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Growth Response of West African Dwarf (WAD) Sheep Fed Plantain Peel with Blended Crop Residue Ration

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Abstract
A feeding trial was conducted to determine the growth response of West African Dwarf (WAD) sheep fed unripe plantain peel supplemented with blended crop residue ration. Sixteen (16) growing female WAD sheep with the average live weight of 8kg were randomly allotted into four dietary treatments of individual pens and to one of four (4) treatments diets in a complete randomised design with four animals per replicate. Results indicated that dietary dry matter (DM), crude protein (CP), ash and ether extract (EE) contents were similar ($p>0.05$) among diets 1 to 4, except for DM, CP and EE of diet 1, which significantly ($p<0.05$) differed. The CP contents were highest (17.33%) in diet 4 and lowest (5.20%) in diet 1. The crude fibre (21.86-31.66%) content differed ($p<0.05$) among diets. Total feed intake (g/day) was significantly ($p<0.05$) highest in sheep fed diet 3 (1046.35 g/day) and lowest in sheep fed diet 4 (921.80 g/day). However, sheep fed diet 2 had the highest ($p<0.05$) live weight gain (60.65 g/day) and feed conversion ratio (16.56) compared to other treatments. In conclusion, sheep fed plantain peel supplemented with diet 2 utilized the feed more efficiently and gave the best weight gain.

Keywords: Blended crop residue ration, intake, sheep, weight gain, unripe plantain peel

Introduction

Investment in sheep and goat production is increasing daily in Southwestern Nigeria. This is due to the high demand for its meat apart from the socio-economic and attached cultural importance. It also guarantees financial security to crop-livestock farmers during crop failure. However, poor health and nutrition still remain a major constraint (Anaeto *et al*., 2009). The challenge of poor nutrition is further compounded by body weight loss and low productivity due to fluctuations in the quality of forages caused by unpredictable climate change. To salvage such situation, smallholder ruminant farmers explore the locally available and cheapest feed resources to maintain their animals in periods when green forages are grossly inadequate. Typical among such feed resources are post-harvest crop residues from cereals, legumes, fruits, and root and tubers which often times constitute an environmental nuisance if it is not adequately managed in periods of plenty. Corn cobs are the main residue of maize shelling (removal of grain from the cob). Cassava peels are important crop residue rich in metabolizable energy and well degraded in the rumen (Smith, 1988). Groundnut haulms are palatable, and the protein-rich residue obtained after groundnut harvesting (Ayantunde *et al*., 2007. Similarly, cowpea husks and soya bean hulls are legume residues, with moderately low nitrogen content. Plantain peel is a valuable source of energy, mineral, and dietary fibre but low in crude protein (Babatunde, 1992). Their relative abundance and low cost compared to the expensive commercially formulated concentrate make them an important source of fibre for 'rumen fill' especially in high producer's ration during the dry season. Information on WAD sheep fed unripe plantain peel supplemented with blended crop residues mixtures is scanty.

Hence, this study was designed to evaluate the growth performance of WAD sheep fed unripe plantain peel supplemented with blended crop residues mixtures.

Materials and Methods

The experiment was conducted at the Sheep and Goat Unit of the Institute of Agricultural Research and Training, Moor Plantation, Ibadan. Prior to commencement of the experiment, animals were given prophylactic treatments against ectoandendoparasite.The animals were adjusted to their treatments diets over a 2-week preliminary period, which was followed by 84-day feeding trial. Sixteen (16) growing WAD female sheep with the average live weight of 8kg were weighed and randomly allotted to individual pens and to one of four (4) treatments diets in a complete randomised design with four animals per replicate.

Cowpea husk, groundnut haulms, soya bean hull and dried cassava peel were sourced from feedstuff vendors at Oranyan market, Ibadan, while dried corn cobs were collected from maize processing unit of the Institute of Agricultural Research and Training, Ibadan. Unripe plantain peel was also collected from plantain chips

processing factory. Fresh *Gliricidia sepium* leaf was harvested from an established pasture of the above mentioned Institute of Research. The leaf of *G. sepium* was air dried under shade to about 25% dry matter. Each of the dried feedstuff was crushed using a hammer mill into small particle size (1.5-2.5 mm) to allow for easy mixing and to prevent selection of feed by the animal. Thereafter, the crushed feedstuff was separately weighed and mixed according to the proportion of each dietary treatment as indicated in Table 1.

Blended crop residue ration (Diet 1 to Diet 4) were offered separately to individual animals at 3% body weight at 08:00 h. Plantain peel was offered to all the sheep at 2% body weight at 16:00 h. Provision was made for a daily feed allowance of 10% above the previous week's consumption. Clean water was served *ad libitum*. Initial weights of the animals were taken and recorded before the commencement of the experiment. Daily feed intake was determined by subtracting feed refused from feed offered over a 24-h period, while live weight changes were measured once each week before feeding in the morning throughout the 84 days feeding trial excluding 2 weeks of adaptation period.Dried samples of the experimental diets (blended crop residue ration and plantain peel) were analyzed for Crude protein (N×6.25), dry matter, ether extract, ash, and crude fibre contents as described (AOAC, 2000).

Data obtained were subjected to analysis of variance and Duncan's Multiple Range Tests was used to detect significant differences among means at $p< 0.05$.

Table 1: Gross composition of experimental diet

Ingredients (Kg)	Diet 1	Diet 2	Diet 3	Diet 4
Corn cob	53	---	---	---
Palm kernel sludge	30	30	30	30
Soya bean hull	12	12	12	12
Cassava peel	---	53	---	---
Groundnut haulms	---	---	53	---
Cowpea husk	---	---	---	53
Gliricidia sepium	4.5	4.5	4.5	4.5
Salt	0.5	0.5	0.5	0.5
Total	100	100	100	100

Results and Discussion

Table 2 shows the proximate composition of experimental diets and unripe plantain peel. The values of dietary dry matter (DM) content ranged from 89.43-86.11%, being highest in diet 4 (89.43 %) and lowest in diet 1 (86.11%). The crude protein (CP) contents were highest in diet 4 (17.33%) and lowest in diet 1(5.20%). The CP content of diet 1 (5.20%) falls below the minimum range of CP (10-13%) required for maintenance and growth of small ruminants (NRC, 2007). However, the range of CP values (14.82-17.33%) of diet 2 to diet 4 exceeded the CP required for maintenance and growth of sheep (Gatemby, 2002). The lowest CP content observed in diets 1 compared to diets 2 to 4 could be due to the low nitrogen and higher lignocellulose contents in corncob (Kategile, 1981), being the principal component of the feed mixture. Meanwhile, the range of values obtained for Nitrogen free extracts (NFE) in diet 1 to diet 4 (49.13-56.30%) was lower than NFE value (70.10%) observed for unripe plantain peel. This implied that the fibre portion of plantain peel was more of the soluble and easily digestible carbohydrates than the blended crop residue ration (diet 1 to diet 4) in this study. Nonetheless, the nutritional values recorded in diet 1 to diet 4 suggest its potentials to support maintenance and growth of small ruminants in the dry season. The reasons for differences in nutritional contents of the experimental diets could be due to varietal differences of feedstuff, species and the age of harvest of the crop, the percentage of principal components of each diet, ratio of leaf to vines and the quality of residue obtained during the processing of the main crop.

The performance characteristics of sheep fed the formulated diets with unripe plantain peels differed ($p<0.05$) across the treatments (Table 3). Total feed intake (g/day) was significantly ($p<0.05$) highest in sheep fed diet 3 (1046.35 g/day) and lowest in sheep fed diet 4 (921.80 g/day). Highest total feed intake by sheep fed diet 3 could have resulted from the low crude fibre contents and higher dietary crude protein (14.82%), which was above the minimum required for optimal rumen microbial activities and digestibility. This suggests that groundnut haulms, the principal component of the diet, and *Gliricidia sepium* leaves could have enhanced rapid rumen fermentation, hence increased feed intake. Sheep fed diet 2 had the highest ($p<0.05$) live weight gain (60.65

g/day). Though the feed conversion ratio (FCR) were similar ($p<0.05$) for sheep on diet 1 and diet 2, the FCR (17.47) of sheep fed diet 1 closely followed sheep fed diet 2, which had the best FCR (16.56).

Table 2: Proximate composition (g/100g DM) of experimental diets and unripe plantain peel

Parameters (%)	Diet 1	Diet 2	Diet 3	Diet 4	Unripe plantain	SEM
Dry matter	86.11^{b}	88.50^{a}	88.35^{a}	89.43^{a}	87.17^{b}	0.26
Crude protein	5.20^{b}	15.34^{a}	14.82^{a}	17.33^{a}	5.42^{b}	1.19
Crude fibre	31.66^{a}	27.88^{b}	21.86^{c}	29.13^{b}	16.88^{d}	1.23
Ash	5.78^{a}	4.71^{a}	4.30^{a}	5.90^{a}	4.40^{a}	0.16
Ether extract	1.06^{b}	2.94^{a}	2.85^{a}	3.66^{a}	3.20^{a}	0.20
NFE	56.30^{b}	49.13^{c}	56.17^{b}	43.98^{d}	70.10^{a}	2.02

^{abcd} Means with the same superscripts along the same row are significantly different ($p<0.05$).NFE =Nitrogen free extracts.

The outstanding weight gain and FCR observed for sheep fed diet 2 could be ascribed to the relatively lower crude fibre level, easily digestible soluble carbohydrates from cassava and plantain peels coupled with sufficient nitrogen in the diet, which provided ready nutrients for the synthesis of body tissues and accumulation of muscles. Therefore, the performance of sheep fed diet 2 and diet 3 respectively, in terms of weight gain agrees with the assertion of Vazquez *et al*. (2000) that energy-protein balance of a ration enhances live weight gain.

Table 3: Performance of WAD sheep fed blended crop residue ration and unripe plantain peel

Parameters	T1	T2	T3	T4	SEM
Feed intake (g/day)					
Unripe plantain peel	806.42	797.06	798.99	661.71	
Blended crop residue ration	160.21	207.33	247.36	260.09	
Total feed intake (g/day)	966.63^{c}	1004.39^{b}	1046.35^{a}	921.80^{d}	11.88
FCR	17.47^{b}	16.56^{c}	17.91^{b}	28.40^{a}	1.25
Initial body weight (kg)	7.6	8.0	7.8	9.0	
Final body weight (Kg)	11.86	12.67	12.30	11.50	
Live weight gain (g/day)	55.3^{c}	60.65^{a}	58.44^{b}	32.4^{d}	2.91

^{abcd}= Means with the same superscripts along the same row are significantly different ($p<0.05$); FCR = Feed conversion ratio

Conclusion

In conclusion, the nutritive value of blended crop residue mixtures improved. Although the total feed intake of West African dwarf (WAD) sheep fed diet 3 was superior to other treatments, the feed intake in sheep fed diet 2 was more efficiently utilized and resulted to significant weight gain. Hence, the growth performance of sheep during dry season would be enhanced when fed plantain peel and supplemented with mixtures of blended crop residue ration.

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