

PERFORMANCE OF GROWING RABBITS FED GRADED LEVELS OF GOAT RUMEN CONTENT.

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ABSTRACT

A ten-week feeding trial was conducted to assess the biological and economic performance of growing rabbits fed graded levels of goat rumen content (GRC). The GRC which contained 27.25% crude protein and 28.33% crude fibre were included at 0, 10, 20, 30, and 40% levels in diets 1, 2, 3, 4 and 5 respectively to replace maize and groundnut cake in the diets. Thirty crossbred rabbits (Dutch X New Zealand White) between 5 and 7 weeks of age were randomly allocated to the 5 dietary treatments in groups of 6 and allowed unlimited access to the feed and drinking water throughout the experimental period. The daily feed intake (FI) were 49.0, 50.08, 51.05, 49.05 and 50.77g for diets 1 (control), 2, 3, 4 and 5 respectively. The corresponding daily weight gains (DWG) were 11.07, 10.0, 9.52, 8.96 and 8.69g. The FI, DWG and feed conversion ratio did not significantly ($p > 0.05$) differ among the treatments. The feed cost per kg decreased as the level of GRC increased in the diets. The feed per kg of weight gain also steadily declined from 20% to 40% levels of GRC hence leading to lowered feed cost and cost of production. Therefore, 40% GRC could be incorporated into the diets of growing rabbits without adverse effects on performance.

KEY WORDS: Growing Rabbits; Performance ; Goat rumen content.

INTRODUCTION

The need to closely examine the usefulness of minilivestock such as rabbits as sources of animal protein has been advocated (Ebenebe, 2000). The greatest potential for the use of meat rabbit is in those countries experiencing national animal protein shortages (Owen, 1981).

Rabbits are fast-growing, prolific and are known to be highly efficient in converting diverse plant materials into meat (Spedding *et al.*, 1976; Cheeke *et al.*, 1982). Rabbit meat has high protein but low fat, sodium and cholesterol levels (Rao *et al.*, 1978).

Despite the proven better performance of rabbits on pelleted feed (McNitt, 1980; Cheeke *et al.*, 1982; Harris *et al.*, 1983), rabbit farmers in Nigeria still resort to the use of unpelleted feed due to the scarcity and exorbitant cost of the pelleted ones. Poultry growers' mash and other sundry feeds have been fed to rabbits (Spreadbury, 1978; Ekpenyong, 1984).

The abundance of rumen content which presents problems in many abattoirs and slaughter houses in Nigeria may provide the needed alternative for feeding rabbits at cheaper cost. Preliminary studies by Egege (1994) and Ibeawuchi and Gbue (1995) have highlighted the possibility of adapting bovine rumen content as a suitable feed ingredient for growing rabbits. The study reported here examined the performance of growing rabbits fed graded levels of goat rumen content (GRC). It is envisaged that the widespread use of rumen content for animal feeding will enhance the disposal of this waste from the abattoirs.

MATERIALS AND METHODS

Study Location

The study was conducted in Maiduguri which is located in the semi-arid area of north eastern Nigeria. The area is characterized by short rainy season (3 – 4 months) and very long dry season (8 – 9 months). Mean ambient temperature is 31°C by August but gets as high as 40°C or more by April to May (Alaku and Moruppa, 1988).

Management of the experimental stock

Thirty (30) crossbred rabbits (Dutch X New Zealand White) of mixed sexes, age ranging from 5 – 7 weeks, were randomly allocated to five treatments in groups of 6 rabbits each. The rabbits were housed individually in cages measuring 35cm x 36cm x 45cm (width x length x height) and supplied daily with the experimental diets, in mash form, and clean drinking water *ad libitum* throughout the experimental period of 10 weeks.

Experimental diets

The experimental diets (Table I) were compounded using maize, maize bran, goat rumen content, groundnut haulms (hay), fish meal, salt and premix. The diets contained 0, 10, 20, 30 and 40% of goat rumen content (GRC) in diets 1 (control), 2, 3, 4 and 5 respectively. The diets supplied approximately 21% crude protein.

Source of goat rumen content (GRC)

Wet goat rumen content (GRC) was collected from fresh heaps within the premises of Maiduguri abattoir, Borno State, Nigeria. The GRC was spread and sun-dried on concrete floor at the abattoir. The dry goat rumen content was ground using a hammer mill before inclusion into the diets at the specified levels.

Data collection

The daily feed intake was obtained by subtracting the left over from the total amount of feed supplied. Each rabbit was weighed at the inception of the experimental and weekly thereafter to obtain the weekly and daily body weight gain throughout the experimental period. The feed conversion ratio was calculated as the dry matter feed intake per unit weight gain.

The economic implication of including GRC into the diets of growing rabbits was assessed by calculating the:-

- I. Cost per kilograms of each diet;
- II. Cost of feeding the rabbits on their respective diets throughout the experimental period; and
- III. Cost per kilogram of weight gain by the rabbits.

Chemical and statistical analyses

The proximate analysis of the experimental diets and GRC was carried out according to AOAC (1980) methods. Analysis of variance (ANOVA) was carried out on the data collected (Steel and Torrie, 1980) and means separated, where applicable, using the Duncan's multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Proximate analysis of the diets and goat rumen content

The chemical composition of the experimental diets is shown in Table 2. The crude protein contents of the diets are adequate for growing rabbits. Omole (1982) recommended protein level of 18% for growing rabbits reared in tropical countries. However, the quality of dietary protein is very important in rabbit nutrition since voluntary feed has been found to increase with improvement in protein quality (Kennedy and Hersherger, 1974; Spreadbury, 1974). The crude fibre levels of the diets increased with increasing level of goat rumen content (GRC) in the diets. This may be attributed to the higher crude fibre content of GRC compared to maize and groundnut cake (GNC). The fibre levels of the diets (18.50 – 24.50%) were higher than the 14% recommended by Anugwa *et al.* (1982) for growing rabbits but close to the 15.0 to 20% recommended by Cheeke *et al.* (1982). Fat levels which ranged from 3 to 5% are adequate; Cheeke (1974) reported that a minimum level of 3% fat is ideal to provide essential fatty acids and maintain glossy sleek hair.

The metabolizable energy levels of the diets containing GRC are lower than that of the control (0% GRC). This may be due to the lower energy level (2369.60Kcal/kg) of GRC compared to the energy levels of 3730.0 and 2891 Kcal/kg respectively for maize and GNC (Gohl, 1981).

TABLE 1: COMPOSITION OF THE EXPERIMENTAL DIETS

Ingredient (%)	Diets				
	1	2	3	4	5
Maize	40.98	36.35	32.48	28.25	23.98
Maize offal	17.00	17.00	17.00	17.00	17.00
Goat rumen content	0.00	10.00	20.00	30.00	40.00
Groundnut haulms	13.00	13.00	13.00	13.00	13.00
Groundnut cake	23.37	17.60	11.87	6.10	0.37
Fish meal	3.00	3.00	3.00	3.00	3.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Salt (NaCl)	0.50	0.50	0.50	0.50	0.50
Premix*	0.15	0.15	0.15	0.15	0.15
Total	100.00	100.00	100.00	100.00	100.00

* Composition of premix (Bio - Mix) Supplying following per kg diet: Vitamin A, 5,000,00 IU, vitamin D₃ 800,000 IU, vitamin E 12,000mg; vitamin K 1,500,000mg, vitamin B₁ 1,000mg, vitamin B₂ 2,000mg, vitamin B₆ 1,500,000mg; Niacin 12,000mg; Pantothenic acid 20.00mg Biotin 10.00mg; vitamin B₁₂ 300.00mg; folic acid 150,000mg; choline chloride 60,000mg; manganese 10,000mg; iron 15,000mg; zinc 800.00mg; copper 400.00mg; iodine 80.00mg; cobalt 40mg; selenium 8,000mg.

TABLE 2: PROXIMATE COMPOSITION OF THE EXPERIMENTAL DIETS AND GOAT RUMEN CONTENT (ON DRY MATTER BASIS)

Nutrient (%) ¹	Treatments/Diets					
	1	2	3	4	5	Goat rumen content
Dry matter (DM)	99.97	99.98	99.97	99.97	99.98	99.97
Crude protein (CP)	21.11	20.69	20.89	20.93	20.51	27.25
Crude fibre (CF)	18.5	20.5	21.25	23.5	24.5	28.33
Ether extract (EE)	5.5	3.5	4.0	5.0	5.0	4.33
Ash	6.5	10.5	11.0	14.0	15.0	11.50
Nitrogen-free extract (NFE)	48.39	44.81	42.86	36.57	34.99	28.59
Metabolisable Energy (Kcal/kg) ²	2944.41	2639.79	2618.46	2477.65	2406.02	2373.93

1. Mean of 3 determinations

2. Calculated according to the formula of Pauzenga (1985):

$$ME \text{ (Kcal/kg)} = 37 \times \% \text{ CP} + 81 \times \% \text{ EE} + 35.5 \times \% \text{ NFE.}$$

TABLE 3: PERFORMANCE OF RABBITS FED DIFFERENT LEVELS OF GOAT RUMEN CONTENT

Parameters	Treatments/Diets						Mean	SEM
	1	2	3	4	5			
Initial weight (g/rabbit)	525.0	1225.0	525.0	523.0	525.0	524.6	41.39 ^{NS}	
Final live weight (g/rabbit)	1300.00	125.00	1191.67	1150.00	1133.33	1200.00	75.0 ^{NS}	
Mean daily weight gain (g/rabbits)	11.07	10.00	9.52	8.96	8.69	9.65	0.49 ^{NS}	
Mean daily feed intake (g/rabbit)	49.02	50.08	51.05	49.05	50.77	49.99	0.62 ^{NS}	
Feed conversion ratio (FCR)	4.23	5.01	5.36	5.47	5.84	5.18	0.43 ^{NS}	
Mortality	Nil	Nil	Nil	Nil	Nil	-	-	

* FCR = feed intake/weight gain

SEM – Standard error of means

NS – Not significant ($p > 0.05$)

The chemical composition of GRC presented here (Table 2) tallies with the findings of Ghol (1981) who reported that ovine (sheep) rumen content is composed of 28.0% crude protein, 25.5% crude fibre, 4.6% fat, 12.30% ash and 28.8% nitrogen-fibre extract.

Performance characteristics

Results of performance parameters are presented in Table 3. There were no significant ($p > 0.05$) differences in mean feed intake, body weight gain and feed conversion ratio among the treatments. The results indicate that up to 40% inclusion of goat rumen content into the diets of growing rabbits has no adverse effects on feed intake (FI), weight gain (WG) and feed conversion ratio (FCR). The values of (FI), WG and FCR reported in this study compare favourably with results obtained in similar studies (Egege, 1994; Ibeawuchi and Gbue, 1995) in which graded levels of dried rumen content were incorporated into the diets of young rabbits. The slight variation in mean daily weight

gain (10 – 15g/rabbit/day) reported by Olumeyan *et al.* (1995) could be attributed to the micro-climatic conditions at the experimental site. During the experimental period, ambient temperature ranged from 36°C to 41°C and this is above the comfort zone (16°C to 19°C) of rabbits beyond which feed intake and weight gain are adversely affected (Fielding, 1991).

Economic analysis

The economic performance presented in Table 4 showed that cost per kilogram of feed decreased steadily as the level of goat rumen content (GRC) increased in the diets. The feed cost per kg of weight gain also steadily declined from 20% to 40% levels of goat rumen content (GRC) in the diets. Increasing the quantity of GRC in the diets resulted in the reduction of the quantity of maize and groundnut cake in the diets. These ingredients are more expensive than goat rumen content as shown in Table 4. Thus, incorporation of GRC into the diets of growing rabbits lowered the feed

TABLE 4: ECONOMIC PERFORMANCE OF RABBITS FED DIFFERENT LEVELS OF GOAT RUMEN CONTENT

Parameters	Treatments/Diets				
	1	2	3	4	5
Level of goat rumen content (%)	0	10	20	30	40
Initial weight (g/rabbit)	525.00	525.00	525.00	523.00	525.00
Final live weight (g/rabbit)	1300.00	1225.00	1191.67	115.00	1133.33
Total feed intake/rabbit (g)	2059.0	2078.0	2144.0	2060.0	2145.0
Total feed intake/rabbit (kg)	2.059	2.078	2.144	2.060	2.145
Cost/kg fed (N)	27.08	24.65	22.22	18.60	16.16
Total weight gain/rabbit (g)	775.00	700.00	666.67	627.00	608.33
Total weight gain/rabbit (kg)	0.78	0.70	0.67	0.63	0.61
Cost/kg gain (N/kg)	71.47	73.17	71.10	60.83	56.69

Cost per kilogram of the various ingredients used in compounding the experimental diets: Goat rumen content, N5.00; maize, N 33.75; maize offals, N 10.00; groundnut cake, N 26.00; groundnut haulm N 20.00; fish meal, N 60.00; bone meal, N 20.00; salt, N 15.00 and premix, N 400.00. One US Dollar (\$) = N 138.00 (Nigerian currency)

cost and hence cost of production.

CONCLUSION

The results of this study indicate that up to 40% GRC could be incorporated into the diets of growing rabbits without adverse effects on the performance of the rabbits. Additional advantages are reduced feed cost and lower cost per kg weight gain observed on the GRC - based diets. These are incentives that could warrant the recommendation of GRC as a dietary component for growing rabbits. However, further studies are needed to evaluate the effect of GRC on nutrient digestibility, blood components and the histopathology of the digestive tract which could be used to assess the health status of growing rabbits.

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