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## Replacement Value of Maize with Enzyme Supplemented Decomposed Bovine Rumen Content in the Diets of Weaner Rabbits

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**Abstract:** This feeding trial was carried out in order to assess the replacement value of maize with Decomposed bovine Rumen Content (DRC) supplemented with enzyme (Allzyme) in the diet of weaner rabbits. 48 weaner rabbits were used in this feeding trial that lasted for a period of eight weeks. DRC replaced maize (45%) at 0, 33.33 and 66.67 and 100% levels, thus giving 4 dietary treatments containing 0, 15, 30 and 45% DRC respectively. 0, 33.33 and 66.67% replacement levels had no significant effect ( $p>0.05$ ) on feed intake, weight gain and feed to gain ratio; while 100% replacement level of DRC for maize showed a significant effect on these parameters. Effect of treatment ( $p<0.05$ ) on nitrogen and crude fibre digestibility was significant, although increasing level of DRC in the diets tended to have decreasing effect on protein and fibre digestibility and tended to have ( $p>0.05$ ) increasing effect on crude fat digestibility. Feed cost decreased with the increase in the level of DRC replacement. The results obtained in this experiment showed that enzyme supplemented DRC could replace up to 66.67% of maize level in the diets of weaner rabbits without adverse effects on performance.

**Key words:** Decomposed bovine rumen content, weaner rabbits, replacement, maize, enzyme supplementation

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### INTRODUCTION

Malnutrition is a great problem facing people in the developing countries due to inability to afford proteins from animal sources which are highly nutritious. Hence, majority of these people depend on proteins of plant origins because they are cheap and more accessible. This implies that only a small proportion of the food consumed in these countries is derived from livestock products (Abalu, 1982). This nutrition problem has led to failing health, children malnutrition and high rate of mortality in developing countries especially in Africa. Hence, to alleviate malnutrition and its attendant problems, efforts are being diverted to production of livestock that can meet the rising demand of animal protein such as swine, poultry, rabbits and fish as against cattle, sheep and goat which are less prolific and have longer generation interval.

The rabbit is a small sized monogastric herbivorous animal with a short gestation period of 28-30 days. Rabbits are prolific and can have a litter size of up to 14 rabbits. Rabbits are easy to manage and they can turn 80% of forage consumed into edible meat. Rabbits produce nutritionally excellent meat that is easily digested, high in protein and minerals and low in fat, steric and oleic acids than the meat of some other animals. Rabbit has a dressing percentage of 48.1% which is higher than that of goat (44%).

As feed represents the major cost in any livestock production, cost of feeding is the major challenge facing rabbit production. Atteh (2002) reported that the price of maize increased from 15 Naira (N) per kg in January to N40 in June of year 2000. Maize accounts for about 45% of the diet of rabbits, hence such price changes will induce a classic increase in the price of finished feed. There is therefore the need to research into the use of cheap and unconventional feed ingredients for compounding rabbit diets so as to boost rabbit production.

Bovine rumen content which is the content of the first stomach compartment of slaughtered cattle is a material that has been utilized as feedstuff in poultry, swine and ruminant diets. Rumen Content (RC) is made up of undigested feed eaten by the ruminant animal, lots of micro-organisms that aid in feed degradation, the feed and synthesized protein, fatty acids and vitamins produced by the microbes. RC is highly fibrous; hence supplements that can aid digestion of fibre such as enzyme may be needed when using RC in feed formulation especially for monogastrics feed.

The enzyme used in this research work is Allzyme which is a naturally occurring enzyme complex produced by a fungus called *Aspergillus niger*, using the process of solid state fermentation. Allzyme consists of 7 active enzymes which are amylase, betaglucanase, protease, cellulose, pectinase, phytase and xylanase.

This study was aimed at determining the amount of maize that can be replaced by DRC in the diet of weaner rabbits in order to reduce the cost of rabbit feed which will consequently lead to a boost in rabbit meat production and consumers accessibility to cheaper meat. The aim is to reduce the use of maize (which is expensive) in rabbit feed.

### MATERIALS AND METHODS

A total of 48 weaner rabbits were used in this trial that lasted for 8 weeks. The experiment was carried out in year 2006 at University of Ilorin, Ilorin, Nigeria. The rabbits were randomly allocated to four dietary treatments. Each treatment had 3 replicates of 4 rabbits per replicate. The 4 dietary treatments had DRC replacing maize at 0, 33.33, 66.67 and 100% levels (Table 1). All the dietary treatments except 0% DRC were supplemented with allzyme (Recommended inclusion is 200 g t<sup>-1</sup> of feed).

The rumen content was collected at the abattoir at slaughter time, immediately the rumen was split open. The RC was left in a container to decompose for five days. On the fifth day, the RC was boiled in a drum for 2 ½ h with constant stirring. The boiled RC was then spread to dry until the

Table 1: Composition of experimental diets (kg/100kg)

Feed ingredients	Diet			
	1	2	3	4
DRC	0.00	15.00	30.00	45.00
Maize	45.00	30.00	15.00	0.00
Com bran	5.00	5.00	5.00	5.00
Wheat offal	10.40	10.40	10.40	10.40
Palm-kernel cake	15.00	15.00	15.00	15.00
Groundnut cake	14.00	14.00	14.00	14.00
Soybean cake	5.00	5.00	5.00	5.00
Fish meal	1.00	1.00	1.00	1.00
Limestone	1.50	1.50	1.50	1.50
Bone meal	2.50	2.50	2.50	2.50
Premix*	0.25	0.25	0.25	0.25
Salt	0.35	0.35	0.35	0.35
Allzyme (g)	20.00	20.00	20.00	20.00
Total	100.00	100.00	100.00	100.00
<b>Proximate composition (Analysed values)</b>				
Dry matter	89.63	85.21	81.86	89.34
Crude protein	18.91	18.42	18.56	18.65
Crude fat	7.40	8.20	8.55	8.72
Crude fibre	6.75	7.00	7.50	8.60
Ash	7.67	7.56	7.49	10.26

\*: Biomix-Vit. Premix used contained Vit. A: 330,000IU; Vit D<sub>3</sub>: 330,000IU; Vit E: 16,500IU, Vit A<sub>3</sub>: 506 mg; Riboflavin: 3.3 g; Pantothenic acid: 9.9 g; Niacin: 11 g; Vit B<sub>12</sub>: 20 mg; Chlorine: 220 g, Zinc: 207 g; Fe: 20.7 g; Copper: 2.07 g; Mg: 4.17 g; I: 62 mg; Se: 62 mg

moisture content was below 10% after which it was milled. The DRC fed was analysed to contain 9% crude protein, 16.20% crude fibre, 4.25% ether extract, 16% ash and 95.86% dry matter.

The rabbits were allowed 1 week adaptation period to adjust to the feeds and cage prior to the 8 weeks data collection. At the commencement of the experiment, the rabbits were dewormed with ivomec and embazin fort (Coccidiostat) was also administered to them. Feed and water were supplied *ad libitum* throughout the experimental period. At the last week of the experiment, the rabbits were placed in metabolic cages for digestibility trial which lasted for 72 h. The total collection method was adopted. Faeces were collected, dried, measured and stored, while the urine collected was stored in plastic bottles and Tetraoxosulphate (6) acid (H<sub>2</sub>SO<sub>4</sub>) added as preservative.

Proximate analysis was conducted using the methods of AOAC (1980). Records of initial and weekly live-weight and daily feed intake were kept and feed to gain ratio calculated. All data were subjected to analysis of variance using the completely randomized design and significant differences in treatment means were compared using Duncan's multiple range test (Duncan, 1955).

## RESULTS AND DISCUSSION

The growth performance characteristics of weaner rabbits fed diets in which DRC replaced maize is shown in Table 2. No significant effect ( $p > 0.05$ ) of treatment was observed on feed intake by the rabbits fed on 0, 33.33 and 66.67% DRM diets with values of 96.83, 95.44 and 96.43 g, respectively. 100% DRM diet however, had a significant effect ( $p < 0.05$ ) on feed intake with a value of 84.48g. There was no significant difference in the weight gain values obtained for 0%, 33.33% and 66.67% DRC replacement for maize diets (DRM), although the weight gain of rabbits tended ( $p > 0.05$ ) to decrease with increasing level of DRC. However, 100% DRM diet showed a significant effect ( $p < 0.05$ ) on weight gain. Feed to gain ratio obtained in rabbits fed 0, 33.33 and 66.67% DRM diets were highly comparable ( $p > 0.05$ ). At 100% replacement level of DRC, feed to gain ratio showed a significant decrease ( $p < 0.05$ ) with a value of 8.16 compared to 7.44, 7.42 and 7.68 for rabbits fed 0, 33.33 and 66.67% DRM diets, respectively.

Feed cost decreased with increase in the level of DRC in the weaner diets from N33.50 at 0% to N 17.14 at 100% replacement level. However, profitability of the dietary treatments decreased with increasing DRC in the diets.

The result of the nutrients digestibility trial for weaner rabbits fed DRC replacement for maize diets (DRM) is shown in Table 3. There was significant effect of treatments on nitrogen and crude fibre digestibility obtained, while treatment effect on crude oil fat digestibility is insignificant ( $p > 0.05$ ). Both nitrogen and crude fibre utilization decrease with increasing DRC in the diets, while crude fat digestibility tended to increase with increasing DRC level. Crude protein digestibility value obtained in rabbits fed 100% DRM diets is significantly ( $p < 0.05$ ) lower than that of the other diets while 0% DRM diet gave a significantly higher ( $p < 0.05$ ) protein digestibility value than other diets. However, the digestibility values obtained at 33.33 and 66.67% DRM diets were highly comparable ( $p > 0.05$ ) (70.35 vs. 70.30).

Table 2: The effect of replacing maize with drc on the growth performance and cost benefit of rabbits

Level of DRC (%)	Feed intake (g rabbit <sup>-1</sup> day <sup>-1</sup> )	Body weight gain (g rabbit <sup>-1</sup> day <sup>-1</sup> )	Feed to gain ratio (FCR)	*Feed cost N kg <sup>-1</sup> of diet (a)	Cost of rearing the rabbit (N) (b)	Selling price kg N <sup>-1</sup> (c)	Gross profit (d)	Profitability (%) (e)
(0% DRC) 0	96.83 <sup>b</sup>	13.02 <sup>b</sup>	7.44 <sup>a</sup>	33.50	150	300	150	100.00
(15% DRC) 33.33	95.44 <sup>b</sup>	12.86 <sup>b</sup>	7.42 <sup>a</sup>	29.14	156	280	124	79.50
(30% DRC) 66.67	96.43 <sup>b</sup>	12.56 <sup>b</sup>	7.68 <sup>a</sup>	23.14	170	290	120	70.60
(45% DRC) 100	84.48 <sup>a</sup>	10.35 <sup>a</sup>	8.16 <sup>b</sup>	17.14	180	260	80	44.00
SEM	9.53	4.04	4.23					

Means in the same column not followed by the same superscript letter(s) are significantly different ( $p < 0.05$ ), \*: N 130 = \$ 1 as at the time the experiment was conducted in 2006

Table 3: Effect of DRC replacement for maize on nutrient digestibility of rabbits

Treatment level of DRC (%)	Crude protein	Crude fibre (%)	Crude fat
0 (0% DRC)	76.760 <sup>c</sup>	34.900 <sup>a</sup>	77.940 <sup>a</sup>
33.33 (15% DRC)	70.350 <sup>b</sup>	25.590 <sup>b</sup>	79.940 <sup>ab</sup>
66.67 (30% DRC)	70.300 <sup>b</sup>	24.590 <sup>c</sup>	78.900 <sup>bc</sup>
100 (45% DRC)	64.010 <sup>a</sup>	20.500 <sup>d</sup>	81.180 <sup>c</sup>
SEM	0.290	0.265	0.385

Means in the same column not followed by the same superscript letter(s) are significantly different (p<0.05)

The different dietary treatments had significant effect (p<0.05) on crude fibre digestibility of the fed rabbits, hence fibre utilization of the rabbits fed different diets were not comparable. In crude fat digestibility, the values obtained at different levels of DRM are comparable (p>0.05), 100% DRM diet however, gave the highest value of 81.18. There was no mortality throughout the experimental period.

The significantly different feed intake, weight gain and feed to gain ratio observed at 100% DRC replacement for maize (DRM) diet as compared to the other test diets may be attributed to the higher fibre content of 100% DRM diet. According to Scott *et al.* (1969), the amount and constitution of crude fibre in the diet, as well as the type and stage of development of the animal have marked effects on monogastric nutrition. Kass and Pond (1980) also stated that high fibrous feeds have depressing effect on body weight gain and feed to gain ratio in non ruminants. However, the highly reduced feed intake of rabbits on 100% DRM (45% DRC) observed, is in contrast to the report of Linderman (1986) that pigs fed peanut hills consumed 24 to 71% more feed than the control pigs. This difference in feed consumption of the pigs and rabbits may be due to the type and stage of development of each of the monogastrics as explained by Scott *et al.* (1969).

The observed reduction in feed intake is however supported by Onwudike (1986), who reported that the grittiness of PKC as a result of its highly fibrous nature was responsible for reduced feed intake of starter and grower pullets.

The insignificant effect of DRC on weight gain, feed intake and feed to gain ratio obtained at 0, 33.33 and 66.67% is similar to the report of Aduku *et al.* (1988). This could be due to the fact that rabbits as non-ruminant herbivores can tolerate considerable levels of fibre in their diets. Aduku *et al.* (1988) suggested that high crude fibre level of PKC did not have effect on growth parameters of rabbits because of coprophagy which allows further digestion of the fibre. Barnes *et al.* (1963) was also in support that coprophagy contributes 12-25% of the growth in rabbits. Harris *et al.* (1983) also observed insignificantly different weight gains for rabbits fed high and low crude fibre.

Increasing the replacement level of DRC for maize resulted in decreasing cost of feed because DRC is a cheap abattoir waste that can be collected freely and the only costs incurred are in transportation and processing of the rumen content. Hence, DRC is a good substitute for maize in reducing feed cost of rabbits especially during periods of maize scarcity or when maize is highly expensive. Although 33.33% DRM diet had a higher feed cost than the other diets containing DRC, it gave the highest profitability estimate among the DRM diets.

The significantly decreasing crude protein and crude fibre digestibility as DRC level increased in the diets may be attributed to poor utilization of the nutrients as a result of increasing fibre content of the diets. This is in agreement with the report of Babatunde *et al.* (1975) that linked the low digestibility values for PKC to its fibre content. Proximate analysis of the test diets (Table 1) showed increasing crude fat content with increasing DRC level. This may explain the insignificantly increasing crude fat digestibility observed.

The results obtained in this experiment showed that DRC has a high feedstuff potential in rabbit nutrition. The result also showed that growth performance characteristics of the test rabbit were not adversely affected as a result of replacing DRC for maize in their diets. For economic rabbit production, 66.67% of enzyme supplemented DRC replacement for maize is being recommended for weaner rabbit diet.

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