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Full Length Research Paper

Performance and carcass characteristics of Yankasa ram fed with variable levels of biscuit waste and *Leucaena leucocephala* based diets

Eniolorunda, O. O.[1]*, Apata, E. S.[1], Fajemisin, A. N.[2] , Adeyemi, B.O[1] and Okubanjo, A.O.[1]

[1]Department of Animal Production, College of Agricultural Sciences, Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State, Nigeria.
[2]Department of Animal Production and Health, Federal University of Technology, Akure, Ondo State, Nigeria.

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A study was conducted to find out the performance and carcass characteristics of sheep fed diet in which biscuits waste (BWM) and *Leucaena leucocephala* leaf hay (L/h) mixture were used to replace maize and wheat offal mixture at zero (control), 25, 50, 70 and 100% replacement levels. In a completely randomize design, the experimental diet where designated B_0, B_1, B_2, B_3, B_4, respectively. The 20 growing Yankasa rams aged between 9 to 11 months with an initial average life weight of 12.17 ± 0.33 kg were randomly assign to the 5 dietary treatment with four rams per treatment. Data were collected to estimate dry matter intake (g/d /$W^{0.7}$ kg), daily mean life weight gain (g/d), feed efficiency and carcass indices. Dietary replacement of maize and wheat offal mixture with biscuit waste meal and *L. leucocelphala* leaf hay mixture significantly (P< 0.05) influenced the entire variable measured. However, animal on diet B_1 and B_2 in which biscuits waste and *L. leucocephala* leaf mixture replaced 25 and 50% maize and wheat offal mixture, were better when compared to the control (B_0) and other test diet in terms of performance and carcass characteristics. This was evident by higher DMI (77.18 and 76.84 g/d /$W^{0.75}$ kg), ADWG (134.40 and 129.52 g/d), feed efficiency (0.199 and 0.195), live shrunk weight (21.50 and 20.10 kg), dressing percentage (85.81 and 84.33%), chilled carcass weight (18.33 and 16.83 kg), wholesale cuts leg (9.18 and 8.73%), rack (3.11 and 2.78%), BSF (4.53 and 3.83%), neck added (2.51 and 1.78%) and rib eye area (6.06 and 8.29) which were obtained from the animal on these two diets. Broadly, the result in the present study indicated that 25 and 75% replacement level of maize and wheat offal mixture with biscuits waste and *L. leucocephala* leaf hay mixture are ideal for ruminant animal production because it improve both the performance and carcass characteristics of rams.

Key words: Performance, carcass, biscuit waste, Yankasa ram.

INTRODUCTION

Ruminant animals are important component of farming system of southern Nigeria where they play important and cultural roles and are flexible financial reserve for the rural population (Bamikole et al., 2001). Sheep and goat are important sources of animal protein (meat, milk and skin) throughout the world, including developing economies (Dawa et al., 1996; Ayangbile et al., 1998). Meat is the most desired product of sheep due to high demand for protein consumption especially in developing countries (Leward et al., 1995).

The scarcity and prohibitive cost of conventional feed sources aggravated by stiff competition between men and livestock for these feeds as well as insufficient emphasis on production (Purcell, 1998), have resulted in the evaluation of alternative and cheap agro-industrial products as source of feed. Researchers like Longe (1987) and Jeremiah et al. (1995) have stressed the need for the utilization of alternative feed ingredients that are far removed from human and industrial interests in order to reduce cost of feed. Therefore, the economies of crop residue and by-products utilization require intensive

*Corresponding author. E-mail: seyieniolorunda@yahoo.com.

analytical investigation to formulate least cost ration for animal production. Some of the non-conventional feed stuffs used as substitute for the conventional feed stuff include cassava meal, flour dust, biscuit waste, noodle waste, coca pod meal and shrimp waste. Eniolorunda et al. (2008) reported that indomie waste has no anti-nutritional factor and the high energy content of indomie waste makes a good substitute for maize (and other cereal grains). Olayeni et al. (2007) also observed that laying hens could tolerate 60% replacement level of biscuit waste in the diet with laying performance and egg quality parameters not significantly affected. Replacement of maize with biscuit waste as one of the industrial waste becomes justifiable, as many alternative sources have been ventured into.

Biscuit meals comprise of high quality ingredients which have been taken from food sources intended for human consumption. Biscuit meal is a palatable, high energy ruminant feed made up of bakery waste meal. Biscuit is produced from wheat flour, sugar, vegetable fat, skimmed milk powder, salt, ammonium bicarbonate, butter flour and other ingredients, depending on the maker. Biscuit waste has no anti-nutritional factor and makes a good substitute for maize (and other cereal grains).

Replacement of the conventional feed stuff with the unconventional feed stuff like biscuit waste meal and *Leucaena leucocephhala* leaf meal can help reduce feed cost as well as improve meat animal production.

However, most investigators have been concerned with the evaluation of different feed stuffs and feed additives in the nutrition of these animals, while relatively few work has been done to determine the differences in the performance and carcass characteristics within and among breeds of sheep in their response to dietary unconventional feeds. The present study was therefore designed to evaluate the performance and carcass quality of Yankasa rams fed with varied levels of biscuit waste mixed with *L. leucocephala* as an alternative feed ingredient to maize and wheat offal mixture.

MATERIALS AND METHODS

Preparation of experimental diets

Biscuit waste meal (BWM) was one of the test ingredients used in this study. It was purchased from a biscuit factory located in Oluyole industrial estate, Ibadan, Oyo State, Nigeria; *L. leucocephala* leaf was the other test ingredients used and was obtained from the Teaching and Research farm of the Olabisi Onabanjo University, Yewa Campus Ayetoro, Ogun State, Nigeria. The biscuit waste and *L. leucocephalas* leaves were sun dried for four days and separately grounded in a hammer mill to allow proper mixing with other dietary ingredients.

Five experimental diets were consequently formulated using combined levels of biscuits waste and *L. leucocephala* leaf hay (L/h) to replace maize and wheat offal mixture at 0, 25, 50, 75 and 100% inclusion levels (Table 1). The rations were designated B_0\(control), B_1, B_2, B_3 and B_4 and used in the trial that lasted for 84 days.

Animals, housing and management

Twenty male Yankasa sheep, aged between 9 and 11 months, with an average initial live weight of 12.17 ± 0.33 kg were used for this study. The animals were purchased from Zaria and transported to the sheep and goat unit in the Teaching and Research farm of the College of Agricultural Sciences Ayetoro, Ogun state, Nigeria. They were subjected to 8 weeks adaptation period and group fed with cowpea husk and dried cassava peels. Water was made available *ad libitum*. The animals were treated against internal and external parasites using long acting antibiotic (oxytetracycline - a Pfizer product and asuntol- a Bayer product) and anti-helminthes (Banminth II- a Pfizer product).

The animals were grouped into five groups of four rams each. Each group was balanced for weight and randomly allotted to one of the five experimental diets B_0, B_1, B_2, B_3 and B_4, respectively. Animals were housed in individual concrete pens of 1.2 x 1.00 x 1.20 m in dimension. Adjustment to feed allowance were made as at when necessary making sure that rams had at least twice as much feed as they were eating. Water was provided *ad libitum*. Refusals were collected and weighed daily to determine feed intake. Weekly weights of animals were measured and recorded to determine the daily weight gain.

Slaughter procedure and carcass processing

Animals were subjected to a 10 h fast and weighed at the end of the feeding trial. They were consequently slaughtered by severing through their jugular veins and carotidal arteries of the neck below their jaws (Okubanjo, 1997). The rams were dressed and their carcass weighed after evisceration to determine the dressing percentage before chilling for 24 h. The carcass was thereafter fabricated into wholesale cuts and their percentages relative to the chilled carcass weight was determined following the free duress of Awosanya and Okubanjo (1993).

Chemical analysis

The chemical composition of the feed ingredients (biscuit waste and *L. leucocephala* leaf hay) and the experimental diets were determined (Table 2) by the methods of AOAC (2002).

Statistical analysis

The data collected from this study were subjected to statistical analysis using SAS (2000), and the means were separated with Duncan multiple range test of the same software.

RESULTS AND DISCUSSION

Chemical composition of maize, wheat offal, biscuit waste meal and *L. leucocephala* leaf hay are presented in Table 2. The average crude protein (CP) content of 9.65% obtained for BWM was close to 9.10% CP obtained for maize in the present study. While the CP content (9.10%) fell within the range of 8.90 and 10.50% reported for maize in literature (David and Chabeuf, 1991; Obioha, 1992; Atteh, 2002), the value was higher than 7.7%

Table 1. Percentage composition of experimental diet.

Ingredient	Dietary treatment				
	B0	**B25**	**B50**	**B75**	**B100**
Maize	32.50	24.37	16.25	8.13	-
Wheat offal	30.00	22.50	15.00	7.50	-
Biscuit waste meal	-	8.13	16.25	24.37	32.50
L. leucocephala	-	7.50	15.00	22.50	30.00
leaf hay	-	7.50	15.00	22.50	30.00
PKC	10.00	10.00	10.00	10.00	10.00
BDG	23.50	23.50	23.50	23.50	23.50
Bone meal	2.50	2.50	2.50	2.50	2.50
Oystarshell	0.50	0.50	0.50	0.50	0.50
Premix	0.50	0.50	0.50	0.50	0.50
Salt	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00

Table 2. Proximate composition of biscuit waste, maize, wheat offal and *L. leucocephala*.

Measurement	Biscuit waste	Maize	Wheat offal	*L. leucocephala*
DM	85	88.00	92.50	92.50
CP	9.65	9.10	16.50	21.75
CF	2.10	2.7	9.80	15.90
Crude Fat	5.25	4.60	4.70	3.05
Ash	6.00	1.45	6.50	8.60
NFE	77.00	81.65	62.5	50.70
Gross energy (Kcal/kg)	3200	3440	1880	2140

CP, Crude protein; CF, crude fiber.

reported by Longe (1987). The CP content of BWM was however slightly lower than the 10.80% reported by Longe (1987). These differences in the CP content might be due to the variety of maize, types of fertilizers applied, post-harvest management and processing methods. The average CP content of 21.75% obtained for L/h was higher than the value (16.50%) reported for wheat offal. The CP content of L/h was slightly lower than the range (22.64 to 30.60%) reported by (Atteh, 2002) but higher than the value of 14% reported by Eniolorunda et al., (2008). This might be due to the stage of maturity of the trees and when the leaves were harvested.

The chemical composition of experimental diets showed that CP content was highest ($P < 0.05$) for the control (15.15%) and lowest ($P < 0.05$) for diet B_4 (14.05%) indicating that CP decreased as the level of BWM/*L*/h mixture increased in the diet (Table 3). The CP contents of the formulated diets were high enough to compare favourably with the CP content of biscuit waste meal based concentrate reported by Longe (1987), Ademola et al. (2003) and Olayeni et al. (2007).

Treatment effect on DMI (g/d /$W^{0.75}$ kg) was significant ($P < 0.05$). The replacement of maize and wheat offal with biscuit waste and *L. leucocephala* leaf hay mixture caused the animals on diets B_1, B_2 and B_3 to record 77.18, 76.84 and 76.30 which were individually similar ($P > 0.05$) to 76.96 recorded for the control (Table 4). This suggests that biscuit waste and *L. leucocephala* leaf hay mixture diets up to 75% level of inclusion were comparably acceptable to the animals. The highest dry matter intake recorded on B_1 which contained 25% BWM and L/h mixture however, gave an indication of the best combination of these ingredients as feed for rams.

All the animals gained weight (Table 4) during the feeding trial that lasted for 84 days. The average daily weight (g) gained were 113.93^{c}, 119.40^{d}, 125.83^{c}, 129.52^{b} and 134.40^{a} by animals on diets $B_4{}^{e}$, $B_3{}^{d}$, $B_o{}^{c}$ (control), $B_2{}^{b}$ and $B_1{}^{a}$, respectively. The observed higher daily weight gains for animals on diets B_1 and B_2 in which 25 and 50% biscuit waste and *L. leucocephala* leaf hay mixture replaced maize and wheat offal mixtures might be suggestive of better replacement levels for better performance of animals on those diets. The higher ($P < 0.05$) weight (g/d) obtained for rams on B_1 (134.40) and B_2 (129. 52) where due probably to corresponding higher ($P < 0.05$) dry matter intake (g/d) and more efficient

Table 3. Chemical composition of experimental diet fed to Yankassa rams.

Nutrient (%)	B0	B25	B50	B75	B100
DM	92.62	93.08	93.02	92.95	93.05
OM	84.06	83.77	83.36	83.15	82.65
CP	15.15	14.48	14.30	14.17	14.05
CF	11.20	13.00	13.16	13.61	14.15
Crude fat	3.17	3.06	2.34	2.21	2.08
Ash	8.56	9.31	9.66	9.80	10.40
NFE	61.92	60.21	60.54	60.21	59.32
Gross energy(kcal/g)	3.15	3.00	2.95	2.92	2.85

BWM, Biscuit waste meal; L/h**,** *L. leucocephala* leaf hay; CP, crude protein.

Table 4. Mean performance indices of Yankassa rams as influence with dietary.

Variable	Dietary treatment					
	B0	B1	B2	B3	B4	SEM
DMI (g/d)	647.23^{b}	673.73^{a}	664.63^{ab}	653.17^{ab}	591.17^{c}	22.2
DMI (g/d/kg 0.75)	76.96^{a}	77.18^{a}	76.84^{a}	76.30^{a}	71.83^{b}	2.83
Initial weight (kg)	11.83	12.33	12.33	12.55	11.83	1.26
Final weight (kg)	22.40^{ab}	23.62^{a}	23.21^{a}	22.53^{bc}	21.40^{c}	1.17
DNG(g/d)	125.83$^{?}$	134.40^{a}	129.5^{b}	119.40^{d}	113.93^{e}	3.05
Feed efficiency (%)	0.194$^{?}$	0.199^{a}	0.195^{a}	0.183^{b}	0.193^{a}	0.02

^{a,b,c} Means within the same row with different superscript are significantly different ($P < 0.05$). DMI, daily matter intake

Table 5. Mean carcass characteristics of Yankasa rams fed experimental diets.

Variable	Dietary Treatment					
	B0	B1	B2	B3	B4	SEM
Live shrunk weight (kg)	18.75^{c}	21.50^{a}	20.10^{b}	18.00^{c}	17.50^{cd}	0.70
Warm carcass weight (kg)	15.65^{c}	18.45^{a}	16.95^{b}	14.57^{d}	13.70^{e}	0.17
Dressing (%)	83.47^{c}	85.81^{a}	84.33^{b}	80.94^{d}	78.29^{e}	167
Chilled carcass wt (kg)	15.52^{c}	18.33^{a}	16.83^{b}	14.45^{d}	13.56^{e}	0.68
Chilling loss (%)	0.83^{b}	0.65^{d}	0.71^{c}	0.82^{b}	1.02^{a}	0.35
Wholesale cuts (ccw) leg (%)	8.12^{b}	9.18^{a}	8.73^{c}	8.17^{b}	8.70^{b}	0.72
Shoulder (%)	5.93^{b}	6.82^{a}	4.87^{c}	5.74^{b}	5.74^{b}	0.42
Rack (%)	2.26^{b}	3.11^{a}	2.78^{c}	2.14^{b}	2.14^{b}	0.41
BSF (%)	3.87^{b}	4.53^{a}	3.83^{c}	3.46^{b}	3.68^{b}	0.89
Neck (added) (%)	2.13^{b}	2.51^{a}	1.78^{c}	2.15^{b}	2.50^{a}	0.46
Rib eye area	6.04^{b}	6.06^{b}	8.29^{a}	5.64^{b}	5.58^{b}	0.43

$^{a, b, c}$ Means on the some row with different superscripts are significantly different ($P < 0.05$).

utilization of nutrients by the animals. The values in weight gains obtained in the presents study were higher that the range of values (35.7 to 36.5 g/d) reported by Adegbola and Osiyi, (1985) for sheep fed urea and ground meal diets.

Results in Table 5 showed that all the carcass variables measured on rams fed experimental diets were significantly ($P < 0.05$) influenced by dietary treatments. Rams on diet B_1 which contained 25% biscuit waste and *L. leucocephala* leaf hay mixture had the highest ($P < 0.05$) and best carcass characteristics only to be followed by rams on diet B_2 with 50% replacement value, while those

on the control (B_0) and other test diets (B_3 and B_4) were the least in that order. The results obtained in the present study were in agreement with the findings reported by previous authors (Fluharty et al., 1999). Osuhor et al. (2009) also noted high carcass weight and dressing percentage for Yankasa rams fed dried poultry litter plus maize offal supplement. However, the values for carcass weight and dressing percentage as well as cut up parts obtained in the present study were higher than those reported by this same author.

Conclusion and recommendation

Based on the findings in the present study, comparable but higher values were obtained for almost all the parameters measured in assessing the response of rams on dietary treatments B_1 and B_2 when compared to those on B_0 (Control), B_3 and B_4 respectively. Higher ($P < 0.05$) values of dry matter intake (g/d), daily mean live weight gain (g/d), feed efficiency, live shrunk weight (kg), warm carcass weight (kg), dressing percentage (%), chilled carcass weight (kg), wholesale cuts (CCW), leg (%), shoulder (%), rack (%), BSF (%), neck (added) % and rib eye area in rams on dietary treatments B_1 and B_2 with 25:75 and 50:50 combination ratios were quite encouraging as 25 and 50% of maize/wheat offal mixture could be replaced with equal value of biscuit waste/*L. leucocephala* leaf hay mixture to give satisfactory levels of performance and enhanced carcass quality.

The replacement levels between 25 to 50% are therefore recommended for small holder sheep farmers especially during the dry season when most grass species are of very low quality and oil seed cakes are cost prohibitive.

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