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PERFORMANCE OF GROWING RABBITS FED GRADED LEVELS OF GOAT BLOOD-RUMEN CONTENT MEAL

Mohammed, G, Igwebuike, J.U. and Alade, N. K.
Department of Animal science, University of Maiduguri, P.M.B. 1069, Maiduguri, Nigeria

ABSTRACT
A ten-week feeding trial was conducted to assess the growth and economic performance of growing rabbits fed graded levels of goat blood-rumen content meal (GBRCM). The GRRCM which contained 33.87% crude protein and 28% crude fibre has included at 0, 10, 20, 30 and 40% levels in diets 1, 2, 3, 4, and 5 respectively to replace maize and groundnut cake. Forty-five crossbred rabbit (Dutch X New Zealand white) between 6 and 7 weeks of age were randomly allocated to the 5 dietary treatments in groups of 9 rabbits and given feed and clean drinking water *ad libitum* throughout the experimental period. The average daily feed intake were 46.13, 51.86, 51.36, 59.07 and 53.14 g for diets 1 (control), 2, 3, 4, and 5 respectively. The average daily weight gains were 11.28, 10.52, 8.52, 11.16 and 11.22 g for treatments 1, 2, 3, 4 and 5 respectively. The mean final body weight, average daily weight gain and feed conversion ratio did not significantly ($P>0.05$) differ among the treatments. The average daily feed intake differed significantly ($P<0.05$).Rabbits on the 30% GBRCM diet consumed more feed than the others treatments. The feed cost per kg decreased as the level of GBRCM increased in the diets. The feed cost per kg of weight gain also steadily declined from ₦242.56 in T1 to ₦176.05 in T5. Therefore, up to 40% goat blood-rumen content mixture could be incorporated into diets of growing rabbits without adverse effects on performance.

KEYWORDS: Goat blood-rumen content mixture, growing rabbits, Performance.

INTRODUCTION

In Nigeria and in most developing countries average consumption of animal protein is very low (4.5g/head/day) as against minimum requirement of 35/head/day recommended by Food and Agriculture Organization of the United Nation (FAO, 2001). Yusuf *et al.* (2009) reported that low protein consumption may be due to the high cost of animal protein consumption, because of the high cost of conventional feed. This reduced animal protein intake has far-reaching implication on the health status and well-being of the populace (Alu *et al.*, 2009). Feeding in livestock production accounts for up to 70% of the total cost of production in Nigeria (Ijaiya *et al.*, 2002). The possible and most promising remedy for shortage of animal protein consumption lies in the production of fast maturing animals like rabbit with low cost of feeding. This is because livestock like cattle, pig, goat and sheep require large capital and take longer period to mature (Ebenezer, 2004).

Rabbit are highly prolific animals with short gestation period of 30 – 32 days and attain mature weight within short period of time. Rabbits have the ability to survive on forage, crop by-products and animal by-product. Therefore integrating these into rabbit diet can reduce its cost of production (Mohammed *et al.*, 2005). Rumen content is one of the animal by-products that could be used to feed rabbits if properly processed (Mohammed *et al.*, 2008). Investigation has revealed the composition and potentials of rumen content and blood-rumen content as good sources of protein in monogastric diets (Mann, 1984; Adeniji and Balogun, 2001; Igwebuike *et al.*, 2006). Therefore the objective of this study was to determine the optimum level of inclusion of dried goat blood-rumen content on the growth and economic performance growing rabbits.

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 31^0C by August but gets as high as 40^0C or more by April to May (Alaku and Moruppa, 1988).

Preparation of goat blood-rumen content mixture

Goat rumen content and blood were collected from the main abattoir in Maiduguri while slaughtering of the animal was in progress. The rumen was split open with the aid of a sharp knife and the content emptied into a 70-litre plastic vat. A mixture of the material was made at a ratio of one part of blood and three parts of rumen content after which it was boiled in a drum with constant stirring. The boiling lasted for 30 minutes and this was done to reduce the microbial load of the mixture. The goat blood-rumen content meal (GBRCM) was sun-dried on a concrete floor to about 12% moisture and all the foreign objects removed. After sun-drying, the mixture was milled and stored for mixing with other ingredients.

Management of the experimental stock

Forty-five (45) crossbred (Dutch X New Zealand while) rabbits between 5 and 6 weeks of age were randomly allocated to five treatments in groups of 9 rabbits each. The rabbit 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 from.

Clean drinking water was also provide *ad libitum* throughout the experimental period of 10 weeks

Experimental diets

The experimental diets (Table 1) were compounded using maize, wheat offal, goat blood-rumen content mixture, groundnut cake, groundnut haulms (hay), fish meal, salt and premix. The diets contained 0, 10, 20, 30 and 40% of goat blood-rumen content meal (GBRCM) in diets 1 (control), 2, 3, 4, and 5 respectively. The diets supplied approximately 19% crude protein. The GBRCM replaced maize and groundnut cake in the various diets.

Data collection

The daily feed intake was obtained by subtracting the left over from total amount of feed supplied. Each rabbit was weighed at the inception of the experiment 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 GBRCM into the diets of growing rabbits was assessed by calculating the:

i. Cost per kilogram 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 analysis

The proximate analysis of the experimental diets and GBRCM was carried out according to AOAC (1990) method. Analysis of variance (ANOVA) was carried out on the data collected (Steel and Torrie, 1980) and mean separated, where applicable, using the Duncan's Multiple range test (Duncan, 1955).

RESULTS AND DISCUSSION

Proximate composition of the experimental diets and GBRCM

The proximate composition of the experimental diets and the GBRCM are shown in Table 2. The crude protein (CP) of all the experimental diets was similar. This is in agreement with the 18% CP recommended for growing rabbits reared in tropical countries (Omole, 1982). The GBRCM has a crude protein of 33.87% and a crude fibre of 28.0% which is close to the one obtained by Mohammed *et al.* (2005) who fed similar diets containing goat rumen content. The diets containing GBRCM have higher crude fibre content than the control diet. This may be due to the type of diet consumed by the goat before slaughter and the interval between the feeding and slaughter period (Adeniji and Balogun, 2001). Goat reared in semi-arid areas usually depends on roughages which are high in fibre. On the other hand, the control diet has the highest metabolizable energy level which resulted from the variation of the ingredients used in other diets. The low metabolizable energy of GBRCM-based may be attributed to the lower energy level of GBRCM (2195.96 kcal/kg) compared to the energy levels of 3730.00 and 2891.00 kcal/kg for maize and groundnut cake respectively. The lowest ash percentage was obtained in Treatment 1 (2.0%) but values in other treatments were between 3.0 and 4.0%. Treatment 1 has the highest fat (4.5%) while other treatments values were 3.0% which were comparable to the minimum requirement of 3% reported as the ideal level (Cheeke, 1987). The highest nitrogen-free extract was recorded in Treatment 1 (58.80%) while the lowest value was in Treatment 3 (41.93%).

Performance Characteristics

Results of performance parameters are presented in Table 3. Daily feed intake were significantly different ($P<0.05$) among the experimental diets. Rabbit fed diets containing GBRCM eat more fed than those fed the control diet (0% GBRCM). This may be attributed to the lower energy values of the diets containing GBRCM to make up their requirement (Mohammed *et al.*, 2005). There is however, non significant ($P<0.05$) difference in daily weight gain, feed conversion ratio and final body weight. The values of daily weight gain, feed conversion ratio and final body weight obtained in this study are comparable with results obtained in similar studies (Mohammed *et al.*, 2005; Dairo *et al.*, 2005).

Economic Analysis

The economic performance presented in Table 4 showed that cost per kg of feed decrease steadily as the levels of goat blood-rumen content increased in the diets. The feed cost per kg of weight gain also declined from ₦242.56 in T1 (0%GBRCM) to ₦176.05 in T5 (40% GBRCM). Increasing the quantity of GBRCM in the diets resulted in the reduction of the quantity of maize and groundnut cake in the diets. These ingredients are more expensive than GBRCM as shown in Table 4. Thus incorporating up to 40% GBRCM let to a reduction in the cost of production.

CONCLUSION

The results of this experiment indicate that up to 40% GBRCM could be incorporated into diets of growing rabbits without adversely affecting the performance of the rabbits. The use of GBRCM as a feed ingredient let to reduce feed cost and lowered cost per kg weight gain. These are incentives that could guarantee the recommendation of GBRCM as a dietary component for growing rabbits. However, further investigations will greatly assist in providing the necessary information on the effect of GBRCM on blood parameters, digestibility and histopathology which could be used to assess the health status of the rabbits.

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TABLE 1 Composition of the Experimental Diets

	Diets/ Treatments				
Ingredient (%)	T1	T2	T3	T4	T5
Maize	40.98	39.12	37.41	32.24	24.35
Wheat offal	17.00	17.00	17.00	17.00	17.00
GBRCM	0.00	10.00	20.00	30.00	40.00
Groundnut cake	23.00	15.23	6.94	2.11	0.00
Groundnut haulms	13.00	13.00	13.00	13.00	13.00
Fish meal	3.00	3.00	3.00	3.00	3.00
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

GBRCM = Goat blood-rumen content meal

**Composition of premix (Animal care) supplying following per kg premix: Vit A, 8,000 IU; Vit D3, 2,000,000 IU; Vit E, 5,000 mg; Vit K3, 2,000 mg; Folic Acid, 500 mg; Niacin 15,000 mg; Carpan 5,000 mg; Vit B2, 600 mg; Vit B12, 10mg; Vit B1, 1,500 mg; Vit B6, 1,500mg; Biotin, 20mg; antioxidant, 125,000mg; Cobalt 200mg; Selenium, 200mg; Iodine, 1,200mg; Iron, 40,000mg; Manganese, 80,000mg; Copper, 50,000mg; Zinc, 60,000mg; Chloride, 2,000,000mg.*

TABLE -2. Proximate Composition of the Experimental Diets

Nutrient (%) GBRCM	Treatment/Diets T1 (0 %)	T2 (10 %)	T3 (20%)	T4 (30%)	T5 (40%)	
Dry matter	91..00	94.90	89.40	93.30	93.60	96.30
Crude protein	19.20	19.00	18.47	18.32	19.93	33.87
Crude fibre	15.50	23.00	23.00	25.00	25.00	28.00
Ether extract	4.50	3.00	3.00	3.00	3.00	4.00
Ash	2.00	3.00	4.00	4.00	3.00	13.00
Nitrogen-free extract	58.80	46.90	41.93	49.68	50.07	17.43
ME (kcal/kg)	3,162.30	2,611.00	2,414.91	2,684.48	2,720.90	2,195.96

GBRCM = Goat blood-rumen content meal
ME = Metabolizable energy calculated according to formulae of Pauzenge (1985).
ME – 37 X % CP + 81X% EE+35.5X% NFE.

TABLE- 3. Performance of Rabbits Fed Graded Levels of Goat Blood-Rumen Content Meal

Ingredient (%)	Treatments/Diets TI(0%GBRCM)	T2(10%GBRCM)	T3(20%GBRCM)	T4(30%GBRCM)	T5(40%GBRCM)	SEM
Initial weight (g/rabbit)	463.89	464.44	460.55	466.66	463.88	65.39^{NS}
Final weight (g/rabbit)	1,195.33	1,198.67	1,090.63	1,180.22	1,125.22	47.36^{NS}
Mean daily weight gain (g/rabbit)	11.28	10.34	8.52	11.16	11.22	3.45*
Mean daily feed intake (g/rabbit)	46.13^{c}	51.86^{b}	51.36^{b}	59.07^{a}	53.14^{b}	4.09^{NS}
Feed conversion ratio (FCR)	4.78	5.42	5.42	6.24	6.13	2.86^{NS}
Mortality	0	0	0	0	0	-

*NS = Not significant (P>0.05); * = Significant (P<0.05);abc = Means in the same row bearing different superscripts differ Significantly;. SEM =Standard error of means.*

TABLE- 4. Economic Performance of Rabbits Fed Graded Levels of Goat Blood-Rumen Content Meal

Parameters **Levels of GBRCM**	Treatments/Diets 1 0	2 10	3 20	4 30	5 40
Initial weight (g/rabbits)	463.89	464.44	460.55	466.66	463.88
Final live weight (g/rabbits)	1,195.33	1,178.67	1,110.63	1,180.22	1,125.22
Total feed intake/rabbit (g)	2,583.28	2,904.16	2,876.16	3,307.92	2,975.85
Total feed intake/rabbit (kg)	2.58	2.90	2.88	3.31	2.98
Cost/kg feed (₦)	59.23	52.90	46.59	40.64	37.22
Total weight gain/rabbit (g)	631.68	579.04	477.12	624.96	628.32
Total weight gain/rabbit (kg)	0.63	0.58	0.48	0.62	0.63
Cost/kg gain (₦/kg)	242.56	264.5	279.54	216.97	176.05

Cost per kilogram of the various ingredients used in compounding the experimental diets: Goat blood-rumen content mixture, ₦10.00; maize, ₦65.00; wheat offal ₦36.00; groundnut cake; ₦75.00; groundnut haulms, ₦43.75.00; fish meal, ₦37.00; Bone meal, ₦25.00; salt, ₦60;00 and premix, ₦300.00. One US Dollar = ₦151.00.