankasa ram lambs with an average weight of $14.3 \pm 0.03\text{kg}$ were used for the study. Results obtained revealed that incorporation of RMW and SBMR in the diets of growing Yankasa ram lambs up to 20% gave impressive output. Although significant differences were not recorded ($P > 0.05$) between all the treatments in respect of average daily gain (ADG), diet C (10% inclusion) recorded the highest mean. The Dry matter, Crude fibre and Crude protein digestibility significantly ($P < 0.05$) increased gradually up to 20% inclusion level from the control diet (0% inclusion). Similarly cost of production was significantly ($P < 0.05$) lower for diet E (20% inclusion). It is concluded that feeding combination of RMW and SBMR to growing Yankasa ram lambs up to 20% inclusion level improved performance and reduced cost of production.

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1. Introduction

Africa has a population of 205 million sheep, representing approximately 17% of the world total population (FAO, 1990). In Nigeria, there are about 22 million sheep (Rim, 1992). About 75% of African Livestock are associated with small holders and Agro pastoral farming systems (Akpa *et al.*, 2008). In Nigeria, sheep and goats production bears a serious neglect over the years. Sheep are raised extensively on natural grazing lands, crop residues, farm weeds and sometimes supplemented with agro-industrial by-products. Under extensive management system, supplementation has frequently being advocated as the main solution to nutritional constraint faced by livestock during the long dry season (Malami *et al.*, 2006).

Feed resources for ruminants are mainly from native rangelands complemented by crop residues from farmlands (Alhassan *et al.*, 1983). Same author reported that, 50 million tonnes of crop residues are available in Nigeria annually. The cereals crop residues are produced in large quantities but are high in lingo-cellulose and low in readily available carbohydrates and nitrogen (Leng, 1990). Grasses, leaves and Agricultural waste products form important part of ruminant animals' diets in the tropics especially in rural areas where ruminant animals are the major sources of protein (Onwuka *et al.*, 1991). Studies further revealed that grasses alone do not possess adequate nutrients for optimum production of sheep and goats (Mc Donald *et al.*, 1995). Feed supply has remained a major constraint in animal production due to the ever-increasing cost of conventional feedstuffs occasioned by the competition between man and livestock for cereals grain (Ahamefule *et al.*, 2002). The need to harness the potential of the numerous agro-industrial by – products and wastes as a replacement for expensive feedstuffs have been advocated.

In Nigeria, waste recycling has received little attention over the years and conventional animal feeds have remained unaffordable to low income livestock farmers because of high cost (Smith, 1988). The high cost of feeds stimulates the need for alternative feed resources that can economically replace the conventional feed ingredients used in ration formulation without any adverse effect on health and performance of animals (Smith, 1988).

Conventional feeds for ruminant livestock show marked variation in availability, cost and quality, while crop residues capable of serving as alternate feed resources have not been fully utilized (Etela *et al.*, 2008). The increasing cost of conventional feedstuffs coupled with high demand of grains for human consumption has stimulated interest in the use of unconventional, readily available, and cheaper sources of feedstuff in animal ration.

The combination of Rice milling waste (RMW) and Soyabean meal residue (SBMR) will yield a better result considering the fact that Rice Milling Waste (RMW) is a poor source of protein but provide bulkiness and to some extent energy as well as its cheapness. Rice is principally produced for human consumption, and large amount of straw are left on the field after harvest. The production target for rice in Nigeria by the year 2010 is 11,52,000 tones (Shuaib *et al.*, 1997). Rice milling waste is obtained from rice milling centres in areas where rice is produced in large quantity. In order to improve the digestibility of Rice Milling waste and enhance its utilization it could be fed in combination with legume such as soyabean meal residue. Invariably, Soyabean meal residue (SBMR) is rich in protein and available. Extracted soyabean meal has an average protein content of 44% and the protein is the best balance in respect of amino acids of all the normal vegetable sources (Feltwell and Fox, 1980). Same authors reported that soyabean meal is made from the residues of whole beans following extraction of the oil. The yield of soyabean meal from the whole beans amounts to about 60% (Feltwell and Fox, 1980).

Ruminant animals feeding in the dry season especially in the sudan savanna zone is a challenging issue. This simple factor has a lot of negative effect on the productivity of the animals. One of the major and cheap sources of feeding ruminant in the dry season is by using agro-industrial by-products mainly obtained from cereal processing.

Muhammad (2005) reported that Rice milling waste is an agro-industrial by-product found in large quantities in areas where rice is produced abundantly. Kano is one of the areas where rice is produced in large quantities and most of the rice is processed within the area. Accumulation of rice milling waste will pose environmental problem such as blockage of drainages in areas where it is processed, resulting in flood especially during rainy season.

Rice husk and Rice bran constitute 15.7 and 6 – 10 % - respectively of the paddy depending on the efficiency of the milling (Devendra, 1989). Rice Milling Waste (RMW) was analysed and found to contain substantial amount of nutrients (Abubakar 2003). Same author reported that the crude protein and energy contents of Rice Milling Waste were 11.5% and 2100 kcal/kg respectively with 12.5% fibre. In another report (Obeke, 1985) reported that Rice Milling Waste (RMW) has a crude protein content of 6.2%, crude fibre of 37.0%, ash content of 20.2% and energy value of 1131kcal/kg.

Soyabean Meal Residue is the by-product of soyabean after all the milk has been removed. The report on the utilization of Soyabean Meal Residue (SBMR) is limited (Feltwell and Fox, 1980). In their raw state soyabeans are unsuitable for animal feeding because of the presence of growth-inhibiting factors. However, the factors can be overcome by proper processing which is referred to as cooking or roasting (Feltwell and Fox, 1980).

Researches have been conducted on the uses and utilization of RMW alone by sheep, yet no report on the effect of Rice Milling Waste (RMW) in combination with Soyabean Meal Residue (SBMR) when fed to Yankasa Sheep in the Sudan Savanna zone of Nigeria. Therefore, growth performance, cost of feed per Kilogram live weight and digestibility of Yankasa Ram Lambs fed combination of RMW and SBMR were determined

2. Materials and methods

2.1. Experimental Location

This study was conducted at the Livestock Teaching and Research Farm of Bayero University, Kano. The Farm is located at the New Campus of the University in Ungogo Local Government Area (LGA) of Kano State. Kano lies on longitude 9° 30' and 12° 30' North and Latitude 9° 30' and 8° 42' East. The area characterized by tropical wet and dry climate with tropical type of vegetation, which, composed of a variety of trees (Ahmed, 1998). The wet season is from May to September and dry season from October to April. Annual rainfall and temperature (minimum and maximum) ranges between 787 mm and 960 mm and 21°C and 39°C respectively (KNARDA, 2001).

2.2. Experimental animals and their management

Twenty (20) growing entire Yankasa Rams Lambs with average live weight of 14.3kg±0.03 were used for this study. The animals were selected from the university sheep flock. Before the commencement of the study, the experimental animals were flushed with groundnut hay for two weeks and dewormed with albendazole bolus (12.5mg/kg body weight) and sprayed with asuntol against the ecto parasites.

2.3. Experimental feed preparation

Rice Milling Waste (RMW) and Soyabean Meal Residue (SBMR) were purchased from Rice processing centres in Kano State and local soyabean cheese/meat makers respectively. Both ingredients were sun dried and packed in sacks for future use. Other feed ingredients such as cotton seed cake, groundnut hay, maize, wheat offal, cowpea husk, bone meal, and salt were purchased from different centres in the metropolis. Five complete experimental diets were formulated at different inclusion levels of 0, 5, 10, 15 and 20% each for both RMW and SBMR. The experimental diets were designated as treatments A, B, C, D and E respectively. The gross compositions of the experimental diets is shown in Table 1

Table1
Gross Composition of the experimental diets

Ingredient (%)	Experimental diets				
	a	b	c	d	e
RMW	0.0	5.0	10.0	15.0	20.0
SBMR	0.0	5.0	10.0	15.0	20.0
Maize	9.0	10.0	10.0	9.0	7.0
Wheat offal (WO)	30.0	26.0	23.0	17.0	16.0
Cowpea husk	15.0	10.0	5.0	4.0	0.0
Cotton seed cake (CSC)	22.0	19.0	17.0	18.0	15.0
Groundnut hay	22.0	23.0	23.0	20.0	20.0
Bone meal (BM)	1.0	1.0	1.0	1.0	1.00
Salt	1.0	1.0	1.0	1.0	1.00
Cost (N/kg)	34.08	33.43	32.58	30.07	30.01
Total	100	100	100	100	100

2.4. Experimental Design

Randomized complete block design (RCBD) was used for the experiment. The 20 animals were divided into five treatments (group) of four animals each and balanced for body weight with variation of ± 0.03 during the allotments. Each treatment (group) was assigned to one of the five treatments. Experimental diets were fed *ad-libitum* in the morning and evening daily for twelve weeks. Water and salt lick were offered *ad-libitum*.

2.5. Data Collection

The animals were weighed prior to commencement of the experiment and at two weeks intervals thereafter throughout the experiment between 8:00 am and 9:00 am after an overnight fasting. Daily feed intake of the animals was determined through weighing the feed given and the leftover in the following morning for twelve weeks.

Digestibility trials were conducted using the four animals from each treatment. The animals were fed the same experimental diets as in the feeding trial. The trial lasted for 21 days (14 days for adaptation and 7 days for collection of faecal samples). Harness bags were used for the collection of faecal samples, which is fitted in the last 7 days of adaptability. During the period, daily feed intake was recorded. Total faecal output from each animal was also recorded on daily basis. About 10% representative sample of the total faecal output was oven dried at 105⁰C for dry matter determination and subsequent chemical analysis.

2.6. Data Analysis

Thoroughly mixed representative samples of the five experimental diets, Rice Milling Waste (RMW), Soyabean Meal Residue (SBMR) and faecal samples were analysed for proximate compositions as outlined by AOAC (1990). Records collected from questionnaires were managed using Microsoft excel (2007) software. Data thus generated, were analysed using simple descriptive statistics (percentages and frequencies) available in SPSS (16.0). The data obtained from the second trial were managed in the Microsoft excel (2007) and analysed using general linear model available in SAS (1999) Least Significance Difference (LSD) was used to separate the means.

3. Results and discussion

3.1. Results

3.1.1. Chemical Composition of Experimental Diets and Test Ingredients

Results of the proximate composition of the experimental diets were indicated in table 2. From the table it could be deduced that diet A has the highest dry matter (93.00%) with diet C having the lowest (91.10%) value. Crude protein (CP) content was higher in diet B (16.30%) and lower in diet D (16.15%). The highest value of Ether extract (EE) was obtained in diet E (9.15%) and the lowest was recorded in diet B (7.00%). The Crude fibre (CF) content was highest in diet D (22.20%), followed by 22.10% in treatments A and E, while the lowest (21.50%) value was in treatment C. The highest value of Ash content was in treatment A (12.00%) and the lowest value was obtained in treatment E (9.50%). Nitrogen free-extract (NFE) was lower in diet A (42.17%) and higher in diet D (45.60%).

Table 2
Chemical Composition of Experimental Diets and Test Ingredients

Parameter (%)	Treatments					RMW	SBMR
	A (0)	B (5)	C (10)	D (15)	E (20)		
Dry matter (DM)	93.00	92.70	91.10	91.80	92.00	89.90	96.26
Crude protein (CP)	16.23	16.30	16.19	16.15	16.20	4.38	17.50
Crude fibre (CF)	22.10	21.80	21.50	22.20	22.10	43.28	26.89
Ether extract (EE)	7.50	7.00	8.80	8.04	9.15	25.03	15.55
Ash	12.00	10.00	10.00	11.00	9.50	17.40	6.99
Nitrogen free-extract (NFE)	42.17	44.90	43.50	45.60	43.05	14.29	33.07

3.1.2. Growth performance and cost of feed/kg live weight gain of Yankasa ram lambs fed RMW and SBMR Combination

Results from table 8 indicates the growth performance of growing Yankasa ram lambs fed complete diet containing graded levels of rice milling waste and soyabean meal residue combination. It could be observed from the table that no significant differences ($P>0.05$) between treatment means were recorded in dry matter intake (DMI), Average daily gain (ADG), DMI as % body weight and cost of feed per kg live weight gain. The average daily gain (ADG) was higher in treatment C (98.21g/day) and lower in treatment B (91.22g/day). Mean feed intake (FI) decreased from 796.50g/day in treatment A to 764.48g/day in treatment E. Though feed to gain ratio did not differ significantly ($P>0.05$) between all the treatments, but highest mean was obtained in treatment A (8.83) and the least is in treatment E (8.25). Cost of feed intake (CFI) indicated significantly ($P<0.05$) the highest value in treatments A (27.15 N/day), B (26.54 N/day) and C (25.42 N/day) whose values did not differ significantly ($P>0.05$) between each other. Values in treatments C (25.42N/day) and D (23.76N/day) did not differ significantly between each other. Likewise, no significant differences ($P>0.05$) between treatments D (23.76N/day) and E (23.09N/day) which had the lowest value.

Table 3

Growth performance and cost of feed/kg live weight gain of Yankasa ram lambs fed RMW and SBMR Combination

Parameter	Treatment					LSD
	A (0)	B (5)	C (10)	D (15)	E (20)	
Average initial wt. (kg)	14.30	14.33	14.33	14.33	14.30	-
Average final wt. (kg)	22.17	21.98	22.58	22.45	22.08	3.64
Average weight gain (kg)	7.88	7.66	8.25	8.13	7.79	2.13
Average daily gain (g/day)	93.75	91.22	98.21	96.73	92.71	25.38
Feed intake (g/d)	796.50	793.88	790.29	780.13	764.48	68.62
Feed intake as % body wt (g)	3.60	3.61	3.49	3.53	3.52	0.48
Dry matter intake DMI (g/day)	740.79	735.92	725.49	718.50	707.92	63.38
DMI as % body wt. (g/day)	3.34	3.35	3.22	3.25	3.23	0.45
Feed to gain ratio	8.83	8.75	8.37	8.33	8.25	2.26
Cost of feed (N/kg)	34.08	33.43	32.58	30.07	30.01	-
Cost of FI (N/day)	27.15 ^a	26.54 ^a	25.42 ^{ab}	23.76 ^{bc}	23.09 ^c	2.19
Cost of feed/kg live weight (N)	300.86	292.55	268.78	251.12	250.54	74.11

abc: means in the same row with different superscript are significantly different ($P<0.05$)

3.2. Discussion

3.2.1. Proximate composition of Experimental diets and ingredients

Results on proximate composition showed that crude protein content (16.15-16.30%) of the experimental diet were within the values of 15-18% CP recommended by ARC (1990) for growing Sheep. Similarly, Adu (1985) reported 15-18% CP levels when he replaced maize with brewer's dried grains in the diet of growing Sheep. The CP values used in the present study was similar to 16.29-16.43% reported by Muhammad (2005) when he assessed the quantity, quality and utilization of rice milling waste in the diet of growing sheep.

The Ether extract (EE) contents increased with increasing level of rice milling waste and Soyabean meal residue. The values obtained were higher than 5.92-7.63% reported by Nayawo (2010) when he replaced rice milling waste with wheat offal in the diet of Kano Brown goat. Similarly the CF content increased slightly from the control diet to diet E with higher inclusion of rice milling waste and soyabean meal residue. The CF content obtained from the present study met the minimum requirement recommended for ruminant by Banerjee (2007). The values of 21.10-22.20% were lower than the values of 32-37% reported by Nayawo (2010). The dry matter content of the experimental diets (91-93) were higher than the values recommended by Adu and Lakpini (1983) that the daily requirement of Yankassa sheep has been estimated as 53 to 67g/day/kg while the requirement for lambs is said to be 54.6g/day/kg. NFE values obtained from the present study were lower than the values reported by Muhammad (2005).

3.2.2. Performance of Yankasa ram lambs fed rice milling waste and soyabean meal residue combination

Results of this study indicated an increased in feed intake (FI) with increasing level of rice milling waste and soyabean meal residue even though no significant differences ($P>0.05$) were obtained among all the treatments, but treatment E recorded the lowest FI. This could be associated to high fibre content and non-palatability associated to the rice milling waste. Palatability and feed composition affect the intake of feed by ruminant animals (Mc Donald *et al.*, 1995). Variation in feed intake between the treatments could be as a result of individual difference naturally existing among the experimental animals. This can be linked to the report of Payne (1990) and Lynch *et al.*, (1992) that individual variation affect the rate of feed intake in sheep and other ruminant animals.

Results of the current study indicated that the average daily gain (ADG) of the growing sheep is higher in diet C with 15% inclusion of both Soyabean meal residue and Rice milling waste and lower in diet B containing 10% of both RMW and SBMR but not significantly different. The ADG of growing sheep fed at 20% RMW and SBMR in this study (92.71g) is better than the ADG of 53g reported by Abil *et al.* (1992) when they replaced cotton seed cake and maize with wheat bran in the diets of sheep. The ADG obtained in this experiment can be favourably compared with 68-80g and 69-94g/day reported by Adeloje (1994) and Maigandi *et al.*, (2002) who fed fore-stomach digesta to Yankassa sheep. The ADG obtained in the present study (91.22-98.21g/day) were higher than the 53-77g/day reported by Usman (2005) when the author replaced fore-stomach digesta for cowpea husk in the diet of growing Sokoto red goats. The relatively high ADG reported in this study might be associated to the high intake observed in this study (figure1) which may also be attributed to the fact that all the feed ingredients used are known to be palatable to ruminants with the exception of rice milling waste (Topps, 1995). The ADG reported in this study is lower than the values of (142-191g) reported by Garba (2009) when he fed varying levels of sugarcane peels to the growing Yankasa Lambs.

Significant differences were not recorded among the experimental diets in terms of dry matter intake. The Dry matter intake (DMI) decreased with the increase in the inclusion level of both RMW and SBMR. This could relate to the DM content of the experimental diets. The proximate composition of the experimental indicated that DM content of the control diet was higher and decreased slightly towards the diet D (15% inclusion (table 7).

Though the DMI did not differ significantly between treatments but were higher in control diet and sharply decreased with increased in the inclusion levels of both SBMR and RMW combination up to 20%. The DM intake (707-740g/day) reported in this study were higher than the values (670-690g) reported by Maigandi and Nasiru (2006) when they fed *Faidherbia albida* pod to Uda Sheep. The DM reported in the present study is comparable to reports under conventional and non-conventional feeding conditions (Muhammad, 2005).

The Dry matter intakes as per cent body weights were the same in all the treatments (3.22-3.35) and were higher than 2.5 recommended by Aduku (1990) and 2.29-2.5 reported by Maigandi *et al.* (2002) when they fed Fore-stomach digesta to growing sheep. This is an indication that growing ram lambs can tolerate the inclusion of RMW and SBMR combination up 20%. The feed to gain ratio (8.25-883) obtained in this study can be favourably compared with the values (8.3-9.5) obtained by Nayawo (2010) when he replaced wheat offal for rice milling waste in the diet of Kano brown goats and can be compared favourably with the values reported by Maigandi and Nasiru (2006) when they replaced *Faidherbia albida* pods in the diet of Uda sheep. Better feed to gain ratio recorded in this study could be associated to the relatively high ADG achieved and the adaptability of the animals to the study area.

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