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**PERFORMANCE OF WEANER RABBITS FED ENSILED CASSAVA PEEL, BOVINE BLOOD
AND RUMEN CONTENT MIXTURES**

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ABSTRACT

The performance of weaner rabbits fed ensiled cassava peel, bovine blood and rumen content mixtures (CABLORUM) were investigated. CABLORUM were ensiled for 14 days at different ratios (1:1:1, 2:1:1, 1:2:1 and 1:1:2). The silage was added to formulate diets designated as diet 1 (0% CABLORUM), diet 2 (1:1:1), diet 3 (2:1:1), diet 4 (1:2:1), diet 5 (1:1:2). Thirty weaner rabbits of about 5-6 weeks of age with average weight of 504g were randomly allocated to the five dietary treatments and fed for 70 days. The parameters evaluated were weight gain, length gain, chest girth gain, feed intake, feed conversion ratio. The results showed that average final body weight, average daily weight gain, total length gain and total chest girth gain were not significant among the dietary treatments ($p > 0.05$). However, average daily feed intake (ADFI) of rabbits fed diets 1, 3 and 4 were similar but lower than those fed diets 2 and 5 ($p < 0.05$). The FCR of rabbits fed diet 1 was similar to Diets 2, 3 and 4 but lower than Diet 5 ($p < 0.05$). The cost analysis showed that feed cost per kg and feed cost per kg weight gain was lower in CABLORUM based diets ($p < 0.05$), particularly when mixed in a ratio of 2:1:1. It was concluded that ensiled CABLORUM could be included in diets of weaner rabbits without adverse effects, while CABLORUM at 2:1:1 ratio gave the least cost per kg weight gain. It was therefore recommended for adoption by rabbit farmers to reduce cost.

Keywords: CABLORUM, Cassava peel, Bovine blood, Rumen content, Weaner rabbits.

INTRODUCTION

The greatest proportional cost in livestock production is expended on feeding, with the exception of ruminants whose feed is based on pasture. In non-ruminant animals such as pigs, rabbits and poultry, feed ingredients represent 65 to 70% of the total cost in an intensive production system in Nigeria as in many developing countries (Esonu *et al.*, 2006). Rabbit has long been known to thrive on farm and kitchen wastes of high fibre content. However, fibre digestion in the caecum is often limited but enhanced by caecotrophy (Esonu *et al.*, 2006). Fermentation procedures have been employed to improve the nutritive quality of many farm wastes by reducing fibre proportion while increasing protein content; therefore making raw materials rich in non-digestible carbohydrates a functional livestock feed (Dairo *et al.*, 2005).

Cassava peel is an agricultural by-product. It offers a tremendous potential as a cheap and alternative feedstuff for conventional feedstuffs. It however contains hydrogen cyanide that has been shown to be toxic to livestock and could limit its usage in raw state as feed for livestock (Ewane, 1996). Detoxification of cassava peels has been made possible by several methods including sun drying and ensiling (Adegbola and Okonkwo, 2002). Bovine blood and rumen content are some of the by-products of abattoirs. Rumen content is the partially digested forage mainly found in the rumen of ruminant animals. It is fairly rich in crude protein (18.52%) and other micro flora such as fungi, protozoa and bacteria (Dairo *et al.*, 2005). The utilization of bovine blood and rumen content as animal feed also alleviate and maximize the economic and environmentally benign disposal of slaughter house by-products (Esonu *et al.*, 2006) while reducing cost of production. Therefore this study was conducted with the objective to investigate the performance of weaner rabbits fed different mixtures of ensiled cassava peel, bovine blood and rumen content (CABLORUM).

MATERIALS AND METHODS

The study was carried out at the rabbit unit of the Department of Animal Science farm, University of Nigeria, Nsukka, located on latitude 05° 22' North and longitude 07° 24' East (Asadu, 2002).

Preparation of Test Ingredients.

Cassava peels were obtained at Obukpa market in Nsukka Local Government Area of Enugu State. Bovine blood and rumen contents were collected from the Ikpa abattoir in Nsukka Local Government Area of Enugu State. The rumen content was collected directly from animals freshly slaughtered and air dried for two days to reduce the moisture content. Four (4) different silage based diets were prepared. The first



using the cassava peel, bovine blood and rumen content in a ratio of 1:1:1 (one unit representing 5kg), the second was in a ratio of 1:1:2, then 1:2:1 and 2:1:1 for third and fourth silage based diets respectively. The ensiled materials were compressed tightly using blocks; sand was used to fill up the gaps in the silage pit and then allowed for two weeks to ferment. After two weeks the fermented products were sun-dried on a concrete floor to about 12% moisture content and all foreign objects were removed. After sun-drying, the mixtures were milled and stored for mixing with other ingredients. Five (5) experimental diets were formulated as shown in. Table 1. Diet 1 was the control diet without CABLORUM content. Diet two had 20% mixture of CABLORUM at a ratio of 1:1:1, while diet 3, 4 and 5 had 20% mixture of CABLORUM at a ratio of 2:1:1, 1:2:1 and 1:1:2 respectively. The experimental diets were fed in mash form for 70days. Representative samples of CABLORUM and of the five diets were analyzed for their chemical constituents using the method of the Association of Analytical Chemists (AOAC, 1990). The results are presented in Table 2.

Table 1: Percentage Composition of Experimental Diets.

Ingredients	Diet 1 Control	Diet 2 1:1:1	Diet 3 2:1:1	Diet 4 1:2:1	Diet 5 1:1:2
Maize	41	31	31	31	31
Soybean meal	20	10	10	10	10
CABLORUM	0	20	20	20	20
Palm kernel cake	19	19	19	19	19
Wheat offal	15	15	15	15	15
Bone meal	3	3	3	3	3
Limestone	1.5	1.5	1.5	1.5	1.5
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Total	100	100	100	100	100

Table 2: Proximate Composition of the Experimental Diets and Test Ingredients

Test Ingredients	CP (%)	CF (%)	DM (%)	E.E (%)	Ash (%)	N.F.E (%)
CABLORUM 1:1:1	19.70	10.31	81.12	1.50	10.83	38.78
CABLORUM 2:1:1	14.45	19.41	80.92	1.03	16.38	29.64
CABLORUM 1:2:1	21.64	11.82	78.33	1.22	12.29	31.36
CABLORUM 1:1:2	11.38	20.23	76.91	1.12	14.54	29.64
Diet 1: Control	17.34	11.93	89.55	4.90	8.11	47.26
Diet 2: 1:1:1	18.34	11.81	88.14	4.32	11.10	42.57
Diet 3: 2:1:1	17.09	14.12	88.32	3.89	12.89	40.33
Diet 4: 1:2:1	19.26	11.31	88.08	4.23	12.11	41.17
Diet 5: 1:1:2	16.29	15.75	87.18	4.02	12.68	38.34

CP-crude protein, CF-Crude fibre, DM-Dry matter, E.E – Ether extract, NFE-Nitrogen free extract.

Management of Experimental Animals and Experimental design

A total of thirty (30) weaner rabbits of about 5-6 weeks of age, with an initial average weight of 504g were used for the study. The rabbits were allowed a two-week adjustment period during which they were treated against some common diseases by administering prophylactic drugs. The animals were randomly divided into five (5) treatments with three (3) replicates (2 animals per replicate). The animals were intensively managed and housed in wire cages and provided with drinking and feeding facilities. A total of 200g of feed was supplied to each replicate per day at a rate of 100g in the morning and 100g in the evening to reduce wastage. Orts (left over) was collected and weighed the following morning in order to determine feed intake. Water was provided *ad libitum*. Parameters measured were; Daily feed intake, Weekly body weight, Weekly body length and Weekly chest girth.

The experimental design used was the completely randomized design (CRD) with the model



$$X_{ij} = U + T_i + E_{ij}$$

X_{ij} = individual observation, U = population mean, T_i = CABLORUM effect, E_{ij} = experimental error

Economic and Statistical analysis

The variable cost of feeding the rabbits was considered as the cost of the feeds as all other costs (i.e. labour, capital investment, housing) were the same for all the treatments. The cost of processing the CABLORUM was included as the feed cost. All data collected were analysed using SPSS version 20.0 statistical software such that data were subjected to analysis of variance (ANOVA) and significantly different means were separated using Duncan New Multiple Range Test (Duncan, 1955).

RESULTS AND DISCUSSION

The results of the performance of weaner rabbits fed ensiled cassava peel, bovine blood and rumen content (CABLORUM) mixtures are presented in Table 3.

Table 3: Performance of Weaner Rabbits Fed Ensiled Cassava Peel, Bovine and Rumen Content (CABLORUM) Mixtures.

Parameter	Diet 1 Control	Diet 2 1:1:1	Diet 3 2:1:1	Diet 4 1:2:1	Diet 5 1:1:2	Mean	SEM
AIBW (g)	508.33	515.00	516.67	488.33	491.67	504.00	12.866
AFBW (g)	1521.67	1515.00	1485.00	1398.33	1405.00	1465.00	19.279
ADWG (g)	14.47	14.29	13.83	13.00	13.05	13.73	0.227
TLG (cm)	11.17	12.00	10.67	11.25	10.92	11.20	0.239
TCGG (cm)	9.92	10.00	9.00	8.92	8.92	9.35	0.232
ADFI (g)	63.22 ^b	66.69 ^a	61.74 ^b	61.43 ^b	66.79 ^a	63.97	0.745*
FC (₦)	326.02 ^a	283.37 ^b	258.31 ^d	263.04 ^c	285.60 ^b	283.27	6.415**
FC/WG (₦/kg)	321.84 ^a	283.37 ^c	266.85 ^e	271.74 ^d	312.84 ^b	291.32	5.925**
FCR	4.37 ^a	4.68 ^{ab}	4.47 ^a	4.73 ^{ab}	5.13 ^b	4.68	0.089*

AIBW- Average Initial Body Weight, AFBW- Average Final Body Weight, ADWG- Average Daily Weight Gain, TLG – Total Length Gain, TCGG- Total chest girth gain, ADFI – Average Daily feed intake, FC-feed cost, WG-Weight gain, FCR-Feed conversion ratio, SEM-Standard error of means, * significant ($p < 0.05$), ** significant ($P < 0.01$), ^{a-d} Means with different superscript on the same row differ.

The average final body weight was not significantly ($p > 0.05$) different among treatments. However the values obtained in this study are similar to the values reported by Ajayi *et al.*, (2007) and Mohammed *et al.*, (2011) but higher than the values reported by Dairo *et al.*, (2005). This is an indication that the ensiled CABLORUM based diets provided the required nutrients for good growth of the rabbits and therefore can replace maize and soybean meal in the diets of rabbits. The average daily weight gain were not significantly ($p > 0.05$) different among treatments. The values recorded in this study are however similar to the values reported by Ojebiyi *et al.*, (2006) who used cassava peel/blood meal based diet to feed weaner rabbits but lower than values of Ajayi *et al.*, (2007) who used blood-wild sunflower leaf based diets to feed weaner rabbits. This is also an indication that ensiled CABLORUM can be included into the diets of rabbits without any adverse effects. The total length gain and total chest girth gain were not significantly ($p > 0.05$) influenced by the dietary treatments. In this study the experimental ingredients were prepared by ensilage thereby producing a combination that was less powdery, denser and having a good nutritional profile. These suggest that the experimental diets sufficiently satisfied the nutrient requirements of rabbits. Thus it supported the growth of the rabbits as the control diets. Table 3 showed that the effect of the treatments on average daily feed intake (ADFI) were significant ($p < 0.05$). Feed consumption of rabbits fed diets 1, 3 and 4 were similar but lower than Diets 2 and 5 which were also similar. The ADFI values obtained were similar to the values reported by Ajayi *et al.*, (2007) but lower than the reported values of Dairo *et al.*, (2005). The differences observed may be due to different fibre levels, palatability and acceptability of the diets. Chaudhury *et al.*, (1995) noted that rabbits given higher fibre diets ate more feed daily and gained more weight than rabbits on low fibre diets. In a study using pelleted feed, Ojebiyi and Saliu (2014), reported that rabbits fed blood/rumen content based diets in mash form had reduced feed intake probably due to unattractive odour of the blood/rumen content diets.



The feed conversion ratio differed significantly ($p < 0.05$). The results indicated that those with lower FCR values utilized less feed to gain more weight as Diet 5 had higher fibre content. The results agreed with the findings of Mohammed *et al.* (2011) and Ojebiyi and Saliu (2014) but was contrary to the results of Dairo *et al.* (2005) and Ajayi *et al.* (2007) who reported no significant ($P > 0.05$) difference in feed conversion ratio.

Inclusion of ensiled CABLORUM led to reduction in feed cost. There were highly significant ($p < 0.01$) differences among treatments. It follows that feeding rabbits diets based on ensiled CABLORUM improved cost savings. Cassava peel, bovine blood and rumen content are cheaper feedstuffs than maize and soybean meal. This explains the reduction in cost and subsequent higher revenue from the rabbits fed ensiled CABLORUM diets. Ewane (1996), observed that cassava peel mixed with appropriate high protein feedstuffs produces cheaper feedstuffs than when cereal alone was used. Highly significant ($p < 0.01$) differences among treatments on cost per kg weight gain were also observed. The highest cost per kg gain of ₦321.84 was recorded in Diet 1 (control) while the least cost of ₦266.85 was recorded in Diet 3 (2:1:1). The results obtained in this study are consistent with the findings of Onyimonyi and Ugwu (2007) who fed cassava peel/bovine blood based diets to broilers and noted a reduction in feed cost.

Conclusion and Recommendation

We concluded that since there is abundant availability of cassava peel, bovine blood and rumen content, a farmer can reduce cost by incorporating these unconventional feedstuffs in livestock feeding. It is recommended that cassava peel, bovine blood and rumen content should be ensiled at 2:1:1 ratio as this combination supported the performance of rabbits as the control diet and had the least cost per kg gain.

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***Moringa oleifera*: A MULTIPURPOSE BROWSE PLANT FOR FEEDING RABBITS**

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