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FATTENING ATTRIBUTES OF YANKASA RAMS FED UREA TREATED GROUNDNUT SHELLS SUPPLEMENTED WITH XYLANASE AND GLUCANASE

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Abstract
The effects of supplementing xylanase and glucanase with urea treated groundnut shells was evaluated on fattening performance of Yankasa rams in a 90 days feeding experiment. Four rations that met the requirement of the rams were compounded as follows: the control had no groundnut shell and enzyme, 50:50 xylanase glucanase ratio, 75:25 xylanase glucanase ratio and 25:75 xylanase glucanase ratio. Sixteen mature rams were randomly divided into four equal groups and were allocated to one of the four rations formulated. Each ram received the ration based on 5% body weight. The feed was separated into equal portions and fed twice daily. The results revealed significant ($p<0.05$) effects among dietary treatments. Average daily feed intake was improved ($p<0.05$) by 193.7 g/day in the 50:50 xylanase glucanase ratio. However, the control was least for FCR (11.34) and increased ADWG to about 6.13 g/day compared to the enzyme groups. Therefore, the combination of enzymes used in this study with urea treated groundnut shells for fattening rams may not be recommended to farmers over cowpea husk when weight gain and FCR is considered.
Key words: feed intake, feed conversion ratio, sheep, weight gain

INTRODUCTION

In many livestock production systems in Nigeria, feed is the biggest single cost and profitability can depend on the relative cost and nutritive value of the feeds available. Often, the limiting factor when formulating rations is the animal's ability to digest different constituent parts of the feed raw materials, particularly fibre (Tadele and Animut, 2015). Growth, maintenance, reproduction and general performance of sheep in tropical environments are largely limited by forage quality and this is reflected in low voluntary intake and digestibility (Elamin *et al*., 2012). Improving feed utilization in ruminant nutrition is one of the most important features that determine farming profitability. Many strategies have been considered to improve feed utilization; including, for example, the use of fibrolytic enzymes (Vallejo *et al*., 2016) or chemical processing (Millam, 2016).

Ammoniated feed resources sometimes improve the feeding value by increasing the nitrogen (protein) content of the roughage involved and its digestibility. It may also be a cost-effective way to increase the value of crop residues (Lardy *et al*., 2015). Feeding fibre-degrading enzymes seems to improve feed utilization as well as animal performance (Vallejo *et al*., 2016). Although some of the reported results on supplementing animal rations with fibrolytic enzymes are encouraging, they are also inconsistent. In some studies, exogenous enzymes improved feeding value and animal performance by increasing intake and feed digestion (Millam *et al*., 2021). However, in other studies no effects of exogenous enzymes on feed intake and digestion were observed (Sujani and Seresinhe, 2015). Although the reasons for this discrepancy are unknown, it could be due to differences in enzyme activity, application rate and composition, type of diet fed to the animals, physiological stage of the animal, etc. (Vallejo *et al*., 2016). The objective of the present study was to investigate the effects of adding exogenous enzymes in combination at various ratios with urea treated groundnut shells on fattening performance in Yankasa rams.

Materials and Methods

Location of the study

The study was conducted in the small ruminant unit of Adamawa State University farm, Mubi. The area lies within the northern-guinea savannah zone of Nigeria. It is located between Latitude 10°16.6'6.9" north of the

equator and Latitude 13°16'1.2" east of Greenwich meridian at about 560 meters above sea level (Weather Station, 2020).

Source and processing of groundnut shells

The groundnut shells (GNS) used in this study was obtained from a local farmer in Dirbishi ward, Mubi South LGA of Adamawa State. The GNS was milled using a hammer mill fitted with 1 cm screen, then stored in bags until when required for further use. The processed GNS was treated with urea at 5%, lime at 5% and urea-lime at 5% (i.e., 5 g urea dissolved in 1 litre of water to treat 1 kg of GNS; 5 g of lime dissolved in 1 litre of water to treat 1 kg of GNS; 2.5 g of urea + 2.5 g of lime dissolved in 1 litre of water to treat 1 kg of GNS, respectively). The solution (either urea, lime or urea-lime) was uniformly sprayed using watering can on the milled GNS and mixed thoroughly using a shovel on a concrete floor (Can *et al*., 2004). The treated GNS was ensiled in airtight Perdue Improved Cowpea Storage (PICS) double polythene bags for a period of 21 days as described by Al-masri and Guenther (1999). Thereafter, it was spread on polythene sheet to air-dry, bagged and stored before the commencement of the experiment.

Experimental rations

Four dietary treatments (Table 1) were formulated. One of the dietary groups was having no groundnut shells and enzyme denoted ascontrol. The other three contain urea treated groundnut shells supplemented with various ratios of xylanase and glucanase at 50:50, 75:25, and 25:75.

Table 1: Gross composition of experimental diets

Ingredients (kg)	Control	50:50	75:25	25:75
Cowpea husk	40	0	0	0
Urea treated groundnut shells	0	40	40	40
Maize bran	40.5	38	38	38
Cotton seed cake	17.5	20	20	20
Bone meal	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5
Enzyme – xylanase: glucanase	0.00	0.02	0.02	0.02
Total	100	100	100	100
Cost/kg feed (₦)	54.98	46.53	46.53	46.53
Chemical analysis				
Dry matter	98.5	98.5	97	96
Crude protein	13.5	15.2	15.1	15.4
Fats	2	1.2	1	1.5
Ash	5.4	3.5	5	5.3
Nitrogen free extract	60.7	66.2	63.4	61.9
Neutral detergent fibre	50.20	52.15	53.28	55.65
Acid detergent fibre	48.54	46.85	45.1	42.09
Lignin	2.84	4.76	5.15	4.87

Feeding management of the experimental animals and design

Sixteen Yankasa rams were used for this research. Their pens were properly washed and disinfected. The rams were maintained on a mixture of cowpea and sorghum husk before the commencement of the trial. During this period, they were treated with long lasting antibiotic (Oxytetracycline LA) and ivermectin (Ivomec®) against bacterial infections, ecto- and endo-parasite respectively. Before the commencement of the trial, four rams were randomly assigned to the various treatment groups. The four rams were randomly allotted to each dietary treatment in a completely randomise design. Each ram was housed individually in a well-ventilated pen with

concrete floor equipped with water and feed trough. The experimental diet was given at 5% body weight at 8:00 and 14:00 hours; water was offered *ad libitum*. The experiment lasted for 90 days.

Fattening performance study

The initial weight of the rams was taken at the beginning of the trial for three consecutive times using electronic kitchen scale (WH-B05). The subsequent weight of the rams was recorded fortnightly. Feed intake was measured daily while feed-to-gain ratio was computed at the end of the trial.Records of the cost of all items were taken and recorded at the prevailing market price.

Chemical analysis

Samples of the experimental diets was collected and oven dried for proximate composition determination as described by AOAC (2005). The cell wall constituents of the feed was also determined using the methods of Georing and Van Soest (1970). The analysis was conducted in the Meat and Nutrition Lab of Animal Production Department, ADSU, Mubi.

Statistical analysis

All data obtained was analysed using the Generalised Linear Models Procedure (PROC GLM) of SAS (2002) in a one-way analysis of variance. The treatment effect was tested and significant differences between treatment means was established by Dunnett's test.

Results and Discussion

Table 2 denotes the fattening performance of the experimental ration fed to Yankasa rams. The results recorded significant ($p<0.05$) effects on most of the parameters that was considered. The control had the higher significantly ($p<0.05$) weight gain (WG; 4.42 kg) and average daily weight gain (ADWG; 52.62 g/d)

compared to the enzyme groups. Higher ($p<0.05$) total feed intake (TFI) and average daily feed intake (ADFI) was recorded in 50:50 xylanase-glucanase (XG) combinations (60.47 kg, 785.30 g/d respectively) compared to other treatments. Feed conversion ratio (FCR) was least in the control group (11.34) compared to the enzyme groups.

Table 2: Fattening performance of Yankasa rams fed experimental rations

Parameters (kg)	Control	50:50	75:25	25:75	SEM
Initial weight	18.10	18.25	17.38	17.26	0.55
Final weight	22.52^{a}	22.13^{ab}	21.29^{b}	20.46^{b}	0.50
Weight gain	4.42^{a}	3.89^{ab}	3.91^{ab}	3.21^{b}	0.39
Average daily weight gain (g)	52.62^{a}	46.25^{ab}	46.49^{ab}	38.15^{b}	4.62
Total feed intake	45.53^{b}	60.47^{a}	45.46^{b}	43.04^{b}	3.88
Average daily feed intake (g)	591.60^{b}	785.30^{a}	570.40^{b}	590.00^{b}	50.44
Feed conversion ratio	11.34^{b}	18.72^{ab}	14.53^{b}	21.39^{a}	2.46

^{a,b} Mean values with different superscript on same raw are significantly different, SEM: standard error of means

Although, weight gain and FCR were not improved by the addition of the enzyme combinations, feed intake increased significantly due, probably, to the release of sugars caused by the hydrolysis of polysaccharides which may improve the palatability of the diet as a result of 50:50 XG combination (Kholif and Aziz, 2014). The fibrolytic enzymes can also increase the rate of fibre degradation by the rumen microorganisms (Beauchemin *et al*., 2004; Abid *et al*., 2020), thus reducing the rumen fill and increasing voluntary intake of forage (Beauchemin and Holtshausen, 2010; Mendoza *et al*., 2014). Similar results have been reported earlier by other authors (Pinos-Rodríguez *et al*., 2002; Vallejo *et al*., 2016). One of the critical limitation for the use of GNS in ruminant diets is its low palatability (Millam, 2016), and there seems to be a potential to alleviate this restraint by the treatment of the crop residue with urea, supplementing with rapidly fermentable agro-industrial by-product (Sarnklong *et al*., 2010) and exogenous enzymes supplementation (Millam *et al*., 2020). As the voluntary intake of roughage is increased with EFE, poor quality local resources can be economically and successfully used to produce meat for human consumption. This could contribute widely to decrease production costs in ruminant systems by integrating poor quality roughage and fibrous by-products in ruminant diets.

Since the control had better body weight gain and FCR than enzyme groups, this implies that GNS even when treated with urea and supplemented with xylanase and glucanase combinations, cannot be compared with feeding cowpea husk in rations of Yankasa rams for fattening. This translates to cowpea husk being better than treated GNS, at least in this experiment when weight gain and FCR are considered. However, it is not cost-effective as the price of the control is higher than those with groundnut shells and enzymes combinations.

Conclusion and Recommendation

Among the tested enzyme combination ratios, rations of 50:50 xylanase glucanase ratio resulted in improved feed intake in Yankasa rams. However, the enzyme groups decreased weight gain whereas FCR was least in the control compared with the enzyme groups. In a broad sense, xylanase and glucanase combinations along with urea treated GNS in rations of Yankasa rams may not perform better than cowpea husk when weight gain and FCR are considered for fattening. The control is also uneconomical.

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