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Growth Response and Serum Biochemistry of Growing Rabbits Fed Graded Levels of Baobab (*Adansonia digitata* L.) Seed Kernel Meal

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Target Audience: Animal nutritionists, Researchers, Feed millers.

Abstract

The study was conducted for fifty-six (56) days to investigate the effects of feeding baobab seed kernel meal on growth and serum biochemical indices of grower rabbits. Five isonitrogenous, isocaloric and isofibrous rabbit grower diets were formulated to contain 0, 2.5, 5.0, 7.5 and 10.0% baobab seed kernel meal. Twenty (20) cross bred grower rabbits with mean initial live weight of 916±233.04 grams were randomly distributed to five treatments, each replicated four times in a completely randomized design. Final weight, weight gain, feed intake, feed conversion ratio and protein efficiency ratio were not significantly (P>0.05) different. Serum biochemical indices showed that albumin and alanine aminotransferase values were significantly (P<0.05) elevated by additional inclusion of baobab seed kernel. However, this elevation was not out of normal range reported for healthy rabbits. Creatinine was significantly (P<0.05) reduced at up to 5.0% baobab seed kernel inclusion level, but elevated at higher levels of inclusion. Serum biochemistry values for the experimental groups were within normal range, implying healthy nutrition. Baobab seed kernel meal can be fed to grower rabbits up to 10.0% of the diet without deleterious effect on growth and serum biochemistry.

Key Words: Grower rabbits, baobab seed kernel, growth, serum biochemistry

Description of the Problem

Irrespective of numerous national and international interventions, hunger and malnutrition still remain significant problems in Nigeria. Livestock is one of the greatest assets to overcome the challenges of food and nutritional insecurity. The use of micro livestock has been proposed to mitigate the widespread shortage of meat as a result of their very promising potentials (1). Rabbit meat offers excellent nutritive and dietetic properties; high protein, high essential amino-acids levels, low fat, low cholesterol, low sodium, low amount unsaturated fatty acids and low bone to meat ratio (2). Despite these qualities, however, the rising cost of feed attributed to the competitive demand for the main ingredients supplying energy and protein by man and livestock has been a major challenge, with the tendency to impair efforts aimed at food and nutrition security. This necessitates the search for alternative feedstuffs that are nutritionally and economically competitive.

The baobab seed, from the baobab plant species *Adansonia digitata*, is a potential alternative animal feedstuff with large quantities of the seeds available in Nigeria (3).

It contains relatively high amounts of protein (with high levels of lysine and thiamine), crude fat, and crude fiber, minerals (calcium and iron) but low levels of carbohydrates (4; 5; 6; 7). The protein is highly soluble in alkaline pH (8.0) (4). The findings of (8) revealed that baobab seed has high digestibility, biological value and net protein utilization among unconventional tropical seed crop, attributing this to low level of trypsin inhibitor in the seeds, which had been reported to be even lower than in soybean or groundnut (4). It is high in minerals. The leaves, pulp, seeds and bark of the plant have nutritional and medicinal potentials. The seeds are eaten raw or roasted by man and are used to thicken soups.

Feeding trials using broiler chickens by (9) showed that feed intake and body weight gain were significantly ($P<0.05$) reduced with the inclusion and subsequent addition of baobab seed in their diets. On the contrary, the findings of (10) revealed that feed intake and body weight were significantly ($P<0.05$) higher with inclusion of baobab seeds at up to 10% inclusion of raw baobab seed in starter broiler diets.

Blood serum biochemical parameters provide valuable information on nutrient utilization by animals and are often helpful in revealing health disorders (11). This is corroborated by (12) who reported that under abnormal body conditions, variation in the concentration of blood serum biochemical constituents is positively correlated with diet quality. According to (13), serum protein profile and the absolute values of individual fractions are an excellent basis for a tentative health diagnosis.

The study investigated the effect of feeding graded levels of baobab seed kernel on growth performance and blood serum biochemical parameters of growing rabbits.

Materials and Methods

Experimental site

The study was conducted at the Livestock Farm Complex, Plateau State College of Agriculture, Garkawa, located on latitude 8° 58'and longitude 9° 45', and at 240m above sea level determined using Global Positioning System (GPS).

Preparation of test ingredients

Baobab seeds were purchased from Amper market in Kanke Local Government Area of Plateau state. The seeds were winnowed to remove sand and pulp debris. The clean seeds were crushed in a Burr mill and then sieved through 4 x 3mm mesh and included in the experimental diets.

Experimental diets

Five diets containing 17%, 2150kcal/kg and 13% crude protein, metabolizable energy and crude fiber respectively, were formulated to meet the requirements for growing rabbits according to recommendations by (14). The control ($T_{0.0}$) did not contain baobab seed kernel meal, while diets $T_{2.5}$, $T_{5.0}$, $T_{7.5}$ and $T_{10.0}$ contained baobab seed kernel meal at 2.5%, 5.0%, 7.5% and 10.0% respectively (Table 1).

Experimental Design

Twenty (20) rabbits were used for the study. Table of Random Numbers generated by Microsoft Excel was used to randomly assign the rabbits to five treatments with four replications each in a completely randomized design; each animal formed a replicate.

Experimental Animals and Management

Twenty (20) healthy cross bred (Chinchilla x New Zealand White x Angora) grower rabbits with mean initial weight of 916±233.04grams were used for the study. Rabbits were housed in two two-tier hutches having 12 cages each, with a rabbit to a cage measuring 0.5m x 0.8m, and kept in an open-sided house roofed with zinc coated iron

Table 1: Gross composition of experimental diets

	Dietary treatments				
Ingredients	$T_{0.0}$	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	$T_{10.0}$
Yellow maize	3.33	2.98	2.51	1.92	1.18
Soybean meal	17.58	18.06	18.64	19.31	20.07
Groundnut cake	7.11	6.90	6.48	5.84	5.00
Baobab seed kernel meal [2]	0.00	2.50	5.00	7.50	10.00
Palm kernel cake	32.34	26.72	21.47	16.62	12.17
Wheat offal	25.45	27.71	29.95	32.16	34.35
Rice offal	11.69	12.63	13.45	14.15	14.73
Bone meal	2.00	2.00	2.00	2.00	2.00
Iodized salt	0.25	0.25	0.25	0.25	0.25
Vitamin-mineral premix [1]	0.25	0.25	0.25	0.25	0.25
TOTAL	100.00	100.00	100.00	100.00	100.00
Calculated composition:					
Crude protein (%)	17.00	17.00	17.00	17.00	17.00
Metabolizable energy (kcal kg^{-1})	2150	2150	2150	2150	2150
Crude fiber (%)	13.00	13.00	13.00	13.00	13.00
Calcium (%)	0.86	0.87	0.88	0.88	0.89
Phosphorus (%)	0.55	0.56	0.56	0.58	0.58

[1] Aero-Mix® Grower contains per kg diet: Vitamin A 70,000iu, Vitamin D_3 17,000iu, Vitamin E 50iu, Vitamin K 10mg, Vitamin B_2 30mg, Vitamin C 10mg, Niacin 100mg, Panthotenic acid 30mg, Vitamin B_6 30mg, Vitamin B_{12} 0.1mg, Folic acid 5mg, Biotin 4mg, Choline chloride 1300mg, Cobalt 1.0mg, Copper 10mg, Iodine 100mg, Iron 150mg, Manganese 700mg, Selenium 1.0mg, Zinc 200mg, Antioxidant 125mg.
[2] Metabolizable energy, (ME) (kcal/kg) = 37 X %CP + 81 X %EE + 35.5 X %NFE (15).

sheets. Broad spectrum antibiotic (Octracycline™) followed by multivitamins were given in the first 5 days of the experiment, and were fed all marsh diets and given water *ad libitum* for 56 days.

Experimental Procedures and Data Collection

Quantified feed was fed each morning and the balance weighed after 24 hours to determine the intake by the rabbits. Live weights of the rabbits were measured weekly. Feed conversion ratio and protein efficiency ratio were calculated. At the end of the experiment, 2.0ml of blood was collected from each rabbit into separate bijou bottles for analysis of serum biochemistry parameters. Total serum protein, serum albumin, aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, creatinine and urea were determined according to methods described by (16). Serum globulin was calculated by difference.

Statistical Methods

Data collected were analyzed for variance (one-way ANOVA) (17). Significant means were separated using Tukey HSD test (17).

Results and Discussion

Growth performance

Table 2 shows the growth performance of grower rabbits fed baobab seed kernel meal. Final live weight, weight gain, feed intake, feed conversion ratio and protein efficiency ratio were not significantly ($P>0.05$)

influenced among treatments. There was no mortality during the experimental period. (9) and (18) also reported similar findings with broiler chickens. This implies that including up to 10% baobab seed kernel meal in diets of growing rabbits was not detrimental to feed utilization and weight gain. Feed conversion ratio (FCR) obtained is higher than global FCR of around 3.0 for efficient commercial intensive farms (19).

Table 2: Growth performance of grower rabbits fed baobab seed kernel meal

	Dietary treatments						
Parameters	$T_{0.0}$	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	$T_{10.0}$	SEM	*P*
Final live weight (g)	1835.00	1640.50	1572.50	1682.50	1672.00	111.34	0.251^{NS}
Initial live weight (g)	912.50	9I2.50	915.00	920.00	920.00	52.11	0.058^{NS}
Weight gain (g/day)	15.98	12.95	11.92	13.84	11.52	2.69	0.502^{NS}
Feed intake (g/day)	61.91	58.09	58.90	56.11	57.50	3.66	0.607^{NS}
Feed conversion ratio	3.91	4.86	5.24	4.48	5.93	1.41	0.678^{NS}
Protein efficiency ratio	5.88	5.88	5.88	5.88	5.88	0.00	-

NS= means are not significantly (P<0.05) different; SEM = Standard error of means; *P* = Probability value

Serum biochemistry

Result of serum biochemical indices is shown in Table 3. Total protein, albumin, aspartate aminotransferase (AST), alkaline phosphatase (ALP) and urea were not significantly (P>0.05) affected by including up to 10% baobab seed kernel meal in grower rabbits' diets. Globulin was significantly (P<0.05) higher at 2.5%, 5.0%, 7.5% and 10.0% levels of baobab seed kernel meal (BSKM) inclusion. Except with the control, globulin values in the experimental treatments were within normal range reported by (20). This indicates a potential tendency to increased utilization of protein particularly for improved immunity as the level of baobab seed kernel meal increased in the diets. Alanine aminotransferase (ALT) activity was significantly (P<0.05) increased with higher inclusion of BSKM up to 10% level. Except for rabbits fed the control diet ($T_{0.0}$), ALT activity for other treatments were within normal range of 25 - 65 IU/l for rabbits as reported by (21) and (20). This implies that including baobab seed kernel meal did not impair liver function of growing rabbits. An important indicator of protein activity (22), and inversely related to glomerular filtration rate. Serum creatinine values were significantly (P<0.05) depressed in rabbits fed diets with 2.5% and 5.0% baobab

Table 3: Serum biochemical indices of grower rabbits fed baobab seed kernel meal

	Dietary treatments						
Parameters	$T_{0.0}$	$T_{2.5}$	$T_{5.0}$	$T_{7.5}$	$T_{10.0}$	SEM	*P*
Total protein (g/l)	49.63	49.26	50.07	50.34	53.27	1.67	0.177^{NS}
Albumin (g/l)	28.93	24.40	21.59	22.87	22.45	3.41	0.262^{NS}
Globulin (g/l)	18.20^{b}	27.36^{ab}	28.49^{a}	27.48^{ab}	31.07^{a}	3.06	0.008^{*}
AST (U/L)	12.48	11.48	7.00	11.06	11.96	3.17	0.463^{NS}
ALT (U/L)	21.06^{b}	26.06^{ab}	24.51^{b}	23.55^{b}	32.18^{a}	2.09	0.001^{*}
ALP (iu/l)	109.80	77.56	86.93	96.44	67.45	18.64	0.238^{NS}
Urea (mmol/l)	11.98	10.75	11.13	10.08	13.16	1.03	0.073^{NS}
Creatinine (µmol/l)	140.64^{a}	105.40^{c}	123.69^{b}	138.78^{a}	135.60^{ab}	4.85	0.000*

a, b, c, means within the same row bearing different superscript differ significantly (P<0.05); SEM=Standard Error of Means; *P* = Probability value; AST=Aspartate aminotransferase, ALP=Alkaline phosphatase, ALT=Alanine aminotransferase.

seed kernel. However, creatinine values for all groups were within normal range (12.38 – 146.75µmol/l) for physiologically healthy rabbits (23). It therefore, implies that there was neither muscle wastage nor impaired renal function.

Conclusion and Application

From the result of this study, it can be concluded that:

1. Inclusion of up to 10% baobab seed kernel meal in diets of grower rabbits did not impair growth and nutrient utilization of growing rabbits.
2. Baobab seed inclusion in diets of rabbits improved their health status.
3. Baobab seed kernel may be fed to grower rabbits at up to 10% of their diets.

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