JAFE/MS/VOL 2 (3)/2015/01

EFFECT OF FEEDING GRADED LEVELS OF BAOBAB SEED MEAL (*Adansonia digitata*) ON GROWTH AND ECONOMIC PERFORMANCE OF GROWING RABBITS

G. Mohammed, S.B. Adamu, L.G. Ashiekh; A. Hudu, and U.M. Kolo

Department of Animal Science, University of Maiduguri, Maiduguri, Borno State
uskolo220@gmail.com

Abstract

Feeding trial was carried out to assess the growth and economic performance characteristics of growing rabbits fed baobab seed meal (BSM). The BSM was included at 0, 5, 10, 15 and 20% levels in diets 1, 2, 3, 4 and 5 respectively to replace groundnut cake and maize in the diets. Thirty crossbred rabbits (Dutch X New Zealand White) between 5 – 7 weeks of age were randomly allocated to the 6 treatments in groups of 5 rabbits and allowed unlimited access to the feed and drinking water throughout the experimental period. The daily weight gain and feed conversion ratio measurements were not significantly (P>0.05) different among the treatments while the daily feed intake was affected by the inclusion of baobab seed meal in the diets. Rabbits fed 0% baobab seed meal consumed more feed than those fed 20% BSM, but were similar to rabbits fed other diets. The feed cost per kg feed decreased as the level of BSM increased in the diets. The best cost per kilogram of weight gained was obtained by rabbits fed 15% BSM diet compared to others, while the poorest was by rabbits fed 10% BSM diet. Thus, 20% BSM could be incorporated into the diets of growing rabbits without adverse effects on growth and economic performance.

Keywords: *BSM diet, growing rabbits, growth performance, feed cost; soya bean meal*

Introduction

There is global awareness on the level of shortage of animal protein supply in the tropics (Adekunle and Ajani, 1999). Globally, Nigeria remains among the least of animal protein consumers (Egbunike, 1987). Average consumption of animal protein in the country is estimated at about 4.5 g/head/day as against a minimum requirement of 35g/head/day recommended by the Food and Agriculture Organization of the United Nation (Atus, 2002). Policies and programs were made in the past with the aim of boosting sustained livestock production and hence improving total protein intake of the nation. Unfortunately, these policies and programs have been centered on cattle and small ruminant production. Aduku and Olukosi (1990) stated that large animals are characterized by slow production cycles which could not meet the protein requirement easily. In order to meet the increasing demand for animal protein, emphasis needs to be given to non-conventional sources of animal protein such as rabbits as against cattle, sheep, goat, pig and poultry that may require more capital, space and time (Yusuf *et al*., 2009).

The high cost of animal products that is being witnessed in Nigeria and most African countries can be attributed to high cost of livestock feed which generally account for 60 - 70% of the total cost of production (Lawrence *et al*., 2008). This is because the conventional feeds that are used to supply energy and protein such as maize, soya bean and groundnut cake are becoming more expensive due to competition between man and livestock. Although rabbits can be fed on forage, the present day breed of rabbits cannot attain their full genetic potential on sole forage diet. The use of concentrate feed for rabbit and the rapid increase in rabbit production in the last

decade is already creating feed crisis that is being witnessed in poultry and swine production. This calls for the use of less utilized but readily available unconventional feed resources such as trees/browse that abound in most African countries. Baobab (*Adansonia digitata*) tree is a deciduous, drought and fire tolerant tree that is widely distributed in most African countries. The tree is massive and may be up to 20 – 30m high with a lifespan of several hundred years (Heuze *et al*., 2013). Baobab tree begins to bear fruit at the age of 8 years and continues to produce for several years. The main aim of using these non-conventional fruit as an ingredient is to reduce the cost of production, thus making it possible for people to afford animal protein in their menu. This study was therefore, conducted to study the extent to which BSM can replace the very costly ingredient, soya bean meal (SBM), in the diet of growing rabbits.

Materials and Methods

Experimental Animals and Management

The study was conducted at the Livestock Teaching and Research Farm, University of Maiduguri, Maiduguri, Borno State, Nigeria. Thirty (30) crossbred rabbits (Dutch x New Zealand White) between 5 and 7 weeks of age were used for the 8 – week feeding trial. The rabbits were individually weighed, and randomly assigned to six (6) dietary treatments in groups of five (5). Each rabbit was caged individually, and provided with the experimental diets and clean drinking water *ad libitum*. Data collection commenced after an initial adjustment period of seven days.

Experimental Diets

The experimental diets are shown in Table 1. Maize, wheat offal, groundnut haulm, groundnut cake, fish meal, baobab seed meal, limestone, common salt and premix were used in compounding the experimental diets. Baobab seed meal was incorporated at levels of 0, 5, 10, 15 and 20% into the diets 1 (control), 2, 3, 4 and 5 respectively.

Data collection

Daily feed intake was obtained by subtracting the left over from total amount of feed supplied on the previous day. Each rabbit was weighed at the beginning of the experiment and weekly thereafter to obtain the weekly and daily body weight gain parameters throughout the experimental period. The feed conversion ratio was calculated as the dry matter feed intake per unit weight gain. The proximate composition of the diets and test material (baobab seed meal) were determined according to AOAC (2000).

Economic analysis

The economic implication of including baobab seed meal in the diets of growing rabbits was assessed by means of the following determinations:

(i) Total feed intake per rabbit; (ii) Total weight gain; (iii) Cost per kg of each diet; and (iv) Cost per kg of the rabbit's weight gain.

Statistical Analysis

Data collected were subjected to analysis of variance under the Completely Randomized Block design, and where significant differences were observed, means were compared using the Duncan's multiple range test (Duncan, 1955) as outlined by Steel and Torrie (1980).

Results and Discussion

Proximate composition of baobab seed meal and the experimental diets

The proximate nutrient compositions of the baobab seed meal (BSM) and the experimental diets are presented in Table 2. The crude protein content of 19.53% of the baobab seed meal varied from the 23.23% value reported by Saulawa *et al*. (2014), but similar to the 20.40% observed by Oladunjoye *et al*. (2014) for baobab seed meal.

Table 1: Ingredients Composition of the experimental diets

	Level of baobab seed meal in the diets (%)				
Ingredients (%)	0	5	10	15	20
Maize	38.19	34.66	31.13	27.61	24.00
Wheat offal	20.00	20.00	20.00	20.00	20.00
Baobab seed meal	0.00	5.00	10.00	15.00	20.00
Groundnut cake	19.16	17.69	16.22	14.74	13.35
Fish meal	3.00	3.00	3.00	3.00	3.00
Groundnut haulms	17.00	17.00	17.00	17.00	17.00
Bone meal	2.00	2.00	2.00	2.00	2.00
Common 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**

** Premix (grow fast) manufactured by Animal Care Service Consult (Nig) Ltd. Lagos, Supplied the following per kg of premix: Vitamin A, 5000,00 IU; Vitamin D_3 800,000 IU; Vitamin E, 12,000 mg; Vitamin K, 1,5000 mg; Vitamin B_1, 1,000 mg; Vitamin B_2, 2,000 mg, Vitamin B_6, 1,500 mg; Niacin, 12,000 mg; pantothenic acid, 20.00 mg; Biotin,10.00 mg; Vitamin B_{12}, 300.00 mg; folic acid, 150,000 mg; choline, 60,000 mg; manganese, 10,000 mg; iron;15,000 mg, zinc 800.00 mg; Copper 400.00 mg; Iodine 80.00 mg; cobalt 40 mg; selenium 8,00 mg.*

The crude protein content of all the diets were similar and the values are comparable to the 18% crude protein (CP) level recommended by Omole *et al*. (2007) which is adequate for growing rabbits in the tropical countries. The crude fibre levels of the diets ranged from 18.10 (Diet 1) to 21.0% (Diet 5). The level increases with increased levels of baobab seed meal in the diets.

Table 2: Proximate composition of experimental diets and baobab seed meal (BSM)

	Level of baobab seed meal in the diets (%)					
Nutrient (%)	0	5	10	15	20	BSM
Dry matter (DM)	94.30	93.70	94.10	94.10	94.20	93.02
Crude protein (CP)	18.96	18.52	18.14	18.56	18.00	19.53
Crude fibre (CF)	18.10	19.12	20.10	20.50	21.00	10.03
Ether extract (EE)	3.50	3.11	3.00	3.06	3.09	2.82
Total Ash	2.00	3.00	3.50	4.00	4.50	5.00
Nitrogen-free extract (NFE)	57.44	56.25	55.26	53.88	53.41	62.62
ME(Kcal/kg)	3024.14	2934.03	2880.91	2847.73	2812.35	3174.03

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

However, the values obtained were within the range of 12 – 22.5% reported by Cheeke *et al*. (1983) and Provet (2010). The ether extract values recorded were similar and adequate for growing rabbits in the tropical countries. Cheeke *et al*. (1987) reported that a minimum level of 3% fat is ideal to provide requirement of the rabbit. The total ash content increased with increased levels of BSM in the diets with a range of 2.0 (control diet) to 4.50% (20% BSM). The values were however similar to those recorded by Oladunjaye *et al*. (2014) who analyzed diets containing different levels of baobab seed meal. The diet containing 0% BSM had the highest value (61.40%) of nitrogen-free extract (NFE) while the lowest value (54.44%) was recorded in the 15% BSM diet. The metabolizable energy (ME) in the diets followed a trend similar to that of nitrogen-free extract, and the values were adequate to provide required energy for normal production as reported by Omole *et al.* (2007).

Growth Performance

The growth performance of growing rabbits is presented in Table 3. All the parameters were not affected (P>0.05) by the various graded levels of BSM inclusion except for the daily feed intake. Rabbits fed 0% BSM consumed more feed than rabbits fed 20% BSM, but were similar to rabbits fed other diets. The lower feed intake recorded for rabbits on 20% BSM in the diet could be attributed to concentration of anti-nutritional factors such as trysin, phytate and tannin which affect the feed intake as reported by Nkafamiya *et al*. (2007). The values obtained were lower than values recorded by Oladunjaye *et al*. (2014) which ranged from 95.5 to 98.2g.

Table 3: Growth performance of rabbits fed different levels of baobab seed meal

Parameters	Level of baobab seed meal in the diets (%)					
	0	5	10	15	20	SEM
Mean initial body weight (g)	600.00	600.01	616.67	603.68	600.33	11.55^{NS}
Mean final body weight (g)	1133.30	1130.36	1225.00	1233.30	1010.00	109.35^{NS}
Mean daily feed intake(g/rabbit)	65.55^{a}	60.89^{ab}	64.18^{ab}	63.18^{ab}	57.82^{b}	2.59^{*}
Mean daily weight gain (g/rabbit)	9.67	9.45	7.93	10.86	7.48	1.51^{NS}
Feed conversion ratio (feed: gain)	6.77	6.44	8.12	5.82	7.73	2.58^{NS}
Mortality (number)	0	0	0	0	0	-

SEM = Standard error of mean; NS = Not significant (P>0.05); * = Significant (P<0.05);

a, b = Mean in the same row bearing different superscript differ significant (P<0.05)

The variation in the feed intake could be due to the different environments of the experiments. Rabbits fed during the cooler period ate more feed than those fed during the hotter period. The daily weight gain ranged from 7.48 (10% BSM) to 10.86g (0% BSM) which are quite comparable to the values (5.20 – 10.0g/rabbit/day) recorded by Igwebuike *et al*. (1998) who fed rabbits with sorghum waste in the same environment. However, Oladunjaye *et al*. (2014) revealed daily weight gain of 16.0 -17.20g for growing rabbits fed baobab seed meal at varying levels, these values are higher than values obtained in this study. The difference in daily weigh gain recorded may be attributed to the high temperature during the study period which affects daily feed intake and consequently, daily weight gain as mentioned before. The feed conversion ratio values ranged from 5.82 (0% BSM diet) to 8.12 (15% BSM diet). These were similar (P>0.05) to the range of 5.5 – 6.1% reported by Oladunjaye *et al*. (2014) who fed rabbits with varying levels of baobab seed meal.

The economic analysis of growing rabbits fed graded level of baobab seed meal is presented in Table 4. The feed cost per kilogram decreased steadily as the level of baobab seed meal increased. Rabbits fed 15% BSM had the best cost per kilogram gain, followed by 5% BSM diet while the poorest cost per kilogram gain was recorded by rabbits fed 10% BSM diet. This could be attributed to poor feed conversion in rabbits fed 10% BSM diet. Therefore, rabbits can be fed up to 20% BSM diet without adverse effect on the growth and economic performance.

Table 4: Economic analysis of rabbits fed different levels baobab seed meal

	Level of baobab seed meal in the diets (%)				
Parameters	0	5	10	15	20
Initial weight (g/rabbit)	600.00	600.01	616.67	603.68	600.33
Final live weight (g/rabbit)	1133.33	1130.36	1225.00	1233.33	1010.00
Total feed intake (g/rabbit)	3670.80	3409.84	3606.40	3538.08	3237.92
Total feed intake (kg/rabbit)	3.67	3.41	3.61	3.54	3.24
* Cost/kg feed (₦)	90.49	88.95	88.02	87.53	86.74
Total weight gain (g/rabbit)	541.52	529.20	444.08	608.16	418.88
Total weight gain (kg/rabbit)	0.54	0.53	0.44	0.61	0.42
Cost/kg gain (₦/kg)	615.00	572.30	722.16	507.90	669.14

** Cost per kilogram of the various ingredients used in compounding the experimental diets: Baobab seed meal ₦ 74.59; maize, ₦84.00; wheat offal ₦ 60.00; groundnut cake, ₦ 100.00; groundnut haulms, ₦114.28; fish meal, ₦125.00; bone meal, ₦55.00; salt, ₦20.00 and premix, ₦ 1400.00.*

Conclusion

The results presented in this study revealed that up to 15% of baobab seed meal (BSM) could be incorporated into the diets of growing rabbits without adverse effect on the growth and economic performance of the rabbits. Additional advantage could come from the observed reduced feed cost per kilogram as the level of Baobab seed meal increased in the diet. Therefore, farmers can use BSM in rabbit diet at reduced feeding cost with no adverse effect on the animal's growth and productivity.

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