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**IMPROVED TECHNOLOGY: A KEY STRATEGY FOR
ENHANCED LIVESTOCK PRODUCTIVITY
AND NATIONAL ECONOMIC DEVELOPMENT**

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Growth performance and nutrient digestibility of broiler chicken fed diets containing varying levels of decorticated baobab (*Adansonia Digitata*) seed meal at the starter phase

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Abstract

A total of 117 day-old broiler chicks were used to assess the growth performance and nutrient digestibility of broiler chicken fed diets containing varying levels of decorticated *Adansonia digitata* (Baobab) seed meal. The treatments were (0 % dietary inclusion level (control), 9 % dietary inclusion level and 18 % dietary inclusion level tagged as T₁, T₂, and T₃ respectively. The experimental design was a completely randomized design model. Each treatment was replicated three times with thirteen birds per replicate. Feed and water were supplied *ad libitum*. The experiment lasted for four weeks. A nutrient digestibility trial was carried out at the end of the third week of the experiment. Results showed that there were no significant ($P > 0.05$) differences in initial body weight, final body weight and total body weight gain among the birds fed the three dietary treatments but the mortality differed significantly ($P < 0.05$). The digestibility of the crude fibre content of the diets, ether extract and nitrogen free extract as well as the total digestible nutrient differed significantly ($p < 0.05$) across the treatments. It can be concluded that the inclusion of decorticated Baobab seed meal at 9 % and 18 % in broiler starter diets as a protein source is detrimental to the growth performance and nutrient digestibility of the birds. Better processing methods should be employed to reduce the anti-nutritional factors present in the seed meal.

Keywords: Broiler chicken, decorticated Baobab seed meal, growth performance.

Description of Problem

Feed is one of the most important inputs in all livestock production systems (1). Recently, there has been an increased competition for feed ingredients that are used in manufacturing animal feed since some of these ingredients are also used as human food (2). The population of the world is expected to increase by about 29 % from the current 7 billion to 9 billion in 2050 (3). Hence, there is great need to look for alternatives that can compensate for the high demands for conventional feed ingredients. Feed constitutes about 70 % of the entire production cost in poultry; and up to 95 % of the feed are used to meet the protein and energy requirements (2, 4). Voluntary intake, feed digestibility and animal performance can be improved by using alternative low quality multipurpose trees. Seed and leaf meals function as protein sources and aid in providing some essential vitamins, minerals, oxycarotenoids as well as bioactive compounds that function at cellular level (5). African baobab seeds have been shown to be a superb source of protein, with most of the essential and non-essential amino acids (6). The Baobab seed cake is a potential low-cost and locally available protein source for livestock feeding (7). However, the use of Baobab seed cake for poultry feeding is limited by its high fibre content, or the presence of toxic factors or metabolic inhibitors. Therefore, the objectives of this research is to determine the growth performance of broiler chicken fed diets containing different levels of decorticated Baobab (*Adansonia digitata*) seed meal at the starter phase.

Materials and Methods

Experimental Site

This research was carried out at the Department of Animal Production Teaching and Research Farm of the Federal University of Technology, Minna, Niger State. Minna, which lies between latitude 9° 28' N and 9° 37' N and longitude 6° 23' E and 6° 33' E, and has a temperature range of 38° to 42° C, with lowest temperature in August and highest in March. It has a mean annual rainfall range of between 1000 mm – 1500 mm. Minna is within Southern Guinea Savannah Ecological Zone (8).

Experimental Feed Preparation and Formulation

Baobab (*Adansonia digitata*) fruits (kuka) was obtained from Gwari market in Minna, Niger State and crushed with a hammer to obtain the seeds. Processing of the Baobab seeds was carried out in accordance with the procedure of (9). The Baobab seed meal were used to formulate complete diets with 0, 9, and 18 % dietary inclusion levels designated as treatments T₁, T₂, and T₃ respectively. The gross compositions of the experimental diets are shown in Table 1.

Experimental Birds and their Management

A total of one hundred and seventeen (117) day-old broiler chicks were bought from CHI farms along Lagos-Ibadan express way, Ibadan, Oyo State. They were randomly allotted to the three treatments, with each treatment containing 39 birds with three replicate. Each replicate contained 13 birds. The birds were fed with the experimental diets; fresh and clean water was provided *ad-libitum*. The housing system was intensive (deep litter) with concrete floor,

covered with wood shavings, equipped with adequate feeders and drinkers. A week prior to the arrival of the birds, the pens were cleaned and washed with water and detergents, and then disinfected with formaldehyde solution to get rid of harmful organisms. Appropriate drugs and vaccines were

administered when due. Artificial lighting was provided for 24 hours throughout the brooding period with the use of rechargeable lamps. Heat was provided with the aid of charcoal and kerosene stoves. Regulation of temperature was done by observing the behavior of the chicks.

Table 1: Gross compositions of experimental diets containing varying levels of decorticated *Adansonia digitata* seed meal

Ingredients (%)	Treatment (%)		
	T ₁	T ₂	T ₃
<i>Adansonia digitata</i> seed meal	0.00	9.00	18.00
Maize	44.50	53.00	51.20
Maize offal	11.00	4.00	2.00
Groundnut cake	25.00	17.0	10.00
Full fat soya	10.00	7.50	8.30
Fish meal	3.00	3.00	3.00
Limestone	1.00	1.00	1.00
Bone meal	2.00	2.00	2.00
Palm oil	2.00	2.00	3.00
Lysine	0.25	0.25	0.25
Methionine	0.25	0.25	0.25
Salt	0.50	0.50	0.50
Premix	0.50	0.50	0.50
Total	100.00	100.00	100.00
Calculate Analysis			
Crude protein (%)	22.14	22.00	22.00
Metabolizable energy (kcal/kg)	2989	2938	2768
Crude fibre (%)	3.83	3.09	2.84
Ether extract (%)	6.20	5.84	5.64

Table 2: Growth performance of broiler chicken fed diets containing varying levels of decorticated *Adansonia digitata* seed meal at the starter phase

Parameters	T ₁	T ₂	T ₃	P-value	SEM	LOS
Initial body weight	57.92	57.36	57.84	0.36	0.16	NS
Final body weight	202.44	199.02	184.52	0.74	8.80	NS
Total body weight gain	144.52	141.66	126.68	0.73	8.83	NS
Total feed intake	630.92	474.36	524.89	0.97	31.38	NS
Feed conversion ratio	4.43	3.60	4.15	0.58	0.30	NS
Mortality	0.00 ^a	23.07 ^{ab}	82.05 ^b	0.00	12.70	*

^{abcd}Means in the same row with different superscripts were significantly different (P<0.05)

Data Collection

(i) Growth performance

The feeding was designed to last for a period of four weeks during which daily records of feed intake and live weight changes were taken. The birds were weighed before the experiment began. Daily record of feed intake was obtained by subtracting the left over feed from the amount offered every day throughout the period of the experiment. Record of body weight gain was obtained from subtracting the initial weight from the new weight of the animal after every week

(ii) Digestibility trial

The last seven days of this research study was used for digestibility trial. Two birds were randomly

picked from each replicate to determine the nutrient digestibility. Total collection method was used. The birds were managed using specially designed metabolism cages. The first three days were adjustment period. A known measure of feed was fed to the animals per day; the rejected feed was also measured. Faecal sample were collected for four days. These were oven-dried for 24 hours at temperature of 80°C. The oven-dried samples were pooled per replicate at the end of the week and representative samples were taken for proximate analysis. Digestibility coefficient of the nutrients was calculated as follows;

$$\text{Digestibility Coefficient} = \frac{\text{Nutrient intake in feed} - \text{Nutrient voided in droppings}}{\text{Nutrient intake in feed}} \times 100$$

Proximate Analysis

Representative samples of the experimental diets and the collected faecal samples during the digestibility trial were analyzed for their proximate components as outlined by (10).

Statistical Analysis

The data collected was subjected to Analysis of Variance (ANOVA) using SPSS statistical package (Version 23) based on the completely randomized design model. Where significant differences existed, they were separated using Duncan's multiple ranges as contained in the Package.

Table 3: Nutrient digestibility of broiler chicken fed diets containing varying levels of decorticated *Adansonia digitata* seed meal at the starter phase

Parameters	T ₁	T ₂	T ₃	P-value	SEM	LOS
Dry matter (%)	92.16	84.55	88.09	0.16	1.63	NS
Crude protein	90.01 ^a	83.27 ^{ab}	80.42	0.08	1.88	NS
Crude fibre	81.45 ^a	68.36 ^{ab}	59.24 ^b	0.04	4.01	*
Ether extract	96.02 ^a	90.75 ^b	90.12 ^b	0.04	1.15	*
Ash (%)	73.77	68.08	67.00	0.60	2.65	NS
NFE (%)	95.60	89.78	87.92	0.03	1.38	*
TDN (%)	94.54	84.66	81.70	0.01	2.15	*

^{abc}Means in the same row with different superscript were significantly different (P<0.05)

SEM = standard error of means P-Value = probability value
 Diet (T₁) = 0% inclusion level of decorticated baobab seed meal
 Diet (T₂) = 9% inclusion level of decorticated baobab seed meal
 Diet (T₃) = 18% inclusion level of decorticated baobab seed meal
 NFE = nitrogen free extract TDN = Total digestible nutrient

Proximate composition of decorticated *Adansonia digitata* seed meal
 DM: 91.68%, CP: 36.75%, CF: 15.60% EE: 18.30% ASH: 12.32% NFE: 8.71% Calculated ME (kcal/kg): 3147

Results and Discussion

The result of the effect of feeding diets containing varying levels of decorticated Baobab seed meal (DBSM) diets on the growth performance of broiler chicken fed for 28 days is presented in Table 2. The result shows that decorticated baobab seed meal diet had no significant effect (P<0.05) on initial body weight, final body weight, total body weight gain, total feed intake and feed conversion ratio. Mortality was significantly higher (P < 0.05) in birds fed diets containing decorticated baobab seed meal than those fed the control diet. The results of this research study are in line with the findings of (7, 11, 12, 13) who reported that inclusion levels of Baobab seed meal that are beyond 10% in a monogastric animal diet can result in a decline in feed intake and conversion ratio of feed. It is because the seed has an appreciable amount of fibre and some anti-nutritional factors that are detrimental to proper feed utilization by poultry. Therefore, inclusion rates higher than 10% causes a cumulative increase in fibre and anti-nutritional factor levels that cause detrimental effects on poultry performance and even increase mortality rates (2, 12). Baobab seeds contain some anti-nutritional factors, such as phytate (2%), oxalate (10%), tannins and saponins (3-7 %) which reduce digestive efficiency and utilization of dietary

nutrients in poultry (13). The high mortality rate in this study can be attributed to the processing method adopted for Baobab seeds which seemed inadequate to reduce the levels of these anti-nutritional factors to tolerable levels for broiler chicken.

Table 3 shows the nutrient digestibility of broiler chicken fed diets containing varying levels of decorticated baobab seed meal (DBSM) at the starter phase. The result showed that DBSM diets had significant (P < 0.05) effect on crude fibre, ether extract and nitrogen free extract digestibility and on total digestible nutrient (TDN). Dry matter, crude protein and ash digestibility showed no significant (P > 0.05) difference across the treatment groups. The crude fibre digestibility decreased as the level of DBSM in the diet increased. This is most probably due to the high crude fibre content of DBSM (15.60 %), which increased as the concentration of DBSM in the diet increased (Table 4), which resulted in lower crude fibre digestibility.

Conclusion and Application

From the findings in this study, it can be concluded that the inclusion of decorticated Baobab seed meal at 9% and 18 % in broiler starter diets as a protein source is detrimental to the growth performance and nutrient digestibility of the birds;

hence, its inclusion at whatever level is discouraged. Better processing methods should be employed to reduce the anti-nutritional factors present in the seed meal.

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