

EFFECT OF TREATED AND UNTREATED BAGASSE WITH OR WITHOUT ENZYME SUPPLEMENTATION ON RUMINAL PROFILE OF RED SOKOTO BUCKS

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ABSTARCT

A study was conducted to evaluate the feeding value of treated and untreated sugarcane bagasse with or without enzyme supplementation in total mixed ration (TMR) on ruminal characteristics 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 and the diets were offered at 3% body weight. Rumen fluid was collected at the end of the study at 4hrs after feeding to determine rumen characteristics of the bucks. Rumen pH was within the range of 6-7 and rumen ammonia nitrogen was between 30.01-31.26mg/L which are within the normal range for bucks. It was concluded that treatment with urea produced higher volatile fatty acids by the bucks without any adverse effect.

Keywords: Rumen fermentation, Enzyme, Red Sokoto.

INTRODUCTION

Small ruminants occupy an important economic and ecological niche in Agricultural systems throughout the developing countries (Devendra, 2005). Small ruminant livestock under small holder system are scavengers, surviving on crop residues, household wastes and natural vegetation regardless of their quality. However; the economic importance of livestock especially small ruminants in mixed farming system is now receiving attention. Bagasse is a fibrous sugarcane by-product containing high fibre (43%) and low nitrogen (0.2%), it has limited use in animal feeds without any proper treatment (Ramliet *al.*, 2005). The objective of this study was to evaluate the rumen profile of Red Sokoto bucks fed treated and untreated sugarcane bagasse with or without enzyme supplementation.

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 $11^{\circ} 11' N$ and longitude $07^{\circ} 38' E$. (Wikipedia, 2014).

Experimental design and diets

Sixteen Red Sokoto bucks with an average live weight of 10 ± 2 kg were used for the experiment. The bucks were allotted to two dietary treatments with two level of supplementation in a 2×2 factorial arrangement in a complete randomized design, to compare the effect of treated and untreated bagasse, with and without enzymes on the ruminal profile of Red Sokoto bucks. A commercial cocktail of cellulase, phytase and xylanase enzyme was included based on manufacturer's recommendation. The experimental diet was formulated to be isonitrogenous and isocaloric.

Animal management

Before the onset of the experiment, prophylactic treatments such as deworming, vaccination and antibiotics were administered to the bucks. The bucks were then housed in individual pens and weighed every fortnight. They were fed total mixed ration at 3% of their body weight each.

Source of Sugarcane Bagasse and treatment

Sugarcane bagasse was sourced from sugarcane processing centre at Kauran Mata in Kano state. The bagasse was dried and ground into smaller particle sizes, it was then treated with urea at 5%

(50g of urea was dissolved in one litre of water to treat one kg of bagasse). The treated bagasse was then parked in an improved cowpea storage (PIC) bags for two weeks, after which it was opened and aerated before inclusion in the TMR.

Rumen Indices

Rumen samples were collected from each buck at the end of the feeding trial at 4hrs after feeding using stomach tube. Immediately after collection, temperature of the rumen liquor was recorded using Digital Thermometer and also its pH was determined using Henna Digital Hand pH meter (model 9404). Total volatile fatty acid (TVFA) was determined according to the Procedure described by Abdulrazak and Fujihara (1999) and rumen ammonia concentration was determined using simple Micro-Kjeldahl distillation (AOAC, 2005).

Statistical Analysis

Data collected at the end of experiment were analysed using GLM procedure of statistical Analysis (SAS, 2002). Significant treatment in means was compared and separated using Duncan Multiple Range Test (Duncan 1955).

RESULTS AND DISCUSSION

Gross composition of experimental diets

The gross composition of the total mixed ration are presented in table 1. The diets were formulated to contain 14% crude protein.

Effect of enzyme in TMR on rumen indices of Red Sokoto bucks

Table 1 highlights the effect of enzyme in TMR on rumen indices of Red Sokoto bucks. At the end of this study it was observed that there was no significant ($P>0.05$) difference in rumen pH, and rumen ammonia nitrogen. However higher rumen ammonia values were recorded in bucks fed bagasse with enzyme supplementation (30.22mg/L) and the least were for bucks fed bagasse without enzyme (29.97mg/L). A significant ($p<0.05$) difference was observed in total volatile fatty acids produced between bucks fed bagasse with enzyme supplementation and those fed bagasse without enzyme.

Effect of urea treatment in TMR on rumen indices of Red Sokoto bucks

The effect of urea treatment in TMR on rumen indices of Red Sokoto bucks is presented in Table 3. There was no significant ($P>0.05$) difference in rumen pH and total volatile fatty acids produced at the end of the study, however

bucks fed urea treated bagasse had higher numerical values for pH (6.7) and total volatile fatty acids (14.27mg/L). A significant ($P<0.05$) difference was observed in rumen ammonia nitrogen, bucks fed urea treated bagasse had higher values (30.85mg/l) while bucks fed untreated bagasse had the least value (29.35mg/L).

Effect of urea treatment in TMR on rumen indices of Red Sokoto bucks

The effect of interaction between enzyme and urea treatment in TMR on rumen indices of Red Sokoto bucks are presented in Table 4. It was observed that there was a significant ($P<0.05$) difference in rumen ammonia nitrogen (31.26mg/l, 30.43mg/l, 30.01mg/l, and 28.68mg/l) and total volatile fatty acids (15.02mg/l, 14.40mg/l, 14.06mg/l and 13.52mg/l) produced at the end of the study for bucks fed urea treated bagasse with enzyme, bucks fed urea treated bagasse without enzyme, bucks fed untreated bagasse with enzyme and bucks fed untreated bagasse without enzyme respectively. There was no significant ($P>0.05$) difference in pH. However bucks fed urea treated bagasse without enzyme had the highest pH (6.8) and the least pH obtained was on bucks fed untreated bagasse without enzyme supplementation (6.5).

The non-significant difference observed between bucks fed bagasse with enzyme and those fed bagasse without enzyme in the rumen fluid pH and rumen ammonia nitrogen at the end of the trial indicated that the diets had similar rumen fermentation patterns which resulted in similar rumen fluid pH and rumen ammonia nitrogen. Also, similar rumen pH and total volatile fatty acids produced at the end of the study between bucks fed urea treated bagasse and untreated bagasse. However, the relative higher pH may be due to urea effect in enriching the rumen media by higher rumen ammonia nitrogen and consequently leading to an alkaline rumen media and subsequent increase in the amount of total volatile fatty acids produced due to increased microbial activity. This result indicated that ruminal nitrogen degradation were adequate across the treatments for normal rumen function and forage digestion as compared to 20mg/100mL considered optimum for forage digestion (Perdocket *al.*, 1988), and also agrees with the report of Fouda (2008) who showcased

similar results of rumen fluid pH and rumen ammonia nitrogen when the author fed mixed rations containing 30% treated or untreated bagasse to rams.

The rumen fluid pH obtained at the end of the study irrespective of interaction between enzyme and urea showed a non-significant difference which was a result of similar fermentation pattern across the treatment groups. This result is similar with the findings of Lamidi (2005) who reported pH values that ranged between 6.49-6.67. The pH values were above the minimum of 6.0 below which cellulolytic digestion in the rumen could be inhibited but it fell within the normal range of 6-7 (Mould and Orskov, 1984). However, the higher values of rumen ammonia nitrogen and total volatile fatty acids could be attributed to the fact that urea present in the diet is quite soluble in the rumen and rapidly converted to ammonia leading to an increase intake in energy and activity of rumen microorganism for active digestion and production of total volatile fatty acids. However there was no adverse effect on the ruminal profile of the bucks.

CONCLUSION

Treatment and supplementation with enzyme produced higher volatile fatty acids, however there was no adverse effect on the ruminal profile of Red Sokoto bucks.

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Table 1: Gross composition of total mixed ration

Parameters (%)	With enzyme		Without enzyme	
	TB	UB	TB	UB
Maize offal	33.75	8.5	33.75	8.5
Bagasse	40	40	40	40
Cotton seed cake	23	48.23	23	48.23
Bone meal	2	2	2	2
Salt	1	1	1	1
Premix	0.27	0.27	0.27	0.27
Enzyme	20g	20g	0	0
Total	100	100	100	100
Calculated % CP	14	14	14	14

M.E (Kcal/kg)	2367	2318	2367	2318
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Table 2: Effect of enzyme in TMR on rumen indices of Red Sokoto bucks

Parameters	BE	BW	SEM	LOS
pH	6.6	6.6	0.15	NS
NH ₃ -N (mg/L)	30.22	29.97	0.41	NS
TVFA (mg/L)	14.71 ^a	13.79 ^b	0.28	*

^{a, b, c} =Means with different superscripts along the row differed significantly (P<0.05). BE=bagasse with enzyme, BW=bagasse without enzyme, NH₃-N=rumen ammonia nitrogen, TVFA=total volatile fatty acids

SEM=Standard Error of Means

Table 3: Effect of urea treatment in TMR on rumen indices of Red Sokoto bucks

Parameters	TB	UB	SEM	LOS
pH	6.7	6.6	0.15	NS
NH ₃ -N (mg/L)	30.85 ^a	29.35 ^b	0.41	*
TVFA (mg/L)	14.27	14.23	0.28	NS

^{a, b, c} Means with different superscripts along the row differed significantly (P<0.05). TB=urea treated bagasse, UB=untreated bagasse, NH₃-N=rumen ammonia nitrogen, TVFA=total volatile fatty acids

SEM=Standard Error of Means

LOS=Level of Significance

Table 4: Effects of enzyme and urea treatment in TMR on rumen indices of Red Sokoto bucks

Parameter	With enzyme		Without enzyme		SEM	LOS
	TB	UB	TB	UB		
pH	6.6	6.6	6.8	6.5	0.22	NS
NH ₃ -N (mg/L)	31.26 ^a	30.01 ^b	30.43 ^{ab}	28.68 ^c	0.58	*
TVFA (mg/L)	15.02 ^a	14.40 ^{ab}	13.52 ^c	14.06 ^{bc}	0.39	*

^{a, b, c} =Means with different superscripts along the row differed significantly (P<0.05). TB=urea treated bagasse, UB= untreated bagasse, NH₃-N=rumen ammonia nitrogen, TVFA=total volatile fatty acids

SEM=Standard Error of Means