

Evaluation of the meat quality Yankasa rams fed graded levels of biscuit waste

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Abstract

Twenty Yankasa rams aged between 10 and 12 months with average weight of 12.15kg were used to evaluate the effect of different levels of biscuit waste and *Leucaena leucocephala* meal inclusion in diets on the quality of their meat samples. The rams were randomly assigned to five treatment diets of 0%, 25%, 50%, 75% and 100% of combined biscuit waste and *Leucaena leucocephala* in replacement for combined maize and wheat offals or B₀, B₁, B₂, B₃ and B₄ diets with four rams per diet for 91 days. Data were collected on physical, chemical and sensory variables of meat samples. The results showed that there were significant ($P < 0.05$) differences in the cooking loss, water holding capacity, crude protein and overall acceptability of meat samples from the rams. All the parameters measured were better in meat samples from rams fed treatment diets B₁ (25%) and B₂ (50%) inclusion of biscuit waste and *Leucaena leucocephala* meal. The results revealed that feeding biscuit waste to Yankasa rams can improve the quality as well as the consumer acceptability of Yankasa rams meat (mutton).

Key words: Yankasa rams, physicochemical, sensory, biscuit waste, meat.

Introduction

Meat quality evaluation is very important in improving meat production and consumption which is hitherto dependent upon the quality of raw materials fed to the animals and the processing techniques (Berbera and Tassone 2006). Meat of sheep (mutton) is well accepted in Nigeria and other nations, hence their production should be greatly improved through breed crossing with selected good meat types, practicing better feeding and management (Hoffman *et al.*, 2003). Sheep are widely distributed throughout the sub-humid and semi-arid zones and produce, aside meat, milk and skin including other by products (Adewunmi *et al.*, 2006). Meat quality is a measure of meat palatability and acceptability to consumers (Renand and Fisher 1997).

Consumers demand for meat and meat products depend on many criteria such as species of animal, age, sex and eating quality factors like flavour, tenderness, juiciness, colour, texture and overall acceptability which are on a large scale determined by the water holding capacity of the meat (Joseph *et al.*, 1995). The most spectacular factors that affect meat composition and quality in animals are diet formulation and nutrient intake of the animals (Jeremiah *et al.*, 1997), therefore, efforts have to be concentrated on how to improve the quality of feed supplied to meat animals with the view to harvesting superior meat. (Adeyanju *et al.*, 1975). Biscuit waste meal comprises high quality ingredients that have been extracted from food sources intended for

human consumption; it is palatable and high in energy (Olayemi *et al.*, 2007). It has been reported (Alonge 1987) that above 5% of 1,500 tons of biscuit products per week of the manufacturing industry is discarded as waste. There has to be some means of utilizing these wastes in order to prevent environmental hazards (Ayangbile *et al.*, 1998). Biscuit waste compounded with *Leucaena leucocephala* is very rich in protein and can be used to improve the growth of sheep and meat quality. However, comprehensive reports on meat quality of sheep fed biscuit waste are relatively scarce, such information is vital to provide a broad picture of the probable effect of change in meat characteristics or quality arising from feeding these wastes. This study was therefore, designed to evaluate the physicochemical and sensory characteristics of yankasa rams fed graded levels of biscuit waste

Materials and Methods

Experimental site

The study was carried out in the College of Agricultural Sciences (Sheep and Goat Unit) Olabisi Onabanjo University, Yewa Campus, Ayetoro, Ogun State.

Experimental Diet

Biscuit wastes were purchased from a reputable feed mill at Ibadan and *Leucaena leucocephala* leaves were harvested from the Research Farm of the College. Five experimental diets were formulated (Table 1). The diets contained 0%, 25%, 50%, 75% and 100% combined biscuit waste and *Leucaena leucocephala* in replacement for combined maize and wheat offal: B0, B1, B2, B3 and B4 treatment diets. Proximate analysis of experimental diets was determined (AOAC, 2002).

Experimental Animals

Twenty Yankasa rams, between 10-12

months of age weighing 12.15kg were randomly assigned to the diets at the rate of 4 animals per treatment after 14 days adaptation period. The experiment lasted for 91 days during which period the animals were allowed to graze in the day and were fed the test diets in the morning and evening while water was given *ad-libitum* (Okubanjo 1997).

Slaughtering and processing of carcasses.

The rams were slaughtered at the end of the experiment by cutting the jugular veins and carotid arteries of the neck region after fasting them for over 16 hours (Okubanjo 1997). The carcasses were skinned, eviscerated and chilled for 24 hours after which they were dissected into primal cuts viz, leg, loin, rack, shoulder breast-flank and shank (BSF) (Awosanya and Okubanjo 1993).

Cooking of Meat

Chops of meat, 5cm thick were removed from the anterior side of the loin and leg weighed, (10g) and fried in vegetable oil for 15 minutes to an internal temperature of 72^oc (Awosanya and Okubanjo 1993).

Determination of cooking loss and water holding capacity

Cooking loss of the meat chops was determined by taking the initial weight of the chops before cooking and their final weights after cooking.

$$\text{Cooking loss} = \frac{\text{Initial weight} - \text{final weight}}{\text{initial weight}} \times 100$$

Water holding capacity (WHC) was determined by placing 1g of each chop between two filter papers and then enclosed with two plexiglasses and pressed between two jaws of a vice with approximately 35.60kg/cm³ for 1 minute. The areas of free water and pressed meat samples were measured using grid method while percent free water was

calculated based on meat samples weight and moisture content (Suzuki et al 1991).

Thus: WHC is calculated as follows

Where: A_w = Area of water released from meat samples (cm^2)

$$\text{WHC} = \frac{100 - (A_w - A_m) \times 9.47}{W_m \times M_c} \times 100$$

A_m = Area of meat samples

W_m = Weight of meat samples (g)

M_c = Moisture content of meat samples (%)

9.47 = Constant factor.

Chemical Analysis of meat samples

This was carried out following the procedures of A.O.A.C (2002).

Sensory Evaluation

Cooked (fried) meat from loin chops were served in plates to a 10-member taste panel drawn from the students and staff population of the department to adjudge the test for flavour, tenderness, juiciness and overall acceptability of meat samples on a 9-point hedonic scale where (1) corresponds to extremely dislike and (9) to extremely like. Panelists were semi-trained before commencing the test and were supplied with craker biscuits and water in between the samples. (AMSA 1995).

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

The composition of experimental diets is shown in (Table 1) the table shows that the

dry and organic matters of the diet as well as the crude protein and energy were high enough for feeding ruminants to produce high quality meat though, the crude protein and energy of the diets reduced as the percentage inclusion of biscuit waste and *Leucaena leucocephala* meal increased, nonetheless, the levels of protein and energy of the diets compared favourably with those reported by (Olayemi *et al.*, 2007).

Table 2 shows the mean physical properties of meat samples from Yankasa rams fed graded levels biscuit waste. The results show that there were of significant ($P < 0.05$) difference in all the physical variables measured. The cooking loss was highest ($P < 0.05$) in loin chops from rams fed diets B_3 and B_4 (20.00%) each and least ($P < 0.05$) in chop from rams fed diet B_1 (10.00) while chops from rams fed diets B_0 and B_2 had the same ($P > 0.05$) cooking losses (15.00%) each. The cooking loss was highest ($P < 0.05$) in leg slice from rams fed diet B_3 (21.60%), followed ($P < 0.05$) by that of slice from rams fed diet B_4 (19.80%) and least ($P < 0.05$) in slice from diet B_1 (17.25%) while the cooking losses of leg slices from rams fed diets B_0 and B_2 were the same ($P > 0.05$). The water holding capacity results show that meat samples from rams fed diet B_1 and B_2 had the same but highest ($P < 0.05$) water holding capacity (88.00%) (7.90%) followed ($P < 0.05$) by those meat samples from rams fed diets and B_0 and %4 (76.80%) (76.05%) and least ($P < 0.05$) in meat samples from rams fed diet B_3 (75.00%). The results of cooking loss obtained in this study were higher than the values reported for cooking loss by (Omojola and Adesehinwa 2006; Fisher *et al.*, 2000)

Table 1: Composition of Experimental diets

Ingredient	B ₀	B ₁	B ₂	B ₃	B ₄
Maize	32.50	24.37	16.02	8.13	-
Wheat offal	30.00	22.50	15.00	7.50	-
<i>Leucaena leucocephala</i>	-	7.50	15.00	22.50	30.00
Biscuit waste	-	8.13	16.05	24.37	32.50
PKC	10.00	10.00	10.00	10.00	10.00
BDG	23.50	23.50	23.50	23.50	23.50
Premix	0.50	0.50	0.50	0.50	0.50
Oystershell	0.50	0.50	0.50	0.50	0.50
Bone meal	2.50	2.50	2.50	2.50	2.50
Salt	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00
Determined Analysis (%)					
DM	92.62	93.08	93.02	92.15	93.05
OM	83.40	87.52	84.11	82.50	82.05
CP	15.15	14.48	14.30	14.19	14.04
CF	11.20	13.61	13.16	13.00	14.15
EE	3.17	7.56	2.34	2.21	2.08
ASH	10.40	9.66	9.80	8.56	9.25
NFE	52.60	47.77	53.42	54.19	43.53
Calculated ME (kca.kg)	3.15	3.10	2.95	2.92	2.85

Legends: PKC: Palm karnel cake, BDG: Brewers dried grain, DM: Dry Matter
 BDG: Brewers dried grain, DM: Dry matter, OM: Organic matter, CP:Crude protein, CF: Crude fibre, EE: Ether extract, NFE: Nitrogen free extract
 ME: Metabolizable energy

Table 2: Mean physical properties of meat samples from rams

Variable	Treatment diets					SEM
	B0	B1	B2	B3	B4	
Loin chop Weight (g)	105.00 ^a	105.00 ^a	95.00 ^c	100.00 ^b	90.00 ^d	4.58
Cooking loss (%)	15.00 ^b	10.00 ^c	15.00 ^b	20.00 ^a	20.00 ^a	1.63
Leg slice weight (g)	255.00 ^{ab}	250.00 ^b	260.00 ^a	230.00 ^c	220.00 ^d	9.32
Cooking loss (%)	18.50 ^c	17.25 ^d	18.30 ^c	21.60 ^a	19.80 ^b	1.68
WHC (%)	76.80 ^b	88.00 ^a	77.90 ^a	75.00 ^c	76.05 ^b	2.23

^{a,b,c,d} Means within the same row with differing superscripts are significantly different (P<0.05)

WHC: Water holding capacity

Table 3: Mean percentage proximate composition of rams meat sample

Treatment diets						
Variable	B0	B1	B2	B3	B4	SEM
Moisture content (%)	71.60	71.85	72.10	71.45	71.55	0.92
Crude protein (%)	18.75 ^b	19.60 ^a	19.40 ^a	18.85 ^b	18.60 ^b	0.11
Ether extract (%)	7.45	7.05	7.35	7.40	7.80	0.08
Ash (%)	1.15	1.00	1.15	1.15	1.20	0.03

^{ab} Means within the same row with differing superscripts are significantly different (P<0.05).

for rabbits, barrows and gilts. Also the values obtained for water holding capacity in this study were not in agreement with the values reported by (Geenty *et al.*, 1979; Kempster *et al.*, 1976) which could be due to differences in breed, feed quality as well as the cooking method employed.

The mean percentage proximate composition of meat samples from yankasa rams fed graded levels of biscuit waste is presented in (Table 3). The results show that there were no significant (P>0.05) differences in all the proximate variables tested except in the crude protein content of the meat samples. Meat samples from rams fed diet B₁ and B₂ had the highest (P<0.05) crude protein (19.60%), (19.40%) while the crude protein of meat samples from rams fed diets B₀, B₃ and B₄ had the same (P>0.05) values of crude protein. The values obtained for moisture contents of meat samples from the rams were high and corresponded with the values reported by (Omojola *et al.*, 2006) for beef meat, but were at variance with the values reported

by (Babiker *et al.*, 1990) for camel and beef meat. However similar values for crude protein reported by (Omojola *et al.*, 2006) were obtained in this study.

The mean scores for sensory evaluation of meat samples from Yankasa rams fed graded levels of biscuit waste are shown in (Table 4). The results revealed that there were no significant (P>0.05) differences in all the sensory variables tested with the exception of overall acceptability. Meat samples from rams fed diets B₁, B₂, B₀ and B₂ in that order were highly (P<0.05) accepted while the meat samples from rams fed diet B₄ was least (P<0.05) preferred by the taste panelist. The results also show that values for flavour, juiciness and tenderness as well as overall acceptability were numerically highest in meat samples from rams fed diet B₁ and closely followed by those from rams fed diet B₂. These results revealed that the levels of diets tested did not affect the sensory properties of rams adversely, which could be due to the quality of feed (biscuit waste) given to the rams.

Table 4: Mean scores for sensory evaluation of ram's meat samples

Variable	Treatment diets					SEM
	B ₀	B ₁	B ₂	B ₃	B ₄	
Flavour	6.21	6.82	6.80	6.32	6.32	0.15
Tenderness	6.43	6.91	6.81	6.43	6.73	0.24
Juiciness	6.52	6.94	6.65	6.52	6.52	0.27
Overall acceptability	6.52 ^a	6.81 ^a	6.72 ^a	6.24 ^a	5.20 ^b	0.26

^{a,b} Means within the same row with differing superscripts are significantly different (P<0.05).

Conclusion

The results from this study show that Yankasa rams fed graded levels of biscuit waste compared favorably with the rams fed control (BO) diet and that physical, chemical and sensory properties measured were better in meat samples from rams fed treatment diets B1 and B2 followed by others. But, in general it was observed that biscuit waste meal in combination with leucaena leucocephala can be used in replacement of maize and wheat offal to improve the quality as well as the consumer acceptability of Yankasa rams meat (mutton).

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