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Effects of Baobab *(Andasonia digitata)* Seed Meal on Growth and Morphometric Traits in Broiler Chickens

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ABSTRACT: The effects of graded levels of Decorticated Undefatted Roasted Baobab Seed Meal (DURBSM) on the growth and morphometric traits in Arbor Acre broilers were investigated from week 4 to 7. One hundred and twenty broiler chicks were allotted randomly to four treatment groups of DURBSM (0%, 2.5%, 5% and 7.5%) to 30 birds each, with 3 replicates per treatment in a completely randomized design. Parameters measured include Body weight (BW), Body Length (BL) and Girth (BG), Length and Diameter of Shank (SL) and (SD), Lengths of Thigh (TL), Wing (WL) and Keel (KL). Other body parts which are indication of overall growth were also significantly ($P<0.05$) affected by DURBSM at 7 weeks of age. Thus, the results of these findings indicate that the inclusion of DURBSM in broiler feed at 7.5% could increase the rate of development in morphometric traits that are indication of overall growth traits and development in broilers chicken.

Keywords: Broiler, DURBSM, Body weight, Morphometric Trait.

Introduction

Broiler chicken provide much of the proteins in human diets in Nigeria, they have ability to reach market weight (≥2kg) within a short period of time (6-8 weeks) when raised intensively and fed with standard feed (1). One of the main constrain to broiler production in the tropics is high cost of feeding as a results of competition between man and animal for conventional feed stuff (2). Unavailability and high cost of conventional feed ingredients have led animal nutritionists to investigate the nutritional potential of non-conventional ingredients for compounding animal ration (3). (1) stated that feed account for over 70% cost of production as the prices of conventional ingredients use in production of broiler diets sometimes increase by 150% especially during the scarcity period. Thus, high cost of feeding has led various researchers in the field of animal production to exploring alternatives in form of non-conventional feed ingredients because researches into low-cost and locally available feed ingredients that do not attracts competition with human in terms of consumption are necessary for leveraging the ever increasing shortage of conventional feed ingredients.

The use of multipurpose trees and their byproducts was suggested by (4), and *Andasonia digitata* (Baoabab) tree is one (5). The usage of Baobab seed and its products need to be explored for use in livestock diets. Considerable benefits can arise from the usage of Decorticated Undefatted Roasted Baobab seed meal in feeding broiler, It has been reported that Baobab seed contains 37.63% Crude protein, 22.50 Ether Extract, 3.50% Calcium, 46.11% Magnesium and 45.38 potassium (6). Though some anti nutritional factors such as oxalate, phytate, saponins and tannin were reported to be presents in Baobab seed (7) their levels can be made less toxic to animals when properly processed before feeding.

Study involving inclusion of non conventional low cost feed ingredients in animals diets should not be based on production performance alone but also on their effects on growth and morphometric traits which are indications of overall weight gain and body weight as broiler chicken are kept mainly for meat production (8). The quest for exploring the impact of non conventional feed stuffs on growth and morphometric traits in broiler chicken led to this investigation on the usage of Decorticated un defatted Roasted Baobab (*Adansonia digitata*) seed meal in broiler diet. The effects of feeding such non conventional feed ingredients on growth and morphometric traits which are indication of overall weight gain in broiler are pertinent to the successful usage and recommendation of these unconventional feed ingredients to farmers.

Materials and Method

Experimental Site

The experiment was carried out in the Animal Pavilion of the Animal Production Department, Faculty of Agriculture, and University of Ilorin.

Sources and Processing of Baobab Seed

Baobab pods were harvested from Baobab trees within University of Ilorin and its environs. The pods were broken to obtain the seeds with the use of hammer. Collected seeds were soaked in water for 72 hours, water was decanted from the seeds and the seeds were sundried for three days so as to reduce the levels of some anti-nutritional agents in the seed. Sundried seeds were roasted for 30min at 70^0C to soften the seed coat, also to facilitate the removal of the seed coat (decortications). The seed coats were removed with the use of hammer mill which further ground the seed into tiny particles. Fine powder of DURBSM was obtained by removal of the seed coat using 1mm sieve.

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Experimental Birds
A total of one hundred and twenty day old broiler chickens (120) used for the experiment were fed normal standard diets obtained from one of the top leading manufacturer of broiler feed in Nigeria (Top feed) from day old to four weeks of age. At four weeks of age they were randomly assigned to four dietary treatments containing DURBSM at 2.5 5.0 and 7.5% inclusion levels, with the control having no DURBSM such that there were 30 birds per treatment group of three replicate fed the same diet for four weeks. Measurements of bodyweight and linear body parameters were taken on the day of arrival and on weekly basis thereafter to know the effects of adding DURBSM to the normal standard broiler diet.

Body Weight and Linear Measurements
Body Weight (BW): Body weight in gram (g) units was recorded to two decimal places, and this was taken by use of a sensitive weighing scale (Scout II electronic weighing scale 600g capacity).
Body Length (BL): Body length was taken as the nostril to pygostyle distance measured in centimetre (cm) units when a tape measure is stretched from a bird's nasal opening, along its gently stretched neck, and along its back, to the tip of its pygostyle.
Body Girth (BG): Body girth was taken as the distance in centimetre (cm) units covered when a tape measure is looped round the region of the breast, taking care to run the tape under (rather than over) the wing.
Shank Length (SL): The shank length was taken as the distance in centimetres (cm) between the foot pad and the hock joint, measured by use of a set of Venier calipers.
Thigh Length (TL): Thigh length was taken as the distance between the tip of the tarsus and the ball joint, measured in centimetre (cm) units by use of a tape measure.
Wing Length (WL): Wing length was taken as the distance from the humerus-coracoid junction to the distal tip of the phalange digits, and was measured in centimetre (cm) units by use of a tape measure.

Chemical Analysis
The proximate analysis of the experimental diets was carried out using the procedure outlined by the Association of Official Analytical Chemists (9) and the result is presented in Table 1.

Table 1: Proximate Composition of Experimental Diets

Parameters	Levels of DURBSM (%)			
	0	**2.5**	**5.0**	**7.5**
Crude Protein	20.01	20.11	20.23	20.35
Ether Extract	5.10	5.53	6.05	6.58
Crude Fibre	5.00	5.01	5.01	5.02
*ME Kcal/kg	3000	2990	2980	2970

**Calculated Metabolizable Energy*

Statistical Analysis
Least squares means and standard error values for each treatment group were determined by use of Microsoft Excel 2007, and all data were further subjected to Analysis of Variance by use of Genstat Edition 4. Significantly different means ($p<0.05$) were separated by use of the Duncan's multiple Range procedure option (10).

Results and Discussion

Growth Curve of Arbor Acre broiler fed standard broiler diet and graded levels of DURBSM From day old to Seven weeks of age.
The growth curve indicated that the broiler were uniform at the initial stage of life when they were fed the same commercial diet (week 1 to 3) as shown in Figure 1. This shows that the broilers had relatively uniform body weight when they were being fed the same diet and it corresponds with the report of (11) which stated that there is tendency for uniformity of growth in broiler flocks kept under the same feeding and management conditions. There were noticeable differences in body weight from week 4 when DURBSM was added to broiler diet at graded level and this continue to week seven. Birds fed 7.5% inclusion level (×) had higher body weight than others fed lower levels of DURBSM (♦, ■, ▲) Fig. 1. The curve obtained for broiler in this study starting from when they were fed normal standard diet and DURBSM is a normal sigmoid growth curve of bird (1) and this is an indication that inclusion of DURBSM did not have any negative effect on the pattern of body weight development of the broiler bird.
The results of the current study showed that the inclusion of DURBSM in later nutrition (4 - 7 weeks age) disrupts the normal growth rate observed in early stage of the broilers when they were fed normal broiler standard diet. Differences noted in their average body weight with 7.5% inclusion levels having highest body weight as the birds advance in age showed that weight gained in terms of body weight obtained for the Arbor Acre broiler as plotted in Figure 1 is directly proportional to DURBSM inclusion in broiler diet: This contradicts the findings of (12) and that of (6), where inclusion level of Baobab Seed Cake (BSC) and Baobab Seed Meal (BSM) were reported to be inversely proportional to weight gain. However, the former author attributed this to increase fiber in the diet as the Baobab seed cake increase, while the later stated that reduction in feed intake and weight gain as the level of BSM increased in the diet of layers were due to the presence of hard pericarp coat of baobab seed in the feed and suggested the seed coat (hard pericarp) must be removed before incorporation of Baobab seed in chicken diet for better utilization of available nutrient in the seed.

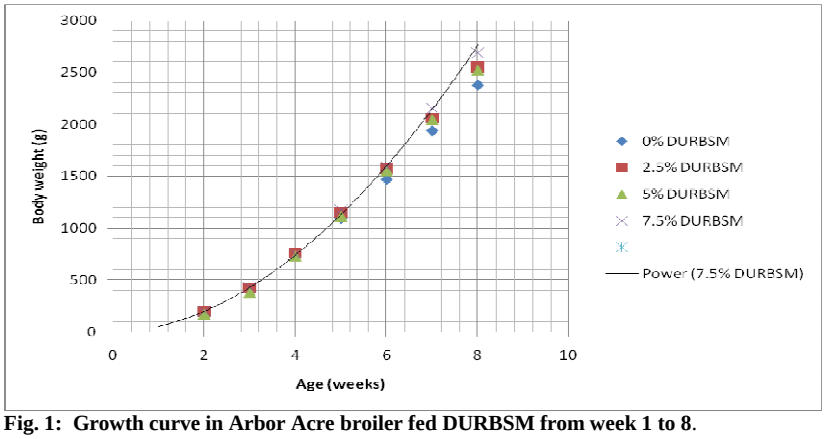

Fig. 1: Growth curve in Arbor Acre broiler fed DURBSM from week 1 to 8.

Morphometric traits of Arbor Acre Broiler fed graded levels of DURBSM at finisher stage

The effects of including DURBSM on morphometric traits in broilers from week 4 to 7 are as shown in Table 2 to 5. It was observed that inclusion levels of DURBSM are directly proportional to body weight, and some morphometric traits. Non Significant (P>0.05) differences were recorded for shank diameter and keel length at week 4, shank diameter, shank length, drumstick length and keel length at week 5, and shank diameter and drumstick length at week 6. Inclusion of graded level of DURBSM significantly (P<0.05) affected the body weight and other morphometric traits at week 7 where all parameters measured were significantly different (P<0.05) with 7.5% DURBSM inclusion level having the highest value (2693g) compared to DURBSM $_{0,2.5 \text{ and } 5}$ (2380g, 2553g, 2523g, respectively) . Broilers that were fed 7.5% DURBSM from 4-7 weeks age performed better than those that were fed 0%, 2.5% and 5% DURBSM inclusion level from 4-7 weeks. These morphometric body traits that are indications of overall growth in animal as stated by (8) were significantly affected by inclusion levels of graded DURSBM, which showed that DURBSM had a significant effect on growth traits of the birds and positively influence the overall weight gain in broiler chicken.

Table 2: Effects of DURBSM inclusion on Morphometric Traits of Broilers at 4 weeks of age

DURBSM Parameters	0	2.5	5	7.5	SE
BW (g)	1094^{a}	1150^{c}	1117^{b}	1177^{c}	45.30
BL (cm)	29.23^{a}	29.63^{ab}	29.27^{a}	30.38^{b}	0.48
WL (cm)	14.84^{a}	16.04^{c}	15.82^{b}	16.37^{c}	0.36
SD (cm)	4.31	4.34	4.23	4.41	0.09
SL (cm)	8.00^{b}	7.95^{b}	7.61^{a}	8.05^{b}	0.09
DL (cm)	11.15^{a}	11.29^{ab}	11.85^{ab}	11.89^{b}	0.33
TL (cm)	8.67^{a}	8.93^{ab}	9.01^{ab}	9.29^{b}	0.26
BG (cm)	24.23^{a}	24.43^{ab}	25.23^{bc}	25.37^{c}	0.40
KL (cm)	9.27	9.35	9.37	9.17	0.15

Means on the same row followed by different superscripts differs significantly (P<0.05)

Table 3: Effects of DURBSM on Morphometric traits of Arbor Acre Broiler Chickens at 5 weeks

DURBSM Parameters	0	2.5	5	7.5	SE
BW (g)	1473^{a}	1577^{b}	1555^{b}	1590^{b}	64.60
BL (cm)	30.43^{ab}	29.97^{b}	30.53^{ab}	31.40^{b}	0.47
WL (cm)	17.90^{ab}	17.57^{a}	18.36^{b}	17.56^{a}	0.24
SD (cm)	4.58	4.72	4.71	4.73	0.11
SL (cm)	9.29	9.26	9.65	9.37	0.18
DL (cm)	12.89	13.11	13.30	13.45	0.29
TL(cm)	10.29^{a}	10.58^{ab}	10.46^{ab}	10.93^{b}	0.27
BG (cm)	26.97^{a}	28.27^{b}	27.97^{b}	28.70^{c}	0.47
KL(cm)	9.90	9.90	10.07	10.29	0.15

Means on the same row followed by different superscripts differs significantly (P<0.05)

Table 4: Effects of DURBSM on Morphometric traits of Arbor Acre Broiler Chickens at 6 weeks

DURBSM Parameters	0	2.5	5	7.5	SE
BW (g)	1094[a]	1150[c]	1117[b]	1177[c]	45.30
BL (cm)	29.23[a]	29.63[ab]	29.27[a]	30.38[b]	0.48
WL (cm)	14.84[a]	16.04[c]	15.82[b]	16.37[c]	0.36
SD (cm)	4.31	4.34	4.23	4.41	0.09
SL (cm)	8.00[b]	7.95[b]	7.61[a]	8.05[b]	0.09
DL (cm)	11.15[a]	11.29[ab]	11.85[ab]	11.89[b]	0.33
TL(cm)	8.67[a]	8.93[ab]	9.01[ab]	9.29[b]	0.26
BG (cm)	24.23[a]	24.43[ab]	25.23[bc]	25.37[c]	0.40
KL(cm)	9.27	9.35	9.37	9.17	0.15

Means on the same row followed by different superscripts differs significantly (P<0.05)

Table 5: Effects of DURBSM on Morphometric traits of Arbor Acre Broiler Chickens at 7 weeks

DURBSM Parameters	0	2.5	5	7.5	SE
BW (g)	2380[a]	2553[ab]	2523[ab]	2693[b]	115.0
BL (cm)	33.00[a]	33.79[a]	35.67[b]	37.46[c]	0.48
WL (cm)	22.29[a]	22.01[c]	23.20[b]	22.46[c]	0.19
SD (cm)	5.60[a]	5.78[ab]	5.91[b]	5.77[ab]	0.09
SL (cm)	13.47[b]	13.31[b]	13.49[b]	11.44[a]	0.09
DL (cm)	17.06[a]	17.24[a]	18.20[b]	17.52[a]	0.24
TL(cm)	14.39[a]	15.19[b]	14.96[b]	15.08[b]	0.26
BG (cm)	31.22[a]	32.43[b]	32.40[b]	35.70[c]	0.45
KL(cm)	11.77[a]	12.13[a]	12.57[b]	12.79[b]	0.20

Means on the same row followed by different superscripts differs significantly (P<0.05)

Conclusion and Recommendation

These results highlight response of broiler chickens growth traits to inclusion of DURBSM in their diet and differential utilization of graded levels of DURBSM by broiler chicken. Increased body weight and directly proportional effect of using DURBSM obtained here could be as a result of further processing of Baobab seed (roasting and removal of seed coat through sieving). From this study it can be concluded that 7.5% Decorticated Un deffated Roasted Baobab Seed Meal (DURBSM) can be added to broiler diet to further enhance their overall body weight.

Further studies should examine the effect of early nutrition by feeding of Broiler chicks from day old with DURBSM. Comprehensive Nutrient analysis of DURBSM is very important for determination and quantification of other macro and micro nutrients in Baobab seed. Long term feeding of DURBSM to chickens from day old up to market weight should be explored to examine the effects of DURBSM on broiler meat quality and production of healthier meat for human consumption.

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