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RUMEN METABOLITES OF YANKASA RAMS FED UREA TREATED AND ENSILED MILLET STOVER BASED DIET WITH CONCENTRATES

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ABSTRACT

An experiment was conducted to evaluate the effect of feeding urea treated and ensiled millet stover based diet with supplements on rumen metabolites of growing Yankasa. Thirty (30) growing Yankasa rams weighing 16.35 to 18.21 kg were allotted to six treatments of five animals per treatment in a Completely Randomized Design. Four kg urea was dissolved in 100 litres of water sprinkled on 100kg of crushed millet stover and ensiled for 21 days was used as basal diet. A concentrate diet consisting of 300g of cotton seed cake diet 1, Faidherbia albida meal diet 2, CSC and maize offal diet 3, FA and maize offal diet 4, CSC and wheat offal diet 5 and FA and wheat offal diet 6, all

fed 150g twice daily. Fifty (50mls) of rumen liquor was withdrawn from 3 Yankasa rams of each diet to determine pH and short chain fatty acids. The values ranged from 5.87 to 7.68 for pH after feeding while for total short chain fatty acids they ranged from 40.26 to 51.60 after feeding respectively. Rams fed FA:WO 50:50 diet recorded higher pH and total short chain fatty acids and could be recommended for growing Yankasa rams.

Key words: *Faidherbia albida, millet stover, rams, rumen pH, Short Chain Fatty Acids and urea*

INTRODUCTION

Livestock is an important part in the agricultural production system which plays an essential role in the economy (Hassan *et al.*, 2010). However, livestock productivity in the tropics has suffered major setback due to inadequate quantity and quality of feeds for animals especially during dry season (Peters, 1998). Leguminous trees and other fodder plants maintain higher protein and mineral contents during growth than grasses, which do not, and decline rapidly in quality as they advance to maturity (Aganga and Tshwenyane, 2003). The economic importance of sheep in developing nations cannot be over-emphasized. In sub-Saharan Africa, sheep provide almost 30% of the meat consumed and around 16% of the milk produced (FAO, 2007). Sheep milk yields 18%

to 25% cheese, whereas goat and cow milk only yield 9-10% (FAO, 2007). They also play a significant socio-economic role in the life of people: They are slaughtered during ceremonies and festivals, and serve as a source of ready cash to livestock farmers (FAO, 2007). In Nigeria, the dietary energy (2.4 Mcal/kgDM) and protein (5.6%) obtained from rangelands, particularly in the dry season are generally low to meet the nutrient requirements for maintenance (2.7 Mcal/kgDM and 16.2 %CP) (NRC, 1985). Animal productivity could be increased by the introduction of low cost technologies such as feeding systems that are simple, consistently practical and within the limits of the farmer's resources (Douthwaite, 2002). One of such feeding systems is the use of *Faidherbia albida* pod meal that supplies protein in fodder for livestock (FAO, 2000). The objectives of the research were to determine the effect of feeding urea treated and ensiled millet stover based diet with concentrates on rumen pH and short chain fatty acids (acetate, propionate and butyrate) of growing Yankasa Rams.

MATERIALS AND METHODS

Study Area: The experiment was conducted at the Teaching and Research Farm, in the Small Ruminant Unit of the Federal University Dutsinma, Katsina State.

Dutsinma LGA lies on latitude 12^0 27'16.128'N and longitude $07^0$29'5544E. It has a land area of about 527, km^2 (203sq miles). It has an elevation of about 605m (1,985 ft.), with a population of 167,671. The inhabitants are predominantly Hausa and Fulani by tribe. Their main occupation is crop production and animal rearing (Wikipedia, 2006).

Preparation of Experimental Diets

Two experimental diets were prepared for the study: basal and concentrates.The basal diet was prepared by dissolving 4kg of urea grade fertilizer in 100 litres of water to make a 4% urea solution, then sprinkled on 100kg of crushed millet stover and spread on a polythene sheet for a period of one hour to allow for escape of excess ammonia. This served as the basal diet of the experiment. The basal diet was fed to the rams, *ad libitum*

Six concentrate diets were formulated using cotton seed cake, *Faidherbia albida* meal, maize offal and wheat offal. CSC, FA, CSC/MO, FA/MO, CSC/WO and FA/WO respectively.

Experimental Design and Animal's Management: Thirty (30) growing Yankasa Rams with an initial weight of 16.35 - 18.21 kg were procured for the study. The animals were balanced for initial weights before they were allocated to six diets with five rams per treatment in a Completely Randomised Design

(CRD), housed in individual face – in cubicles of 2 by 2 metres, housed in the same pen with slanted concreted floors, under a common roof. The house was fully illuminated, ventilated and has been sanitized periodically. Prior to their arrival, the cubicles were cleaned and disinfected with Diskol-ES (Tiscol) at the rate of 10mls/4litres of water. Also 10% formalin was used as a fumigant. On their arrival, they were quarantined for two weeks during which their bodies were sprayed with acaricide, using Amitraz® 1ml/litre against external parasites. They were dewormed with Albendazole at 12.5mg/kg^1 body weight. against internal parasites. Antibiotic (Oxytetracycline L. A. (Kepro®)) 20%, at 1ml per 10kg body weight were injected intramuscularly. They were kept for two weeks, adaptation period prior to the commencement of the experiments. Groundnut haulms and maize offal were offered to the rams during the quarantine period.

Rumen Liquor Collection and Analysis **An improvised suction tube (Bogoro, 1997) was used to collect rumen liquor as described by Menke and Steingass (1988). The rumen liquor was collected before feeding, 3 hours after feeding, and 5 hours after feeding at the last week of each experiment using a suction tube inserted from the mouth into the rumen where 50mls of rumen liquor was withdrawn from 3 Yankasa rams of each diet, they were made to fast overnight to enable liquor collection before feeding in the morning, this was placed in a calibrated gas tight plastic sy ringe fitted with a piston for storage and transportation (Babayemi and Bamikole, 2006). Samples were collected in a labelled and sterilised plastic sample bottles for each animal. The pH of the ruminal fluids collected were immediately recorded using an AGB – 75 laboratory pH – meter. The ruminal fluids were later analysed for total volatile fatty acids, (TVFA) and rumen liquor pH, according to Ziolecki and Kwaitokwoska (1975).**

Statistical Analysis*:*The data collected from the study were subjected to Analysis of Variance (ANOVA) using General Linear Model of SAS (2002). Difference among means were compared at ($p<0.05$) using Duncan Multiple Range Test (DMRT) of the same statistical package.

RESULTS AND DISCUSSION

Rumen short chain fatty acids and pH of Yankasa rams fed urea treated and ensiled millet stover based diets with supplements

Rumen pH before feeding was significantly ($p<0.05$) affected by the diets. However, there was general decrease in pH after feeding across the diets. It was observed in this study that rumen pH values decreased 3hours and 5hours after feeding in D4, also similar trend was maintained from D1 – D5, which agrees with the report of Girgiri (2017) who observed a decrease in pH value range before and 4 hours after feeding as 5.75 – 7.45 and 5.10 – 6.95. The values of rumen liquor pH in this study is in agreement with observations made by Orskov (1990) who reported that cellulolytic bacteria require pH of 6.2 – 7.0 which were optimal for microbial growth when rams are fed on roughages, as such normal rumen pH implies that volatile fatty acids which are by-products of fermentation rapidly diffused through the rumen wall instead of accumulating within the rumen.

The total volatile fatty acids in this study were within range of 73.85 – 85.3% by Thalib *et al,* (2010), 86.2 91.9% by Davies, MCkinna and Mutsvangwa (2012) and were also similar with 42.40 – 81.40 except for D3 which was higher than that of present study. The TVFA values obtained in this study were higher than 8.08 BF and 10.12% AF reported by Tawila *et al,* (2008), 6.07 – 7.34% BF and 8.91 – 10.25 AF reported by Hamad *et al,* (2010), 20.50 – 10.00% reported by Hassan *et al,* (2016) and 9.18, 9.93 and 9.52% BF and 9.96, 10.61 and 11.59% AF reported by Girgiri (2017). According to observation made by

Akinbode *et al,* (2020) that significant variations ($p<0.05$) in total volatile fatty acids (acetate, propionate and butyrate) across diets could be as a result of increase in nitrogen sources.

Table 1: Chemical composition of the concentrates and the basal diets Fed to the growing Yankasa rams during the experiment

Parameters (%)	Diets							
	NTMS	UTMS	T1 CSC	T2 FA	T3 CSC/MO	T4 FA/MO	T5 CSC/WO	T6 FA/WO
DM	93.53	94.58	92.01	94.17	93.46	91.31	92.87	90.63
OM	88.31	84.83	83.53	89.15	75.35	82.06	78.50	83.23
CP	8.75	33.07	27.88	15.1	31.16	19.13	27.88	16.95
NDF	40.05	30.90	50.39	57.27	39.43	42.80	39.25	43.00
ADF	30.75	21.34	21.31	30.50	20.96	31.15	22.75	30.13
Hemic	9.30	9.56	29.08	26.77	18.47	11.65	16.50	12.87
Ash	5.22	9.75	8.48	5.02	18.11	9.25	14.37	7.40

NTMS = Non-Treated Millet Stover; UTMS = Urea-Treated Millet Stover; T1 = Cottonseed Cake; T2 = *Faidherbia albida* meal; T3 = Cottonseed Cake + Maize Offal; T4 = *Faidherbia albida* meal + Maize Offal; T5 = Cottonseed Cake + Wheat Offal; T6 = *Faidherbia albida* meal + Wheat Offal; DM = Dry Matter; OM = Organic Matter; CP = Crude Protein; NDF = Neutral Detergent Fibre; ADF = Acid Detergent Fibre; Hemic = Hemicellulose

Table 2: Rumen Short Chain Fatty Acids and pH of Yankasa Rams Fed Urea Treated and Ensiled Millet Stover with Supplements

Parameters	Periods	Diets						SEM	LS
		1 CSC	2 FA	3 CSC/MO	4 FA/MO	5 CSC/WO	6 FA/WO		
pH	BF	7.07^{b}	8.40^{a}	5.40^{cd}	9.10^{a}	6.80^{c}	6.80^{c}	0.31	*
	3hrs AF	7.60^{b}	9.30^{a}	8.97^{a}	6.20^{c}	9.30^{a}	7.00^{bc}	0.32	*
	5hrs AF	5.30^{cd}	8.40^{a}	5.30^{cd}	5.20^{d}	7.40^{b}	8.20^{ab}	0.40	*
TVFA	BF	38.30^{bc}	30.43^{d}	44.03^{a}	36.60^{c}	33.00^{cd}	38.70^{b}	2.00	*
	3hrs AF	34.33^{b}	41.13^{a}	36.60^{ab}	50.00^{a}	42.50^{ab}	33.13^{b}	1.99	*
	5hrs AF	35.43^{c}	41.30^{ab}	39.83^{bc}	36.17^{b}	43.97^{ab}	49.30^{a}	1.80	*

D1 = Cotton Seed Cake alone; D2 = *Faidherbia albida* meal alone; D3 = Cotton Seed Cake + Maize Offal; D4 = *Faidherbia albida* meal + Maize Offal; T5 = Cotton Seed Cake + Wheat Offal; D6 = *Faidherbia albida* meal + Wheat Offal; BF = Before Meal; 3AF = Three Hours after Meal; 5AF = Five Hours after Meal; TVFA = Total Volatile Fatty Acids; NS = Non Significant (P<0.05).

CONCLUSION

It was concluded that, the diet had no detrimental effect on pH and short chain fatty acids of growing Yankasa rams, in that after feeding the diets, there was increase in short chain fatty acids and the pH. Based on the findings of this study diet 6 gave the best results in terms higher pH and total volatile fatty acids as such it was recommended for growing Yankasa rams.

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