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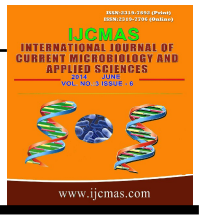

Original Research Article

Evaluation of baobab seed meal as feed for growing rabbits

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Keywords

Carcass characteristics; Feed conversion ratio; Feed intake; Nutrient digestibility; Organ weight

A B S T R A C T

The effects of inclusion of baobab seed meal (BSM) in growing rabbits diet was evaluated in a six weeks study. One hundred mixed breed and sex growing rabbits average 924±4g were divided into four equal groups and assigned to four diets that contained either 0% or 25% or 50% or 75% BSM in a completely randomized design. Data were collected on performance, nutrient digestibility, carcass characteristics and production economy. Data were analyzed by one-way analysis of variance. Results showed that average daily gain of the rabbits that received 5% (17.17g) and 10% (17.15g) were similar to that of the control (17.20g) while those that received 15% had lower ($P<0.05$) value (16.0g). Final weight, live weight, dressed weight and digestibility of dry matter, crude protein, ether extract and nitrogen free extract followed the same trend. Feed conversion was poor at 15% inclusion level. Feed cost decreased with increased BSM in the diets. Production cost was lower in the diets that contained BSM than in the control diet reaching the lowest at 10% inclusion level. Feed intake, organ weights and mortality were not affected. It was concluded that up to 15% BSM can be included in growing rabbit diet for economic reason.

Introduction

The importance of proteins in the diet of man cannot be overemphasized. This is because they play many important roles in the body system of animals including man which include the fact that they serve as the building block in the body structural organs, play vital roles in the maintenance of body structural integrity as well as function as hormones and enzymes (Fallon and Eing,2001). The daily protein requirement of an average adult human being is 65-75g out of which 35g should be derived from animal protein. Unfortunately however, the estimated per capita animal protein consumption of an average Nigerian is 20g (FAO, 1997) which indicates a shortfall of 25g.

Rabbit production is one of the attractive options for rapid animal protein production due to its advantages over other species of livestock. These include prolificacy, short generation interval, low feed consumption compared to cattle sheep and goat, its small

maintenance cost and its ability to utilize appreciable quantity of forage compared to other non ruminant animals. Although rabbits are able to subsist on forage, the improved breeds of rabbits that are used nowadays require concentrate diet to be able to attain their full potential.

Feed is the largest single cost item for livestock and poultry production accounting for 60%-80% of the total cost (Aduku, 1993; Adegbola, 2004; Lawrence *et al.*, 2008). This stems from stiff competition that exists between man and animal for available feed resources and the growing livestock production (Robinson and Singh, 2001). This has greatly reduced profit margin and placed a great limitation on the rate of expansion of livestock industry in most of these industries. One of the pragmatic approaches of solving the problem of high feed cost is the use of readily available but less utilized plants that are available in these countries.

Baobab tree (*Adansonia digitata*) is a drought and fire resistant tree that is found in most part of Africa including the desert (FAO,1988). This tree produce all year round in the savanna and derived savanna area of Nigeria. Though the leaves are used for soup in the drier part of Nigeria, the seeds are not usually consumed and are not subjected to any other use in the forest and derived savanna region of Nigeria. Baobab seed is rich in protein and contains substantial amount of energy (Mwale *et al*,. 2008) while the fruit pulp is rich in vitamin C (Sidibe *et al*,. 1998).

Baobab tree even though contribute significantly to the nutrition of people living in the arid and semi-arid region of Africa, It is of little importance in the derived savanna and forest zone of Nigeria and is greatly underutilized. Inclusion of baobab seed meal in the rabbit diet may therefore be a way of reducing cost of formulating rabbit concentrate feed if accepted. This study was therefore conducted to evaluate the effects of inclusion of varying level of baobab seed meal in the diets of growing rabbits.

Materials and Methods

Experimental site

The study was conducted at the Rabbit Unit of Teaching and Research Farm of Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria. Ogbomoso is situated in derived Savannah Zone of Nigeria and lies on longitude $4^{0}15^{1}$ east of Greenwich meridians and latitude $8^{0}15^{1}$ north of the equator. The altitude is between 300 and 600m above sea level while the mean temperature and annual mean rainfall are 27^{0}C and 1247mm respectively.

Source and processing of test ingredient

Baoba fruits used for the study were collected within the vicinity of the Department of Forestry located within Old Oyo National Park in Oyo State of Nigeria. The seeds were removed from the pods, sorted and dried to attain about 13% moisture content. The dried seeds were then hammer-milled to obtain what was called baobab seed meal (BSM).

Feed preparation

Four experimental diets were formulated. The control diet (diet 1) was formulated to meet the requirements for the growing rabbits. Three other diets (diets 2, 3and 4) were then formulated to contain either 5%, or 10% or 15% baobab seed meal. All the diets were balanced for protein and energy as much as possible.

Experimental animals and management

One hundred (100) weaner rabbits crossbred of Chinchilla and Newzealand white averaged 924±5g were used for the study. The rabbits were divided into four equal group of twenty five rabbits each with each group balanced for weight. The four groups were randomly allotted to either of the four diets in a completely randomized design. Each rabbit was housed separately in a hutch measuring 60×50×45cm and served as a replicate. Feed and water were supplied *ad libitum* using clay pots to avoid feed and water spillage. Prior to the commencement of the experiment, the rabbits were treated for ecto- and endo- parasites using ivomectin injection. They were also allowed to acclimatize for three weeks. Feeds were supplied two times (8-9am and 3-4pm). The study lasted for six weeks.

Data collection

Data collected are feed intake, weight gain and mortality while feed conversion ratio was determined. Feed cost and feed cost per kilogram weight gain were also calculated.

Feed intake: This was determined by subtracting the left-over of the feed supplied the previous day from the quantity given.
Feed consume = Feed supplied - Feed rejected

Weight gain: Each rabbit was weighed at the beginning of the experiment and thereafter weekly using weighing scale. Weight gain was then determined by subtracting weights obtained in two consecutive weeks.

Weight gain = Weight in the current week – weight in the previous week

Feed conversion ratio: This was calculated from the records of feed intake and weight gain by dividing the feed intake of the rabbits by the weight gain
Feed conversion ratio = feed intake/weight gain

Mortality: Records of mortality in each treatment were kept throughout the duration of the study and expressed as the percentage of the total rabbits at the beginning of the experiment.

Feed cost: Feed cost (N/Kg) was calculated from the cost of individual ingredients used in feed preparation. Cost of baobab seed meal was estimated from the costs incurred on transportation, and processing.

Feed cost per kilogram weight gain: This was calculated by multiplying feed cost per kilogram weight gain by feed conversion ratio.

Digestibility trial: Digestibility study was carried out using eight rabbits selected from each treatment. The hutches that housed them were equipped with trays to allow for faecal collection. Feed consumed were measured daily while faeces voided were collected daily for a period of five days using total collection methods. Faeces collected were oven-dried daily at 65^0C for 48 hours. The dried faeces were bulk for each treatment, milled and representative samples used for laboratory analysis.

Carcass evaluation: Eight rabbits that had their weights close to the mean of each treatment were selected for carcass analysis. The rabbits were fasted for 24 hours, weighed and the live weights recorded. They were then stunned, bled, skinned and dressed and carcass weight taken. Internal organs (kidneys, liver, heart, spleen and lung) were carefully excised, clean of the blood and weighed using electronic

weighing balance. Weight of the carcass and the organs were then expressed as a percentage of the live weight.

Laboratory analysis: Samples of feeds, faeces and baobab seed meal were analyzed for proximate composition using the methods of AOAC (1990). Gross energy of baobab seed meal was determined using adiabatic bomb calorimeter.

Statistical analysis: Data analysis was carried out by one-way analysis of variance using SAS (1998) software package and where significance were observed, Duncan's multiple range option of the same software was used to separate the means.

Results and Discussion

The chemical composition of baobab seed meal used in this study is shown in Table 2. The contents of crude protein, crude fibre, ether extract, ash and NFE were 20.4%, 8.4%, 14.8%, 4.5% and 51.9% respectively. The gross energy was 6332Kcal/kg.

The performance and economic implication of feeding baobab seed meal to growing rabbits is shown in Table 3. The final weight and average daily gain (ADG) of the rabbits that received 5% and 10% baobab seed meal were not different ($P>0.05$) from that of the control. However, these parameters were significantly lower ($P<0.05$) in those that were placed on the diet that contained 15% baobab seed meal. Feed intake was not affected by inclusion of baobab seed meal in the diets. Feed conversion by the rabbits that received 5% and 10% baobab seed meal compared favourably with that of the control. However, poor feed conversion was observed in those that were fed diets that contained 15% baobab seed meal as reflected by higher ($P<0.05$) feed conversion ratio observed in this group. No significant effect of diet was observed in the mortality. Feed cost decreased progressively with increased level of baobab seed meal in the diet. Rabbits that received diets that contained baobab seed meal had lower ($P<0.05$) feed cost per kilogram weight gain than the control group. The lowest value was obtained in the group fed 10% baobab seed meal, followed by 15% and 5% in that order. The nutrient digestibility by the growing rabbits fed baobab seed meal is shown in Table 4. The digestibility of dry matter, crude protein, ether extract and nitrogen free extract were similar in the rabbits that received 5%, 10% and control diets. Significant depression was however observed in those that received diets that contained 15% baobab seed meal. No significant effect of diet was observed in the digestibility of crude fibre.

The carcass characteristics and internal organ weight of the rabbits fed baobab seed meal is shown in Table 5. The live weight and dressed weight of the rabbits fed 0% (control), 5% and 10% baobab seed meal were similar but the values observed for those that were fed 15% were lower ($P<0.05$) than others. No significant effect ($P>0.05$) of diets was observed in the carcass yield, kidneys, liver, heart, spleen and lung weights.

The crude protein content of the baobab seed meal used in this study was higher than the value of 16.6% reported by Ezeagu (2005) and the value of 18.4% reported by Anene et al., 2012. The content of crude fibre was however higher than the values reported by these authors.

The fact that rabbits that received 5% and 10% baobab seed meal were similar with respect to their final weight and average daily gain indicates that they can tolerate up to 10% baobab seed meal without any adverse effect on growth. However, the

weight depression that was observed at 15% inclusion level may indicate their inability to tolerate up to this inclusion level. Mwale *et al* (2008) also reported growth repression in guinea fowl keets fed 5% and 10% baobabseed meal while Chimvuramahwe *et al* (2011) reported poor performance in broilers chicken fed baobab seed meal compared to those fed control diet.

The depression could be due to anti-nutritional factors such as oxalate, phytate, saponins and tannins that have been reported to be present in baobab seed meal (Nkafamiya et al, 2007) even though at non toxic level to most livestock animals. The poor feed conversion that was observed at the same level could also be due to the reason of anti-nutritional factors earlier mentioned.

In this study feed intake was not significantly affected by inclusion of baobab seed meal in the diets. This points to the fact that the palatability of the feed was not affected by inclusion of baobab seed meal in the diets. The results obtained in this study however contradict that of Mwale *et al*, (2008) who reported an increase in the feed intake of guinea fowl keets fed graded level of baobab seed meal. This difference could be due to the fact that digestion and digestive system of the rabbits differ from that of the bird in that the former have large caecum and practice caecotrophy which is not the case in the latter.

The reduction that was observed in feed cost can be attributed to low cost and ready availability of baobab seed meal.

Table.1 Gross composition of experimental diets

	Level of baobab seed meal in the diet (%)			
Parameter	0 (diet 1)	5% (diet 2)	10% (diet 3)	15% (diet 3)
Corn bran	28.00	26.00	26.00	25.00
Wheat offal	28.8	26.00	26.00	25.00
Palm kernel cake	21.00	21.8	19.8	18.8
Soy bean meal	3.0	2.20	2.0	1.00
Blood meal	2.0	2.00	1.0	1.00
Rice bran	14.0	13.8	12.0	11.0
Common salt	0.2	0.2	0.2	0.2
Oyster shell	3.0	3.0	3.0	3.00
Baobab seed meal	0.00	5.00	10.00	15.0
Total	100	100	100	100
Crude protein (%)	16.16	16.19	15.65	15.51
Crude fibre (%)	10.2	10.72	11.13	11.51
[1]Metabolizable energy	2161.75	2156.1	2146.1	2116

[1] Calculated value

Table.2 Chemical composition of baobab seed meal

Component	Percentage
Dry matter	90.20
Crude protein	20.4
Crude fibre	10.4
Ether extract	14.8
Ash	4.5
NFE	49.9
[1]Gross energy	6332

NFE=Nitrogen free extract; [1]Kilocal/Kg

Table.3 Performance and economy of feeding baobab seed meal to growing rabbits

Parameter	Level of baobab seed meal (%)				
	0 (diet 1)	5 (diet 2)	10 (diet 3)	15 (diet 4)	SEM
Initial wt (g)	920	925	927	923	-
Final wt(g)	1883[a]	1886[a]	1887[a]	1819[b]	30
A D G (g)	17.20[a]	17.17[a]	17.15[a]	16.00[b]	0.4
Feed intake (g)	95.3	98.2	96.8	97.6	10
FCR	5.5[b]	5.7[b]	5.6[b]	6.1[a]	0.4
Mortality (%)	5.0	5.0	5.0	5.0	0.7
Feed cost (N/Kg)	85.3[a]	82.1[b]	81.1[c]	76.0[d]	0.5
Cost/kg wt gain (N)	469[a]	467[b]	454[d]	463[c]	1.0

abcd: Means bearing different superscripts along the same row are significantly different ($P<0.05$); N = Nigerian Naira; ADG= average daily gain; FCR= Feed conversion ratio; Wt = Weight.

Table.5 Carcass characteristics and internal organ weight of rabbits fed baobab seed meal

Parameter	Level of baobab seed meal (%)				
	0 (diet1)	5 (diet2)	10 (diet3)	15 (diet4)	SEM
Live wt (Kg)	1.87[a]	1.86[a]	1.84[a]	1.74[b]	0.07
Dressed weight (Kg)	0.91[a]	0.92[a]	0.91[a]	0.88[b]	0.02
Carcass yield (% live wt)	48.43	48.66	49.27	50.39	2.2
Kidneys (% live wt)	0.42	0.43	0.41	0.44	0.06
Liver (% live wt)	2.96	2.98	2.90	2.94	0.12
Heart (% live wt)	0.32	0.31	0.31	0.34	0.06
Spleen (% live wt)	0.07	0.06	0.05	0.08	0.1
Lung (% live wt)	0.72	0.66	0.54	0.58	0.1

ab: Means bearing different superscripts along the same row are significantly different ($P<0.05$); Wt=weight

This effect was greatly manifested in the lower production cost which makes the use of baobab seed meal attractive in rabbit production with 10% baobab seed meal inclusion giving the least cost on rabbit meat production. The low values observed in the live weight and dressed weight of the rabbits that received 15% inclusion level of baobab seed meal can be attributed to the poor growth (Uchegbu *et al.,* 2004) which can be traced to poor feed utilization observed in the rabbits fed the same diet. The study revealed that up to 10% baobab seed meal can be included in the diet of grower rabbits without adverse effect on growth and with low production cost. Inclusion of 15% baobab seed meal in growing rabbit's diet though depressed growth, also reduced cost of producing rabbit meat.

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