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NUTRIENT DIGESTIBILITY AND RUMEN FERMENTATION OF DRIED CASSAVA PEELS AND BREWERS DRIED GRAIN BASED DIETS BY WEST AFRICAN DWARF (WAD) SHEEP

BY

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ABSTRACT

In the tropics, supplementing concentrates with grasses, especially during the dry season could improve protein to energy ratio in ruminants thereby improving optimum production. Also, supplementation with a protein source enhances the production capacity of ruminants. Therefore, this study was designed to determine the nutrient digestibility and rumen fermentation kinetics of *Panicum maximum* supplemented with brewers dried grains and dried cassava peels based diets by West African Dwarf (WAD) lambs. Nine lambs of about 9 months in age and bodyweight ranging from 10.5kg-16.5kg were randomly divided into 3 groups and assigned to the following diets: Diet 1-100% *Panicum maximum*, Diet 2 - 81% DCP + 13.50% PKC + 2% Oyster shell + 2% Salt + 1.50% Premix and Diet 3 - 81% BDG + 13.50% PKC + 2% Oyster shell + 2% Salt and 1.50 Premix. Result showed that animals on diet 1recorded the least significant ($p< 0.05$) dry matter digestibility (55.00%) to those on diets 2 and diet 3. Animals on diet 3 recorded the best crude protein digestibility (66.88%) which was significantly different ($p<0.05$) from those on diets 1 and 2 (53.04% and 56.79%). Animals on diet 1 recorded the highest significant ($p<.0.05$) amount of ammonia nitrogen at O **and 4 hours** post feeding. The same trend seems to occur for volatile fatty acids (acetate, propionate and butyrate) at O hour post feeding. However, at 4 hour post feeding, animals on diet 3 recorded a slight numerical advantage over other animals. It can therefore be deduced from this study that diet 3 was most preferred as evident from the chemical composition of the feed and nutrient digestibility of the lambs.

Keywords: Dried cassava peels, brewer's dried grains, digestibility, fermentation kinetics and lambs.

INTRODUCTION

The dry season in Nigeria forms a major drawback to ruminant production due to long periods of drought, with prevalence of poor quality roughages for animal consumption (Ademosun, 1994). Feed scarcity, therefore, has made it necessary to search for substitutes for the conventional feed resources by harnessing available agro industrial wastes. The practice of feeding crop residues and agro industrial by products as alternatives holds inestimable potentials for the development of the subsector (Alhasan, 1985).

Feed ingredients can substitute one another so long as the sheep's nutritional requirements are being met, dangerous nutritional imbalance is not being created, and the health of the rumen is not compromised (Faniyi and Ologhobo, 1999). Ruminants utilize cassava peels due to their anatomical endowment and the advantage of degrading roughages more effectively than other domestic animals. Moreover, ruminants depend on forage from native pastures as

major feed resource. Guinea grass (*Panicum maximum*) is high yielding perennial forage in terms of biomass production per unit area (Bamikole *et al.*, 1998).

This study sets out to evaluate the nutrient digestibility and rumen fermentation kinetics of dried cassava peel and brewer's dried grain based diets fed to West African Dwarf lambs.

MATERIALS AND METHODS

Nine growing lambs with body weight range of 10.50kg to 16.50 kg were obtained for the study. The animals were treated with Oxytetracycline and Ivomec® for bacterial infection and parasites respectively.

The experimental diets were: Diet 1:100% *Panicum maximum*; Diet 2: *Panicum maximum* (*ad lib.)* + dried cassava peel based concentrate at 3% body weight and diet 3 : *Panicum maximum* + brewer's dried grains based concentrate at 3% body weight. Gross composition of the experimental diets is presented in Table 1.

Fresh grass (*Panicum maximum*) was cut within the environment of the University farm, wilted and chopped before being fed to the animals. Dried cassava peels and brewers dried grains were purchased and kept in jute bags placed on a rack till the diets for the experiment were formulated.

Table 1: Gross composition (%) of the experimental diet

Ingredients	Diet 1	Diet 2	Diet 3
Dry cassava peel	0.00	81.00	0.00
Brewers dried grains	0.00	0.00	81.00
Palm kernel cake	0.00	13.50	13.50
Oyster shell	0.00	2.00	2.00
Salt	0.00	2.00	2.00
Premix	0.00	1.50	1.50
Panicum maximum	100.00	*ad lib*	*ad lib*
Total	**100.00**	**100.00**	**100.00**

Animals were housed in individual metabolic cages for 23 days, with the allowance of the first 14 days for adaptation to routine management, while faeces, urine and rumen liquor was collected from each animal in the last 9 days. Feed intake and faeces voided were weighed and samples were oven dried. Urine collected was stored after adding 3 drops of 0.1N sulphuric acid. Concentrate and grass were offered together with fresh water in the metabolic cage. Digestibility was calculated for each animal within diets according to standard procedures recommended by McDonald *et al.*, (2002), while samples of feed and diets were analyzed for proximate composition according to AOAC (1995) and fibre fractions determined according to procedures of van Soest *et al.*, (1991). Rumen liquor samples collected at 0 and 4 hours post feeding were analyzed for ammonia-nitrogen by methods of Conway (1962) and volatile fatty acids (VFA) were assayed by the method of Briggs *et al.*, (1957).

Stomach tube using light suction through peristalsis movement was used for collection of rumen liquor. About 50 - 60ml was collected into sterilized sample bottles and taken to the laboratory immediately for analysis of ammonia-nitrogen and volatile fatty acids.

Data obtained were subjected to analysis of variance (SAS, 2000) and where significant differences were observed, means were separated using Duncan Multiple range test of the same package.

RESULTS AND DISCUSSION

Presented in Table 2, are the chemical compositions (%) of the diets offered to the lambs. The dry matter (DM) values fell within 34.30% - 89.93%, with diet 1 being the least significant ($P<.0.05$) and diets 2 and 3 recording 89.93% and 89.80% respectively. The low DM obtained in diet 1 may be attributed to the fresh state of the grass while diets 2 and 3 were dry. The DM for *Panicum maximum* was just a little over the range reported by Aken 'Ova and Mohamed-saleem (1982) which reported 23.30% - 30.40%.

The crude protein (CP) for *Panicum maximum* in this study (8.60%) was within the range reported by Aken "Ova and Mohamed-saleem (1982) of 5.70% - 13.50% and higher than that reported by Arigbede *et al*, (2005) of 8.50%. Difference can be attributed to geographical location and climate as well as species of grass. Diet 3 had the highest CP of 21.74%, this impact could be traced to brewers dried grain. Also, the CP of diet 3 was significantly different ($p< 0.05$) from other diets. Fibre fractions had no significant difference ($p> 0.05$) between the diets analysed with the trend being diet 1> diet 2 > diet 3.

Table 2: Chemical Composition (%) Guinea grass and concentrate

Parameters	Diet 1	Diet 2	Diet 3	SEM
DM	34.30^{b}	89.93^{a}	89.80	3.16
CP	8.60^{c}	15.90^{b}	21.74^{a}	2.28
EE	3.90	4.80	5.74	0.03
Ash	2.74	3.12	3.57	0.03
NDF	41.60	39.60	38.40	0.18
ADF	26.90	23.60	21.74	0.43

Table 3: Chemical Composition (%) of faeces voided by lambs

Parameters	Diet 1	Diet 2	Diet 3	SEM
DM	42.30	45.93	44.80	0.16
CP	8.05^{b}	13.7^{a}	14.40^{a}	1.12
EE	2.47	2.30	2.40	0.10
Ash	2.43	2.32	2.84	0.01
NDF	36.40	30.90	32.69	0.28
ADF	22.60	20.60	24.50	0.19

Shown in Table 3 is the chemical composition of faeces voided by lambs. There were no significant (P>.0.05) differences in the parameters measured except for CP where animals on diets 2 and 3 recorded a significant (P< 0.05) difference over animals on diet 1.

The nutrient digestibility of the lambs fed guinea grass and concentrate diets are shown in table 4. The dry matter digestibility (DMD) for all diets were within the range (44.14% - 0.745) when complete diets of grass was fed to lambs as reported by Murphy *et al.*, (1994). The DMD for diets 2 and 3 were higher due to the fact that concentrate based diets improved digestibility in growing lambs as reported by Hadjipaniyiotou, (1994) who recorded a range of 78.00% - 79.00%.

Increased crude protein intake induces higher crude protein digestibility through increase in rumen pH and volatile fatty acid concentration (Firkins *et al.*, 1998). Therefore the animals on diet 3 had a higher CP intake hence elicited a better CP digestibility that was significantly (p< 0.05) different from on diets 1 and 2. The increase in CP obtained in diet 3 could be due to the presence of bypass protein present in brewers' dried grain. The fibre fractions (NDF and ADF) had no significant difference (p>0.05) across diets digestibility, with Diet 2 being numerically higher in NDF and diet 1 numerically higher in ADF. Richard *et al.*, (1994) reported 56.50% - 59.20% NDF digestibility for goats fed forage and concentrate mixture.

Table 4: Nutrient digestibility of lambs fed guinea grass and concentrate

Parameters	Diet 1	Diet 2	Diet 3	SEM
DM	55.00^{b}	74.46^{a}	75.06^{a}	2.54
CP	53.04^{b}	56.79^{b}	66.88^{a}	2.25
EE	68.33^{b}	76.04^{a}	79.09^{a}	3.07
Ash	55.66^{ab}	62.82^{a}	50.00^{b}	3.11
NDF	56.25	60.98	57.34	1.31
ADF	57.99	56.36	53.65	3.08

Differences recorded in this study may be due to forage differences and concentrate composition. The ammonia-nitrogen (mg/litre) and volatile fatty acids (m/100ml) are presented in Table 5. Two collection periods were observed (0hr and 4hr post feeding) are recorded as analyzed from rumen liquor of the lambs. Significant difference (p<0.05) was obtained at 0 and 4hr post feeding between the ammonia-nitrogen content of animals on diet 1 (13.50 vs 13.75 mg/L) against those on diets 2 and 3 (8.90 vs 9.69 and 8.98 vs 9.87 mg/l respectively). Also no particular trend was noticed from the data of ammonia nitrogen. However, this study did not agree with the suggestion of Klevesahl *et al.*, (2003) who observed that increase in dietary protein increases ammonia nitrogen concentration. Satter and Slyter (1974) obtained 50-80mg/l as optimum values for maximizing microbial growth, but the values obtained in this study were below this range. Ammonia nitrogen increased across diets in 4hr post feeding.

The result of volatile fatty acids showed that animals on diet 1 recorded the highest values for acetate, propionate and butyrate at 0 hour, with the highest being from butyrate (11.12mg/100ml). However at 4 hour post feeding, volatile fatty acids decreased for animals on

diets 1 and 3 and animals on diet 2 increased in the three volatile fatty acids measured. The decrease in 4 hour post feeding may be due to high uptake of the fatty acids or utilization for metabolic processes by the animals.

CONCLUSION AND RECOMMENDATION

From this study, it is evident that supplementing concentrates with grasses could go a long way in improving the protein to energy ratio of ruminants and invariably lead to optimum production. Hence, brewers dried grain based concentrate showed a good promise of better digestion and utilization by ruminants.

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