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PERFORMANCE OF GROWING RABBIT FED GRADED LEVELS OF SHEEP BLOOD-RUMEN CONTENT MIXTURE

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ABSTRACT
A ten-week feeding trial was conducted to evaluate the growth and economic performance of growing rabbits fed sheep blood-rumen content mixture (SBRCM). The SBRCM which contained 36.70% crude protein and 24.00% crude fibre was included at 0, 10, 20, 30, and 40% levels in diets 1, 2, 3, 4 and 5 respectively to replace groundnut cake and maize in the diets. Forty-five crossbred (Dutch x New Zealand white) rabbits between 5 and 6 weeks old were randomly allocated to the 5 treatments in groups of 9 rabbits and allowed unlimited access to the feed and drinking water throughout the experimental period. The average daily weight gain was not statistically different ($P>0.05$ among the dietary treatments. The mean daily feed intake and feed conversion ratio were significantly ($P<0.05$) different among the treatments. Rabbits on the SBRCM-based diets consumed more feed than the control (0% SBRCM). The feed cost per kg and feed cost per kg of weight gain decreased as the level of SBRCM increased in the diets. This led to lowered feed cost and hence cost of production. Therefore, the results of this experiment shows that sheep blood-rumen content mixture (SBRCM) could replace up to 40% of maize –groundnut cake in rabbit diets without detrimental effects on growth performance. However, best economic returns was obtained at 30% level of SBRCM.

KEY WORDS: Growing rabbits, performance, sheep blood-rumen content mixture

INTRODUCTION

Most Nigerians are poorly fed and suffer from malnutrition due to lack of protein of animal origin in their diets. Atsu (2002) reported that the average Nigerian consumes only about 4.5g/head/day of animal protein which is less than FAO (1990) recommendation of 35g/head/day. The greatest constraint to livestock production is the cost of feedstuff. This is because feed is the major component of the total cost of livestock production representing about 70% of the total cost of production (Ijaiya *et al.*, 2002).

In most developing countries, the search for non-conventional feed ingredient to replace the usually expensive conventional ones appears to occupy the attention of the Animal nutritionists. The main aim of using these non-conventional feed ingredients is to reduce the cost of production thus making it possible for people to be able to afford animal protein in their menu (Ojebiyi *et al.*, 2006) and for the animal rearers to break even. Some of these non-conventional feed ingredients are rumen content and blood which are available in Nigerian abattoirs and slaughter houses (Mohammed *et al.*, 2005). Investigation has revealed the composition and potential of rumen content and blood-rumen content mixture as good source of protein in monogastric rations (Adeniji and Balogun, 2001; Dairo *et al*., 2005; Mohammed *et al*., 2008). This study, therefore investigate the performance of growing rabbits fed diets containing up to 40% sheep blood-rumen content mixture (SBRCM) as replacement for groundnut cake and maize.

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 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 sheep blood-rumen content mixture

Sheep 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 sheep blood-rumen content mixture (SBRCM) was sun-dried on a concrete floor to about 12% moisture and all the foreign objects were 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 white) rabbits between 5 and 6 weeks of age were randomly allocated to five treatments in groups of 9 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. Clean drinking water was also provided *ad libtum* throughout the experimental period of 10 weeks.

Experimental diets

The experimental diets (Table 1) were compounded using maize, wheat offal, sheep blood-rumen content mixture, groundnut cake, groundnut haulms (hay), fish meal, salt and premix. The diets contained 0, 10, 20, 30 and 40% of sheep blood-rumen content mixture (SBRCM) in diets 1 (control), 2, 3, 4, and 5 respectively. The diets supplied approximately 19% crude protein. The SBRCM replaced maize and groundnut cake in the 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 SBRCM into the diets of growing rabbits was assessed by calculating the:

i. Cost per kilogram of each diets;
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 SBRCM was carried out according to AOAC (1990) method. 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

The nutrient composition of the experimental diets and sheep blood-rumen content mixture is presented in Table 2. The crude protein of the diets were similar and the values are similar to the values recommended by other worker (Dairo *et al*., 2005 and Mohammed *et al.,* 2005) who fed similar diets to growing rabbits. The crude fibre ranges from 17.0% to 20.11% in treatments 1 and 5 respectively. The crude fibre increased as the level of sheep blood-rumen content increase in the diets and values were adequate for growing rabbit as reported by Ibeawuchi and Gbue (1995). The fat levels of the diets range from 3.0% (T1) to 4.20% (T3). The values recorded for fat agree with values obtained in similar studies by Egege (1994) and recommended as the ideal fat requirement for growing rabbit in Nigeria. Nitrogen-free extract, ash and metabolizable energy were also similar and adequate for the growing rabbits in all the treatments.

The SBRCM contains crude protein of 36.70%, crude fibre of 24.0%, ether extract of 5.0%, 6.01% ash, nitrogen-free extract of 28.29% and metabolizable energy of 2767.20 kcal/kg. These values compared favourable to the values recorded by Mohammed *et al*. (2005) who analyzed sheep blood-rumen content mixture.

Performance

Results of the performance parameters are presented in Table 3. Average daily weight gain for all the rabbits were not significantly different ($P<0.05$) among the dietary treatments. The significant increases in daily feed intake and non-significant difference in daily weight gain observed in this work agree with the results of Dairo *et al*. (2005) who fed bovine blood-rumen content mixture (BBRCM) and reported that increasing the BBRCM level in the diets significantly increased feed consumption but with non-significant difference in growth rate. Mohammed *et al*. (2005) and Dairo *et al*. (2005) similarly reported that the incorporation of up to 40% rumen content and blood-rumen content in the diets when other components were of high energy concentration did not significantly affect rate of weight gain. Alawa and Umunna (1993) stated that the inclusion of agro-industrial by products in livestock rations has often resulted in increased feed intake as a compensation for the reduced energy concentration of such diets.

The feed conversion ratio which was computed as fed intake per unit weight gain differed significantly ($P<0.05$). The result followed the pattern of the mean daily feed intake of which T1 (0% SBRCM) and T2 (20% SBRCM) showed better feed conversion ratio compared to other treatments. The variation observed in the treatments may be due to increase in the feed intake as the levels of SBRCM increased in the diets.

Economic analysis

The economic performance presented in Table 4 showed that cost per kilogram of feed significantly decreased as the dietary level of sheep blood-rumen content mixture (SBRCM) increased. The control diet has the highest feed cost per kg of ₦ 59.23 and the lowest was recorded by rabbit fed 40% SBRCM. The fed cost per kg of weight gain steadily declined from 0% to 30% levels of sheep blood-rumen content mixture (SBRCM) in the diets. Thus, incorporation of SBRCM into the diets of growing rabbits lowered the feed cost as well as cost of production

CONCLUSION

Sheep blood-rumen content mixture can replace up to 40% of maize/groundnut cake in concentrate diets for rabbits without adverse effects on growth performance. Best economic returns was obtained at 30% levels of SBRCM inclusion. Since sheep blood rumen content can be obtained at little or no cost, its inclusion in rabbit diets by farmers will significantly reduce the cost of production. However, further investigation on blood parameters and histophathology of some organs are necessary as these will help to provide information on the health status of the rabbits.

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Table 1 Composition of the experimental diets**.**

	Diets/Treatment				
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
SBRCM	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

SBRCM = Sheep blood-rumen content mixture

**Composition of premix (Animal care) supplying the following per kg: 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, 10 mg; Vit B1, 1,500 mg; Vit B6, 1,500 mg; Biotin, 20 mg; antioxidant, 125,000 mg; Cobalt 200 mg; Selenium, 200 mg; Iodine, 1,200 mg; Iron, 40,000 mg; Manganese, 80,000 mg; Copper, 50,000 mg; Zinc, 60,000 mg; Chloride, 2,000,000 mg.*

Table 2: Chemical Composition of the Experimental Diets and Sheep Blood-Rumen Content Mixture (SBRCM**)**

	Treatment/Diets					
Nutrient (%)	T1 (0%SBCM)	T2 (10%SBCM)	T3 (20%SBCM)	T4 (30%SBCM)	T5 (40%SBCM)	SBRCM
Dry matter (DM)	94.70	93.70	93.06	93.90	94.30	95.36.70
Crude protein (CP)	19.20	18.33	19.36	19.27	18.67	36.70
Crude fibre CF)	17.00	18.03	18.52	19.20	20.11	24.00
Ether extract (EE)	3.00	4.00	4.20	3.50	3.10	5.00
Ash	4.00	6.13	5.01	4.01	4.03	6.01
Nitrogen-free extract (NFE)	56.80	53.51	53.11	53.93	54.19	28.29
ME (Kcal/kg)	2,960.80	2,901.82	2,925.73	3,033.32	2,857.54	2,767.20

ME = Metabolizable energy calculated according to the formula of Pauzenga (1985):
ME = 37 X % CP + 81X% EE+35.5X% NFE.

Table 3: Performance of Rabbits Fed Different Level of Sheep Blood-Rumen Content Mixture (SBRCM)

	Treatments/diets					
Parameters	T1(0%)	T2(10%)	T3(20%)	T4(30%)	T5(40%)	SEM
Initial weight (g/rabbit)	466.89	467.22	463.89	468.89	466.67	
Final live weight (g/rabbit)	1,195.33	1,204.56	1,136.00	1,104.89	1,098.22	59.04^{NS}
Mean daily weight gain (g/rabbit)	11.28	10.16	11.18	10.33	9.16	1.42^{NS}
Mean daily feed intake (g/rabbit)	46.13^{a}	45.79^{a}	55.26^{a}	57.66^{b}	61.22^{b}	4.50*
Feed conversion ratio (FCR)	4.09^{a}	4.51^{a}	4.94^{a}	5.88^{a}	6.68^{b}	0.88*
Mortality	0	0	0	0	0	-

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

Table 4: Economic Performance of Rabbits Fed Different Levels of Sheep Blood-Rumen Content Mixture (SBRCM)

	Treatments/diets				
Parameters	1	2	3	4	5
levels of SBRCM	0	10	20	30	40
Initial weight (g/rabbits)	466.89	467.22	463.89	468.89	466.67
Final live weight (g/rabbits)	1,195.33	1,124.56	1,136.00	1,104.89	1,098.22
Total feed intake/rabbit (g)	3,229.10	3,205.30	3,868.20	4,036.20	4,285.40
Total feed intake/rabbit (kg)	3.23	3.21	3.87	4.04	4.29
Cost/kg feed (₦)	59.23	52.90	46.59	40.64	37.22
Total weight gain/rabbit (g)	789.60	711.20	782.6	723.1	641.2
Total weight gain/rabbit (kg)	0.79	0.71	0.78	0.72	0.64
Cost/kg gain (₦/kg)	242.17	239.17	231.16	228.03	249.95

Cost per kilogram of the various ingredients used in compounding the experimental diets: sheep 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, ₦900.00. One Dollar = 151.00 (Nigeria currency)