



RESEARCH ARTICLE

Effect of Brozyme on Mixed Banana Forage and Concentrate Diets fed to Weaned Rabbits

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ABSTRACT

60 weaned rabbits were fed mixed banana forage and concentrate diets treated with 5g and 4g of brozyme per kilogram of feedstuff to determine the effect of brozyme on the diets. Feed intake and weight gain of the rabbits was monitored for 56 days from where the feed conversion ratio (FCR) was calculated. The nutrient analysis of the feedstuff and faeces voided by the rabbits during the experimental period was conducted from where the digestible nutrients and coefficient digestibility was calculated. The result showed that there was significant difference ($P < 0.05$) in feed intake and weight gain. The feed intake decreased while weight gain improved as the brozyme was introduced at levels of 4g and 5g per kilogram feedstuff. The FCR reduced from 9.28 for diets without the brozyme to 4.79 for the diet with 5g of brozyme per kilogram of feedstuff. The digestibility coefficient improved from 52.8% for diet without brozyme to 72.5% for the diet with diet with 5g brozyme per kilogram. Also the crude fibre, crude protein and ether extract improved from 39.32, 51.31 and 59.32% for the diet without brozyme to 64.34, 71.35 and 73.15% for diets with 5g brozyme respectively.

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INTRODUCTION

Banana, a large rhizomatous non-woody aerial juicy stem with overlapping leaf base which is propagated by sucker belongs to plant family, *musaceae*, produces the best known tropical fruit (Skinner, 1996). The forage and pseudo-stems can be useful in feeding ruminant animals such as cattle, sheep and goat (Effoulkes, 1993). During dry season or when other forages are scarce, the forage which contains about 15% dry matter can be a useful feedstuff for provision of water and other nutrients to ruminant animals (Stave and Simmond, 1987). Report indicated that banana leaves used as supplement to sheep basal diet of rice straw increased the total feed intake and digestibility as well as rumen ammonia (Fomuyan, 2000).

Also, other livestock like rabbit can feed on banana forage. Many scholars have conducted studies on banana forage as feedstuff for rabbit (Gidenne, 2000; Formuyan, 2000). One of the advantages of banana forage as a feeding stuff is its ability to provide water to animals when it is consumed as feed thereby reduce the quantity of water intake requirement by farm animal. This is because of the high moisture content of banana leaves and pseudo stem (Fielding, 1991). However, the leaves and

pseudo stem being a forage material contains reasonable fibre content.

Though, ruminants and pseudo ruminant animals such as cattle, pigs and even giant rats that can digest large amount of fibrous materials in their rumens and caeca due to rumen micro flora found among gastrointestinal regions of the above mentioned animals, the rabbit has difficulty in digesting fibrous material like banana forage (Aduku and Olukosi). Fibre digestibility in rabbit is inefficient and quite lower than ruminant and pseudo ruminant animals due to few number of gut micro flora that are responsible of cellulose synthesis (Abasiekong *et al.*, 2004). Although there are some gut bacteria in rabbit gastro-intestinal tract, such organisms are found at the hind gut of rabbit, a situation that reduced the efficiency cellulase synthesis (Fotso, 2003). Some scholars have argued that since there is limitation in synthesis of vitamin B and essential amino acid due to absence of gut bacteria responsible for such production, there is a need to include vitamin B and essential amino acid in the diet of rabbit (Fotso *et al.*, 2003). Joyce *et al.* (2001) reported that green forage alone fed to rabbit was not adequate for growth. They proposed 50% forage to be part of rabbit diet. Biobaku (2002) stated that more improvement on rabbit growth could be achieved if rabbit

were fed with concentrate and green forage than either concentrate or forage alone. Ayo and Mink (2003) observed that higher weight gain and better feed efficiency was recorded on mixed feeding regime of free choice forage and concentrate than on sole concentrate or sole forage feeding regime.

The use of enzyme in livestock nutrition is not new as many commercial enzymes are now available for many mono gastric animals nutrition to enhance the nutritional value of diets of such animals. Commercial enzyme increases the digestibility of feedstuff and could release the trapped nutrient nutrients in such feedstuff through enzyme-substrate specific mechanism. It also helps to shorten the digestive period of feedstuff and in some circumstances by pass gut microbes (Nweze, 2010).

Brozyme as new product in Nigeria should be investigated to determine its effects on rabbit nutrition, as the information could be useful in rabbit production in Nigeria and other part of the world.

MATERIALS AND METHODS

Experimental Animals

60 male and female rabbits weighing between 85g and to 95g were sourced local farmers within South East Nigeria. The rabbits were kept separately in a hutch where feed and water were provided *ad libitum*.

Experimental Diets

Brozyme is a commercial enzymes consisting of xylanases complemented with galactosidase, cellulase, Beta-glucanase, leptase, phatase pectinase and manase, which is a product of Zeus Biotech Limited India. The enzyme was used on banana forage consisted of banana leaves and pseudo stem cut fresh from large stands of rhizomatous banana plantation and concentrate comprised the commercial crumble Vital Feed prepared for growing birds by Grand Cereal and Oil Limited, a subsidiary of U.A.C Nigeria shown in table 1.

Experimental Design

A Completely Randomised Design (CRD) was used for the experiment. The linear model was

$$X_{ijk} = \mu + X_{yij} + e_{ijk} \text{ where}$$

X_{ijk} = population mean

X_i = effect of i^{th} enzyme on forage

Z_j = effect of j^{th} enzyme on concentrate

X_{yij} = interaction effect of the diets

e_{ijk} = experimental error

Experimental Procedure

The fresh banana forages were harvested from their plantations and chopped into small pieces and weighed. The chopped banana forage and concentrate were weighed before given to the rabbits as a free choice feeding regimes. The banana forage and concentrates without any brozyme on them was referred as treatment I, which was control experiment. Treatment II was 4g of brozyme thoroughly mixed with each of 1kg banana forage and concentrates, respectively, and was given free choice to the rabbit. Experiment III was 5g brozyme mixed with 1kg of each of banana forage and concentrate respectively

offered on basis of free choice feeding regime to the rabbit. The three treatments were given *ad libitum* for the period of 56 days.

Data Collection

Daily feed intake and faeces voided by the rabbit were collected and weighed on daily basis. The daily feed intake was determined by the expression below

$$F_{\text{ink}} = F_{\text{sp}} - F_{\text{rem}} \text{ where}$$

F_{ink} = Feed intake

F_{sp} = Feed supplied daily

F_{rem} = Feed remaining daily

The feedstuff and faeces voided were analysis using (AO.AC 1980). Digestible nutrient was determined using expression below.

$$\text{TDN} = N^{\text{fd}} - N^{\text{fs}} \text{ where}$$

TDN = Total digestible nutrient

N^{fd} = Nutrient in the feed

N^{fs} = Nutrient in the faeces

The rabbits were weighed on weekly basis and the body weight from the first week was subtracted from the following week. The procedure continued until the eight weeks of experiment. The weekly weight gain was divided by 7 to obtain the daily weight gain. The feed conversion ratio was determined by the expression below.

$$\text{FCR} = \frac{\text{feed intake}}{\text{weight gain}} \text{ where}$$

FCR = Feed conversion ratio

The coefficient of digestibility was calculated with expression below

$$\text{Coefficient of Digestibility} = \frac{\text{TDN}}{N^{\text{fd}}} \times \frac{100}{1} \text{ where}$$

TDN = Total digestible nutrient

N^{fd} = Nutrient in the field

Statistical Data Analysis

The data obtained from the experiment was subjected to analysis of variance (Steel and Torrie, 1990).

RESULTS

Table 2 shows the daily feed intake of mixed banana forage and concentrate as fed basis of the weaned rabbits. There was a significant reduction of the daily feed intake of the banana forage and concentrate as level of brozyme increased from 0-5g/kg diet.

Table 3 showed the performance of rabbits on mixed banana forage and concentrate with brozymes. There was significant difference ($P < 0.05$) in the daily feed intake and weight gain of rabbits on the mixed banana forage and concentrate with brozyme treatment. The daily feed intake decreased while the weight gain increased as the brozyme increased from 0-5g per kilogram diet. The feed conversion ratio (FCR) decreased progressively as the level brozyme increased from 0-5g brozyme per kilogram diet.

Table 4 shows the co-efficient of digestibility of the banana forage and concentrate with treated brozyme fed to the weaned rabbit. There were significant difference ($P < 0.05$) among the digestibility coefficients of the banana forage and concentrate fed to the rabbits. The digestible nutrients improved progressively as the level of brozyme inclusion increased from 0-5g per kilogram diet.

Table 1: Proximate composition of banana forage and concentrate fed to weaned rabbit

Feedstuffs	DM%	CP%	EE%	CF%	Ash%	NFE	GEKcal
Banana forage	35.5	19.50	1.4	28.45	8.50	45.15	2832
Concentrate	89.5	17.80	3.73	6.90	7.50	64.07	2300

Table 2: Feed intake of rabbit as fed basis on mixed banana forage and concentrate treated with brozyme

Feedstuff	0g brozyme/ kg feed	4g brozyme/ kg feed	5g brozyme/ kg feed
Banana forage	120.0	108.0	100.0
Concentrate	56.5	42.0	38.0

Table 3: Performance of rabbits on mixed banana forage and concentrate with brozyme

Parameter	0g brozyme /kg diet	4g brozyme /kg diet	5g brozyme /kg diet	SEM
Daily DM feed intake (g)	97.69a	79.16b	72.65b	0.57
Daily weigh gain (g)	10.53a	13.25b	15.17c	0.12
FCR	9.28	5.97	4.79	0.01

Table 4: Digestibility of banana forage and concentrate with brozyme feed on rabbits

Coefficient of digestibility	0g brozyme/ kg diet	4g brozyme/ kg diet	5g brozyme/ kg diet	SEM
Total Dig Nut.	52.80 ^c	67.39 ^b	72.50 ^a	11.71
Crude Protein	51.31 ^c	64.32 ^b	71.35 ^a	10.30
Ether Extract	59.32 ^c	68.15 ^b	75.00 ^a	10.15
Crude Fibre	39.32 ^c	57.30 ^b	64.30 ^a	12.11
Nitrogen Free Extract	51.80 ^c	65.12 ^b	74.72 ^a	12.00

a,b,c mean in the same row with different superscript are significantly difference ($P < 0.05$)

DISCUSSION

Table 2 shows the daily consumption of banana forage and concentrate by rabbit. There were significant difference ($P < 0.05$) in feed intake among the weaned rabbits on mixed banana forage and concentrate with brozyme. There was reduction of feed consumed as the brozyme increased from 0-5g indicating that the brozyme have some influence on the rabbit feed consumption. Feed intake of farm animals depend on many factors including the energy demand of the animals and the energy available after feed digestion. Most farm animals consume feed to satisfy their energy demand (Anon, 2001). Also the palatability of the diets can determine the level of consumption of a particular diet by the farm animal (Onyimonji and Ene, 2003). It is understandable that the brozyme could have been impacting some peculiar taste to the animals that affected the level of feed consumption. Both the diet without the brozyme and that with brozyme has a distinct taste quite differently from each other and so the rabbit were affected by the difference in taste. Also it was observed that digestibility of diet with brozyme was higher than those without brozyme, indicating that the digestible energy in the diets with brozyme were higher than that without brozyme. This means that there was more digestible energy available for productive performance and so there could have been no need for provision of further energy as result of further digestion of feed.

Table 3 shows the performance of rabbit on the mixed banana forage and concentrate treated with brozyme. There was a general improvement in the weight gain of the rabbits fed the banana forage and concentrate with increased level of brozyme. Also the feed conversion ratio decreased along that line. This could be explained from the role of brozyme on increasing feed digestibility thereby releasing the nutrients that wouldn't have digested without the present of the enzyme. The rabbits now have more digestible nutrient for metabolism and could utilize the nutrients for better performance.

Table 4 shows the digestibility coefficient of the brozyme on the banana forage and concentrate fed on the weaned rabbits. There was significant improvement ($P < 0.25$) on diets as the level of brozyme increased from 0-5g, thus supporting the earlier report that enzyme increased feedstuff digestibility and released the trapped nutrients (Nweze, 2010; Khue, 2005). It could be understandably explained that the brozyme which contained many enzymes such as cellulase, phatase, manase and other enzymes acted on each of the substrates that were part of the feedstuff thereby releasing the trapped nutrient for the rabbit utilization. The specific enzyme-substrate mechanism was able to breakdown the complex nutrients like cellulose that was not able to be broken down by the rabbits' gastro-intestinal tract thereby increasing the nutrients availability for rabbit benefit. This supported Ironkwe (2004) that something has to be done to increase the utilization of forage by rabbit due to low gut microbes. This was partly explained from the fact that rabbit gastro-intestinal tract could not cope with fibre breakdown due to limited amount of gut micro flora. Brozyme which had broad spectrum of these enzymes was able to provide such medium for the rabbits' digestion of fibre materials. It is for this reason that complex protein, fibre and other nutrients were digested and released to the animal for growth and other metabolism.

Conclusion

Brozyme reduced the intake of mixed banana forage and concentrate but improved the weight gain, feed conversion ratio and digestibility.

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