CARCASS CHARACTERISTICS AND MEAT QUALITY OF RED SOKOTO BUCKS FED TREATED AND UNTREATED BAGASSE WITH OR WITHOUT ENZYME SUPPLEMENTATION

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ABSTRACT

A study was conducted to evaluate the effect of feeding treated or untreated bagasse with or without enzyme supplementation on the carcass characteristics and meat quality of Red Sokoto bucks. Sixteen Red Sokoto bucks averaging one year and weighing 10 ± 2 kg were used for the study. Four bucks were assigned per treatment and allotted to two dietary treatments with two level of supplementation in a completely randomized design. The enzyme was included based on the manufactures recommendation. The bucks were slaughtered and dressed according to normal dressing procedure and meat samples were analysed for moisture, protein and ash content. The result of the trial showed that there was no significant difference (p>0.05) in hot carcass weight and protein content between bucks fed bagasse with enzyme and bucks fed bagasse without enzyme. Bucks fed untreated bagasse without enzyme had significantly (p<0.05) higher dressing percentage (44.11 %) when compared to bucks fed treated bagasse with enzyme (42.58 %). The study concluded that treated and untreated bagasse with or without enzyme has no adverse effect on carcass and meat quality of Red Sokoto bucks.

Keywords: Carcass, Meat, Enzyme, Red Sokoto

INTRODUCTION

Small ruminant animals continue to make substantial contribution to the economy of Nigeria as suppliers of food, raw materials and foreign exchange. Oni (2002) reported that sheep and goat account for about 36 % of total national meat supply and they have tremendous potential for growth. Goats also feature prominently in the economic and social lives of Nigerians. They serve as a quick source of income and play a major role in dowry, ceremonies and ritual sacrifices (Adu *et al*., 1979).

Agricultural by-products and crop residues represent a large forage resource for ruminants but are underutilized mainly because of their low nutritive value due to high lignification and cell wall content. Bagasse is produced from sugar plant and it is used for burning energy. It is composed of lignocellulosic materials that prevent itself from micro-organism digestion. The major problem with utilization of bagasse as feed stuff are its low palatability and digestibility (15 – 25 %) which

is due to the physical configuration and chemical complexes of its structural carbohydrates, and high in crude fibre, neutral detergent fibre and acid detergent fibre (Chullanandana, 2000).

Information on carcass composition of sheep and goats from traditional systems are readily available in Sub Saharan Africa. Goat meat is characterized by low subcutaneous fat content with greater muscle component at comparable age and slaughter live body weight (Babiker *et al*., 1990). Owen *et al.* (1978) commented on the difficulties of controlling these masking factors under traditional grazing condition in the tropics

Utilization of exogenous enzymes in animal nutrition is a very good strategy proved to be very useful for better feed utilization and animal performance. Beauchemin *et al.* (2003) concluded that there was inconsistency in the response to enzyme use and that part of this could be attributed to lack of adequate characterization of enzymes products prior to use.

Therefore, the present study intends to look into combining chemical treatment of bagasse and enzyme supplementation to ascertain its effect on carcass and meat quality of Red Sokoto bucks.

MATERIALS AND METHODS

Experimental Site: The experiment was conducted at Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University Zaria, located on latitude 11° 11' N and longitude 07° 38' E. Wikipedia (2014). It is situated at an altitude of 686 m above sea level and lies within the Northern Guinea Savannah zone. The mean relative humidity is 21 and 72% during the harmmattan and wet season respectively. Annual rainfall ranges from 1102 to 1904 mm per annum from late April or early May to mid-October. The mean temperature fluctuates from 31°C maximum during the dry season to 18°C minimum during the wet season (IAR, 2014).

Source of Sugarcane Bagasse and Treatment: Sugarcane bagasse was sourced from sugarcane processing centre at Kauran Mata in Kano State, Nigeria. The bagasse was dried and ground into smaller particle sizes, it was then treated with 5 % urea (50 g of urea was dissolved in one litre of water to treat one kg of bagasse). The treated bagasse was then fermented in an improved cowpea (PIC) storage bags for two weeks, after which it was opened and aerated before inclusion in the diet.

Experimental Animals and Management: The experiment lasted for a period of 90 days (from 12th November 2014 to 10th February 2015). Prior to the arrival of the bucks, the pens were cleaned and disinfected. On arrival, the bucks were quarantined for 2 weeks; and treated with ivermectin (Ivomec) at 1 ml per 50 Kg and antibiotics (Tetracycline L.A.) at 1 ml per 10 kg body weight against internal and external parasites. The bucks were then housed in individual pens and weighed every fortnight. They were fed total mixed ration at 4 % of their body weight each. The ration was adjusted at regular intervals of two weeks along with changes in live weight.

Experimental Design and Diets: Sixteen (16) Red Sokoto bucks with an average live weight of 10 ± 2 kg with an average age of twelve (12) months were used for the experiment. The bucks were allotted to two dietary treatments with two level of supplementation in a completely randomized design, to compare the effect of treated and untreated bagasse, with and without enzymes on the performance of Red Sokoto bucks. The two test diets were designated as TB and UB containing 40 % of bagasse with or without enzyme supplementation. Other feed ingredients include maize offal, cotton seed cake, bone meal, salt and premix. A commercial cocktail of cellulase, phytase and xylanase enzymes were included. Four animals were assigned per treatment; the experimental diets were formulated to be isonitrogenous and isocaloric (Table 1).

Carcass Analysis: At the end of the study, three bucks from each treatment were randomly selected and starved for 9 hours before slaughtering and dressing.

Table 1: Gross composition of experimental diet of red Sokoto bucks fed treated and untreated bagasse with or without enzyme supplementation

Parameters (%)	With enzyme		Without enzyme	
	TB	UB	TB	UB
Maize offal	33.75	8.50	33.75	8.50
Bagasse	40.00	40.00	40.00	40.00
Cotton seed cake	23.00	48.23	23.00	48.23
Bone meal	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00
Premix	0.27	0.27	0.27	0.27
Enzyme	20.00	20.00	0.00	0.00
Total	100.20	100.20	100.00	100
Calculated composition				
Crude protein (%)	14.00	14.00	14.00	14.00
Metabolizable energy (Kcal/kg)	2367.00	2318.00	2367.00	2318.00

TB = treated bagasse, UB = untreated bagasse

After slaughtering organs were removed according to normal dressing procedures (Abdullah *et al.*, 1998). Gut contents were weighed and reweighed when emptied. Sample of meat from the loin where cut and taken to the laboratory for moisture, protein and ash determinations (AOAC, 2005).

Statistical Analysis: All data collected were subjected to one way analysis of variance (ANOVA) using GLM procedure of statistical analysis (SAS, 2002). Significant treatments in means were compared and separated using Duncan Multiple Range Test (Duncan, 1955). Pairwise comparisons were done between urea treated and untreated bagasse, and enzyme supplemented and un-supplemented bagasse using student's t-test.

RESULTS

The results of the effect of enzyme supplementation in diets on carcass and non-carcass characteristics of Red Sokoto bucks indicated a significant difference ($p<0.05$) in dressing percentages (Table 2). Bucks fed bagasse with enzyme supplementation had the highest dressing percentage (43.23 %), while bucks fed bagasse without enzyme had the lowest (41.65 %). However, there was no significant difference ($p>0.05$) in most of the parameters observed. Bucks fed bagasse with enzyme had the highest slaughter weight and hot carcass weight (13.66 ± 0.33 and 6.25 ± 0.16 kg respectively), while bucks fed bagasse without enzyme had (13.16 ± 0.47 and 6.11 ± 0.27 kg) for slaughter weight and hot carcass weight respectively.

Table 2: Effect of enzyme supplementation on carcass characteristics of Red Sokoto bucks fed treated and untreated bagasse

Parameters	BE	BW
Live weight (kg)	14.96 ± 0.38	14.16 ± 0.44
Slaughter weight (kg)	13.66 ± 0.33	13.16 ± 0.47
Hot carcass weight (kg)	6.25 ± 0.16	6.11 ± 0.27
Dressing %	41.65 ± 0.41	43.23 ± 1.24*
Kidney (g)	62.34 ± 1.70	60.43 ± 2.54
Non-carcass characteristics		
Full gut (kg)	2.27 ± 0.07	2.18 ± 0.06
Empty gut (g)	261.67 ± 3.65	308.33 ± 3.12*
Full intestine (kg)	1.10 ± 0.03	1.90 ± 2.1*
Empty intestine (g)	558.50 ± 3.08	610.00 ± 5.0*
Skin (kg)	0.95 ± 0.04	1.04 ± 0.03*
Legs (kg)	0.45 ± 0.01	0.45 ± 0.02
Head (kg)	0.98 ± 0.05	1.09 ± 0.04
Heart (g)	62.16 ± 1.65	60.45 ± 2.63
Lungs and trachea (g)	232.94 ± 1.98	240.51 ± 2.16*
Liver (g)	200.48 ± 2.58	207.99 ± 3.04*

**significantly different means (P<0.05) using pairwise statistics, BE= Bagasse with enzyme, BW= Bagasse without enzyme*

Results of the effect of urea treatment of diet on carcass and non-carcass characteristics of Red Sokoto bucks indicated that there was no significant differences (p>0.05) between bucks fed urea treated bagasse and untreated bagasse, but however, bucks fed urea treated bagasse had higher values for slaughter weight (13.66 ± 0.49 kg), hot carcass weight (6.28 ± 0.30 kg) and dressing percentage (42.46 ± 1.03 %), while bucks fed untreated bagasse had least values for slaughter weight (13.16 ± 0.30 kg), hot carcass weight (6.08 ± 0.08 kg) and dressing percentage (42.42 ± 0.68 %) (Table 3).

Table 3: Effect of urea treatment on carcass characteristics of Red Sokoto bucks fed treated and untreated bagasse

Parameters	TB	UB
Live weight (kg)	14.80 ± 0.45	14.33 ± 0.30
Slaughter weight (kg)	13.66 ± 0.49	13.16 ± 0.30
Hot carcass weight (kg)	6.28 ± 0.30	6.08 ± 0.08
Dressing %	42.46 ± 1.03	42.41 ± 0.68
Kidney (g)	62.24 ± 0.97	60.53 ± 0.05
Non-carcass characteristics		
Full gut (kg)	2.23 ± 0.07	2.21 ± 0.06
Empty gut (g)	280.00 ± 3.76	290.00 ± 3.42*
Full intestine (kg)	1.10 ± 0.03	1.90 ± 2.11*
Empty intestine (g)	608.33 ± 3.20*	560.17 ± 5.3
Skin (kg)	0.95 ± 0.04	1.05 ± 0.03
Legs (kg)	0.44 ± 0.02	0.46 ± 0.01
Head (kg)	1.07 ± 0.04	1.00 ± 0.03
Heart (g)	62.25 ± 1.16	60.37 ± 1.02
Lungs and trachea (g)	234.68 ± 2.68	238.76 ± 1.68
Liver (g)	211.33 ± 3.38*	197.14 ± 4.77

**significantly different means at p<0.05 using pairwise statistics, TB = urea treated bagasse, UB = untreated bagasse*

The interaction between enzyme and urea treatment of diet on carcass and non-carcass characteristics of Red Sokoto bucks showed no significant difference (p>0.05) for the interaction between enzyme and urea treatment (Table 4). However, bucks fed treated bagasse with enzyme had the highest slaughter weight (14.0 ± 0.57 kg), followed by bucks fed untreated bagasse with enzyme and bucks fed urea treated bagasse without enzyme (13.33 ± 0.88 kg) with the least obtained on bucks fed untreated bagasse without enzyme (13.0 ± 0.57 kg). Similar values were obtained for hot carcass weight. Bucks fed urea treated bagasse with enzyme had the highest hot carcass weight (6.50 ± 0.28 kg), followed by bucks fed untreated bagasse without enzyme (6.16 ± 0.16 kg) and bucks fed urea treated bagasse without enzyme (6.06 ± 0.96 kg). The least hot carcass weight was recorded among bucks fed untreated bagasse with enzyme (6.0 ± 0.57 kg). Highest dressing percentage was observed among bucks fed untreated bagasse without enzyme (44.11 %), followed by bucks fed urea treated bagasse with enzyme (42.58 %), then bucks fed treated bagasse without enzyme (42.34 %) and the least in bucks fed untreated bagasse with enzyme (40.72 %). Results of the effect of enzyme supplementation in diet on meat quality of Red Sokoto bucks indicated that moisture content, protein and ash were statistically similar (p>0.05) between bucks fed bagasse with enzyme and those fed bagasse without enzyme (Table 5). However, moisture content (67.53 %) was numerically higher for bucks fed bagasse without enzyme when compared with bucks fed bagasse with enzyme.

The effect of urea treatment of diet on meat composition of Red Sokoto bucks showed no significant difference (p>0.05) between bucks fed urea treated and untreated bagasse (Table 6). However, bucks fed urea treated bagasse had higher numerical values for moisture (68.23 %), protein (30.16 %) and ash (1.5 %), while bucks fed untreated bagasse had least values for moisture, protein and ash (68.05, 29.62 and 1.16 %) respectively.

The interaction between enzyme and urea treatment of diet on meat proximate composition of Red Sokoto bucks indicated no significant difference (p>0.05) for the interaction between enzyme and urea treatment (Table 7). However, bucks fed untreated bagasse with enzyme had the highest moisture content (66.35 %), followed by bucks fed treated bagasse with enzyme (65.19 %) and bucks fed urea treated bagasse without enzyme (66.12 %). The least moisture content value was obtained among bucks fed untreated bagasse without enzyme (66.05 %).

Table 4: Effects of enzyme and urea treatment on carcass characteristics of Red Sokoto bucks fed treated and untreated bagasse

Parameters	With enzyme		Without enzyme	
	TB	UB	TB	UB
Live weight (kg)	15.26 ± 0.63	14.66 ± 0.72	14.33 ± 0.33	14.00 ± 0.57
Slaughter weight (kg)	14.00 ± 0.57	13.33 ± 0.88	13.33 ± 0.33	13.00 ± 0.57
Hot carcass weight (kg)	6.50 ± 0.28	6.00 ± 0.57	6.06 ± 0.96	6.16 ± 0.16
Dressing %	42.58 ± 0.76	40.72 ± 1.96	42.34 ± 0.50	44.11 ± 1.02
Kidney (g)	64.10 ± 3.34^{b}	60.58 ± 4.69^{a}	60.39 ± 1.38^{a}	60.48 ± 1.07^{a}
Non-carcass characteristics				
Full gut (kg)	2.34 ± 0.08	2.2 ± 0.11	2.13 ± 0.08	2.23 ± 0.06
Empty gut (g)	286.66 ± 3.33^{c}	236.66 ± 2.63^{a}	273.33 ± 3.33^{b}	343.33 ± 4.31^{d}
Full intestine (kg)	1.06 ± 0.06^{c}	1.03 ± 0.03^{b}	1.06 ± 0.03^{c}	1.01 ± 0.11^{a}
Empty intestine (g)	550.00 ± 5.1^{a}	567.00 ± 6.5^{b}	666.66 ± 3.33^{c}	553.33 ± 4.71^{a}
Skin (kg)	0.88 ± 0.06	1.03 ± 0.03	1.01 ± 0.04	1.06 ± 0.06
Legs (kg)	0.45 ± 0.02	0.45 ± 0.04	0.43 ± 0.01	0.48 ± 0.01
Head (kg)	1.01 ± 0.09	0.95 ± 0.02	1.13 ± 0.06	1.05 ± 0.07
Heart (g)	63.95 ± 1.42^{b}	60.38 ± 2.78^{a}	60.55 ± 2.12^{a}	60.35 ± 1.91^{a}
Lungs and trachea (g)	228.81 ± 1.68^{a}	237.07 ± 3.91^{b}	240.55 ± 2.42^{c}	240.46 ± 2.56^{c}
Liver (g)	202.07 ± 4.37^{c}	198.89 ± 1.21^{b}	220.59 ± 1.11^{d}	195.39 ± 2.21^{a}

a, b, c Means with different superscripts along then row differed significantly (p<0.05). TB = urea treated bagasse, UB = untreated bagasse

Table 5: Effect of enzyme on meat composition of Red Sokoto bucks fed treated and untreated bagasse

Parameters (%)	BE	BW
Moisture	66.21 ± 0.87	67.53 ± 0.97
Protein	29.20 ± 0.49	28.36 ± 0.39
Ash	1.10 ± 0.18	1.23 ± 0.30

BE = Bagasse with enzyme, BW = Bagasse without enzyme

Table 6: Effect of urea treatment on meat composition of Red Sokoto bucks fed treated and untreated bagasse

Parameters (%)	TB	UB
Moisture	68.23 ± 1.09	68.05 ± 0.97
Protein	30.16 ± 0.29	29.62 ± 0.55
Ash	1.50 ± 0.19	1.16 ± 0.29

TB = urea treated bagasse, UB = urea untreated bagasse

Table 7: Effects of enzyme and urea treatment on meat composition of Red Sokoto bucks fed treated and untreated bagasse

Parameters (%)	With enzyme	
	TB	UB
Moisture	65.19 ± 0.67	66.35 ± 1.17
Protein	30.35 ± 0.24	29.45 ± 0.42
Ash	1.14 ± 0.31	1.23 ± 0.20
	Without enzyme	
Moisture	66.12 ± 1.54	66.05 ± 0.75
Protein	28.98 ± 0.68	29.68 ± 0.73
Ash	1.10 ± 0.30	1.16 ± 0.25

TB=urea treated bagasse, UB=untreated bagasse

Protein content and ash were also statistically similar (p>0.05) across treatment groups.

DISCUSSION

The results of this study indicated that carcass and non-carcass characteristics were not significant among treatment groups which suggest that animals fed bagasse with and without enzyme both performed positively. This was in agreement with the findings of Ramli *et al*. (2005) who fed fermented bagasse to goats and reported a non-significant difference in carcass and non-carcass components.

The statistical similarities in mean values irrespective of enzyme supplementation, urea treatment and interaction between enzyme and urea treatment implied that enzyme supplementation or urea treatment did not affect the quality of the proximate composition of meat. The result obtained in this study is similar but lower to the findings of Moawad *et al*. (2013) who reported higher (75.32, 19.97 and 1.13 %) for moisture content, Crude protein and Ash respectively. The lower values recorded in the present study may be as a result of differences in breed and age of bucks.

The dressing percentage and other characteristics obtained in this study as a result of interaction between enzyme and urea were not significant. The results were similar to that obtained by Yakubu (2015) who reported a non-significant effect of cotton products at different

inclusion level (10, 20 and 30 %), however the dressing percentage were lower (24.45 – 43.43 %) than those obtained in this study which could be as a result of the differences in the age of the animals used. Thus, suggesting that animals performed well irrespective of the interaction between enzyme and urea in the diet.

The non-significant differences irrespective of enzyme supplementation, urea treatment and interaction between enzyme and urea treatment implied that enzyme supplementation or urea treatment did not affect the quality of the meat. However, the values obtained in this study were higher compared to the report of Ramli *et al*. (2005). The differences observed may be attributed to the differences in breed and age of the bucks used for the study.

Conclusion: Diets containing treated or untreated bagasse with or without enzyme supplementation consumed voluntarily had no effect on carcass traits and subsequent meat quality of Red Sokoto buck.

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