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GROWTH RESPONSE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED DIETS CONTAINING DIFFERENTLY PROCESSED BAOBAB SEED MEAL AT FINISHER PHASE.

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ABSTRACT

A study was conducted to determine the growth response and carcass characteristics of broiler chickens fed diets containing differently processed baobab seed meal at finisher phase. The following processing methods served as the treatments (raw, cooked, toasting, fermentation and sprouted) alongside the control. One hundred and eighty (180) broilers chickens were used for the study. Each treatment was replicated three times in a completely randomized design (CRD) and lasted for 21 days. Data obtained were subjected to statistical analysis of variance (ANOVA) and means separated using Duncan's multiple range tests. Final live weight of the chickens fed control diet (T1) was significantly (P<0.05) higher those fed diets $T_3 – T_5$ but similar to T_2 (raw) and sprouted (T_6). The pattern of feed intake at this phase showed that chickens fed baobab based diets $T_2 – T_5$ were similar and significantly inferior to control diet and T_6 despite the processing methods. The different processing methods did not affect body weight gain, feed conversion ratio and protein efficiency ratio of broiler finisher fed baobab seed meal. The carcass yield and cuts differed significantly (P<0.05) at 10% inclusion of processed baobab seed meal. The study showed sprouted as the best among processing methods.

Keywords: *Growth response, carcass, baobab, processing*

INTRODUCTION

Inadequate nutrition is man's oldest problem and therefore any healthy individual must consume one or more of animal products in the form of eggs, milk or meat. Since it has been established that nutrients from food crops do not meet the human needs (Aduku, 2012), the final goal of the animal nutritionist is to supply man with all the nutrients that keep him in good shape and healthy.

Omole, *et al.*, (2002) described broilers as a domesticated feathered birds reared mainly for meat production. They attain market weight of about 1.5 to 1.80 kg at about 6 - 10 weeks of age. Guluwa *et al.,* (2015) in their studies with baobab seed meal reported 2.9 - 3.1 kg/bird at 7 weeks of age.

Similarly it takes about ten (10) weeks with 4.5kg of feed to produce 1.5kg dressed weight (Obioha, 1992). Sola-Ojo *et al.*, (2013) evaluated the carcass characteristics of broilers fed processed baobab seed meal. They reported significant increase in inclusion level or dressing percentage, breast, back, thigh, wings, and drumstick. Internal organs like the liver, heart, kidney and gizzard were significantly different between treatments. Baobab seed as a substitute for soya-beans full fats in poultry diets produced encouraging economy of egg production at 5% (Sola-Ojo *et al.,* 2011).

Saulawa *et al.,* (2014) and Guluwa *et al.,* (2015) recommended 10% inclusion levels since it had no negative effects on productive performance; Oladunjoye *et al.,* (2014) recommend 15% for growing rabbits.

The quest to source for alternative protein supplement to replace the conventional soya-bean is due to increase in the demand for soya beans and global demand for poultry products such as eggs and meat. The objective of this study was to determine the effect of processing methods of Baobab seed (Adansonia digitata) that promote growth response of broiler chickens at 10% inclusion levels.

MATERIAL AND METHODS

The experiment was carried out at the Poultry unit of the Plateau State College of Agriculture, Garkawa. Garkawa is located on latitude 8^0 58E and longitude $9^0$45N, with an elevation of 240m above sea level determined using global positioning system (GPS) (Guluwa, 2014). It is located within the southern guinea savanna zone of Nigeria characterized by six months of raining season (May to October) and six months of dry season (November to April). The experiment was conducted from October 27th to December 22nd, 2015. Baobab seeds were purchased from Dawaki market in Kanke Local Government Area of Plateau State. The seeds were divided into five equal parts and washed in water to completely remove the whitish pulp attached to the hard coat of the seed. This was drained off in a local basket and processed as described below:

Boiling the seeds was done for 60 minutes and the water was brought to boil at 100 ^{o}C. The seeds were poured into the boiling water and then the water was drained off using a local basket.

Toasting of seeds was done by placing them in a frying pan and turned at short intervals of 20 minutes. The toasting continued until its outer coat turned brownish.

After cooking the seeds as described above, they were kept in a plastic jar and closed for five (5) days devoid of oxygen for fermentation to take place. This was further soaked for three days and covered with a tarpauline in a basket. The seeds were washed daily in water gently until the germination process was initiated. The seeds were only washed to remove the pulp and then sun dried.

All the processed seeds were milled to obtain baobab seed meal(BSM) and coded as follows: cooked baobab seed meal (CBSM), toasted baobab seed meal (TBSM), raw baobab seed meal (RBSM), fermented baobab seed meal (FBSM), sprouted baobab seed meal (SBSM) and incorporated into the experimental diets.

A total of one hundred and eighty (180) broilers chickens purchased from Zartech farm Jos, Plateau, state, Nigeria were used for the study. They were randomly allotted to six dietary treatments of 3 replicates. Each replicate had 10 birds arranged in a completely randomized design for 21 days. The birds were vaccinated against Newcastle disease with NDV intraocular at day old and two weeks respectively and against Gumboro disease with the Gumboro vaccine at 9th and 21st day. To reduce stress and dehydration a multivitamin drug was given after every vaccination and water and feed were given ad libitum.

Six dietary treatments were formulated for the finisher phase. Treatment one (T_1) contained no baobab seed meal. Treatments T_2, T_3, T_4, T_5 and T_6 contained raw, cooked, toasted, and sprouted BSM, respectively. Treatment 2 to 6 replaced soya beans at 10% inclusion levels. The birds were fed iso–nitrogenous diets (20% CP) and Iso-caloric (2666.19 - 2935.56 kcal/kg during the finisher phase and the metabolizable energy was balanced by adding palm oil where necessary. The composition and calculated analysis are presented in Table 1.

Record of weekly live weight and feed intake were taken, while weight gain, feed conversion ratio, protein intake and efficiency ratio were determined and mortality was recorded as occurred. At the end of the feeding trial two birds per replicate having average weight of their replicates were fasted for 16 hours. They were slaughtered and evaluated for dressed weight, dressing percentage and carcass cut. All data obtained were subjected to statistical analysis of variance procedure of SPSS (2010). Significance was determined at P<0.05. Duncan's option of the same package was used to separate the means.

RESULTS AND DISCUSSION

The results of the effect of differently processed baobab seed meal on growth performance of broiler chickens are presented in Table 2. Final live weight of the chickens fed control diet (T_1) was significantly (P<0.05) higher than those fed diets $T_3 – T_5$, but similar to T_2 (raw) and sprouted (T_6). The comparable final live weight of chickens fed T_6 (sprouted BSM) diet with birds fed control diet could be due to the higher feed intake recorded in T_6 which is the key factor in determining the final live weight of chickens since the baobab seed meal was sieved to discard most of the fibre content. The different processing methods did not affect body weight gain of broiler finisher fed baobab seed meal.

The daily feed intake of chickens fed the control (T_1) diet was significantly (P<0.05) higher than those fed raw boiled, toasted and fermented ($T_2 – T_5$) but statistically similar to T_6 (sprouted). The feed intake at this phase showed that chickens fed baobab based diets $T_2 – T_5$ were similar. This suggests that processing by sprouting makes the feed more palatable than other processing methods, even though Chimvuramahwe *et al.,* (2011) earlier reported poor performance in broiler chickens fed baobab seed meal.

The daily protein intake recorded the lowest values in T_2 and T_5 diets. T_1 and T_6 had the same value. Non significance effect of protein efficiency ratio in this study agrees with the work of Guluwa *et al.*, (2015) who recorded that TBSM had no significant (P>0.05) effect on protein efficiency ratio of chickens at 28 days old; this shows that broiler chickens fed TBSM and other diets efficiently utilized protein in the feed, suggesting that the processing methods improve utilization to increase protein intake.

Broiler chickens fed T_2 (raw BSM diet) had the lowest daily water intake amongst the treatments. Fibrous feed increases water intake of chickens and reduces feed intake as the fibrous feed absorbs water and swells in the crop of the birds thereby reducing the space for further feed intake (Abeke and Otu., 2008). The lowest water intake recorded in T_2 (RBSM) could be due to the presence of anti-nutrients since it was not processed. Water to feed ratio observed of T_3 (CBSM), T_4 (TBSM), T5 (FBSM) were statistically similar whileT_2 recorded the lowest water to feed ratio. This suggests that chickens on the T_3, T_4 and T_5 diets consumed high amount of water per gram of diet taken.

The overall water intake for T_1 chickens was comparable to T_3, T_4 and T_6. The birds in T_2 had the lowest value. The reduced water intake recorded in T_5 chickens, despite having the highest value of water to feed ratio is not fully understood and is suggested for further studies.

The feed conversion ratio of chickens fed diet T_1 – T_6 was similar, meaning that there was no significant (P>0.05) depression in the nutrient utilization of chickens fed BSM diets. This could be the reason why weight gain was also similar. This finding agrees with the report of Guluwa *et al.,* (2015) who observed similar feed conversion ratio for chickens fed TBSM diets and chickens fed soya beans based diets. This is in contrast to the earlier report of Sola-Ojo *et al,.* (2013) who recorded significance difference in the feed conversion ratio of chickens fed differently processed baobab seeds to replace soya bean in broiler chickens diets.

No significant (P>0.05) difference exists in the body weight gain across all treatment. This finding differs from the report of Bale *et al.,*(2013) who observed that significant difference (P<0.05) exist in weight gain at starter phase when they fed chickens raw baobab seed diet. It also differed from that of Mwale *et al.,*(2008) who observed decreased body weight gain of guinea fowl keets at 10% and 15% inclusion level of BSM. Anene *et al.,* (2012) also reported decreased weight gain by Juvenile clarias gariepinus as level of inclusion of baobab seed increased. This might be attributed to the high level of inclusion (15% and above) of BSM.

The result of the effect of differently processed BSM on carcass yield and cuts of broilers chickens is presented in Table 3. The plucked, bled, eviscerated and dresses weights do not follow the same pattern of significant difference. However, T_1 and T_6 maintained the same pattern for the above mentioned with those fed control diet having significantly higher (P<0.05) value than those on T_6.

Carcass cuts namely: thigh, breast, drumstick, back, wings and neck differed significantly (P<0.05) among differently processed baobab seed meal in diets this study. However, the carcass cuts did not have a particular trend of significant differences as the processing method varied. The low values of thigh, breast, dressed weight, neck and wings in this study disagree with the findings of Saulawa *et al.,* (2014) who reported higher values for raw baobab seed meal.

CONCLUSION

The finding in this study showed that BSM may replace 10% soya beans in the diet of broiler chickens without compromising feed intake and weight gain.

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Table 1: Composition and calculated analysis of broiler finisher containing different processing methods of baobab seed meal

Ingredient	Different processing methods at 10% inclusion levels of baobab seed meal					
	T_1 Control	T_2 RBSM	T_3 CBSM	T_4 TBSM	T_5 FBSM	T_6 SBSM
SBFF	17.76	7.32	13.24	10.84	13.24	9.24
Maize	52.56	53.00	47.04	49.48	47.04	51.04
BSM	00.00	10.00	10.00	10.00	10.00	10.00
FM	0.52	0.52	0.52	0.52	0.52	0.52
GNC	15.00	15.00	15.00	15.00	15.00	15.00
R/O	3.00	3.00	3.00	3.00	3.00	3.00
W/O	6.00	6.00	6.00	6.00	6.00	6.00
P/Oil	1.00	1.00	1.00	1.00	1.00	1.00
BM	2.20	2.20	2.20	2.20	2.20	2.20
CaCO3	0.92	0.92	0.92	0.92	0.92	0.92
Salt	0.35	0.35	0.35	0.35	0.35	0.35
Lysine	0.25	0.25	0.25	0.25	0.25	0.25
Methionine	0.25	0.25	0.25	0.25	0.25	0.25

Premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100kg**	**100kg**	**100kg**	**100kg**	**100kg**	**100kg**
M.E Kcal/kg	2935.56	2810.58	2731.15	2800.42	2731.15	2662.19
Crude protein (%)	20.00	20.00	20.00	20.00	20.00	20.00
Calcium (%)	1.28	1.25	1.25	1.25	1.25	1.25
Crude fiber (%)	4.92	6.73	5.71	6.78	5.71	6.05
Ether extract (%)	6.34	4.21	5.46	4.18	5.46	6.83
Phophous (%)	0.81	1.15	0.78	0.76	0.78	0.76
Lysine (%)	1.56	1.02	1.37	1.28	1.37	1.23
Methionine (%)	0.69	0.62	0.64	0.63	0.64	0.62

SBFF – soy bean full fat, BSM = baobab seed meal, FM – fish meal, GNC – ground nut cake, CBSM = cooked baobab seed meal, TBSM = toasted baobab seed meal, RBSM = raw baobab seed meal, FBSM = fermented baobab seed meal, SBSM = sprouted baobab seed meal, M.E metabolizable energy, CP = crude protein, EE = etter extract, % = percentage, Vitamin-Mineral premix (BIOMIX(R)) will supply per kg diet, Vit. A 500IU; Vit. D3 888, IU; Vit. E12, 000mg; Vit. K315000mg; Niacin 12000mg; Pantothenic acid 2000mg, Biotin 1000mg; Vit b12 3000mg; Folic acid 15000mg; Choline chloride 6000mg, Manganese 1000mg; Vit. Iron 15000mg; Zinc 800mg; Copper 400mg; Iodine 80mg; Cobalt 400mg; Selenium 8000mg

Table 2: Effect of experimental diets on growth performance of broiler finisher

Parameters	Control T_1	Raw T_2	Cooked T_3	Toasted T_4	Fermented T_5	Sprouted T_6	SEM
Initial Weight	2266.67	2233.33	2166.67	2150.00	2250.00	2283.33	21.86 NS
Final live weight	3533.33a	3333.33ab	3166.67b	3116.67b	3200.00b	3293.33ab	46.11*
Daily body weight gain	60.32	52.38	47.62	46.03	45.24	48.09	2.03NS
Daily feed intake	144.44a	122.22b	127.06bc	128.73bc	125.40bc	138.10ab	2.35*
Feed conversion ratio	2.24	2.36	2.65	2.74	2.77	3.05	0.11NS
Protein efficiency ratio	0.02	0.02	0.02	0.02	0.02	0.02	0.00NS
Protein intake	2888.87a	2446.93c	2499.33bc	2573.30bc	2466.53c	2755.10ab	48.43*
Daily water intake	447.23a	376.03b	431.43a	428.43a	464.10a	416.50ab	8.45*
Water to feed ratio	3.11bc	2.86c	3.40ab	3.33ab	3.70a	3.01bc	0.08*
Overall feed intake	6075.33a	5493.00b	5827.67ab	5718.33ab	5458.00b	5821.67ab	75.55*

* a, b, c Means on the same row with different superscripts are significantly different (P< 0.05), ns Not significant (P> 0.05), SEM = Standard error of mean, % LW = Percent live weight, RBSM = raw baobab seed meal, CBSM = cooked baobab seed meal, TBSM = toasted baobab seed meal, FBSM = fermented baobab seed meal, SBSM = sprouted baobab seed meal, ns = not significant, (P<0.05) = significant at 5% levels

Table 3: Effect of experimental diets on carcass yield of broiler chickens

Parameters	Different processing methods at 10% inclusion levels of baobab seed meal						SEM
	T_1	T_2	T_3	T_4	T_5	T_6	
	Control	RBSM	CBSM	TBSM	FBSM	SBSM	
Plucked weight	3191.33a	2855.67d	2996.67c	2765.37F	2784.67e	3042.33b	37.87*
Bled weight	3400.00a	2900.00b	2933.33b	2800.00b	3000.00b	2933.33b	50.79*
Eviscerated weight	2738.33a	2516.33c	2534.67bc	2289.67d	2295.33d	2565.33b	38.35*
Dressed weight	2102.67a	1826.00c	1988.67b	1839.00c	1776.67c	1992.33b	29.35*
Dressing %	58.43c	60.53bc	65.17a	64.27ab	57.33c	64.30ab	0.88*
Thigh	12.42c	12.70b	12.36b	13.01b	11.33b	13.98a	0.20*
Breast	23.65c	24.54c	33.19a	23.97c	24.92b	28.16c	0.84*
Drumstick	9.71ab	9.42bc	8.81d	9.98a	8.00e	9.11cd	0.16*
Back	12.83ab	14.22a	10.67b	13.95ab	13.13ab	13.23ab	0.44*
Neck	4.48d	6.83a	5.94b	5.07c	5.23c	6.07b	0.19*
Wings	7.22c	7.26c	7.84a	6.96c	7.34bc	7.78ab	0.09*

* a, b, c, d Means on the same row with different superscripts are significantly different (P< 0.05), ns Not significant (P> 0.05), SEM = Standard error of mean, % LW = Percent live weight,RBSM = raw baobab seed meal, CBSM = cooked baobab seed meal, TBSM = toasted baobab seed meal, FBSM = fermented baobab seed meal, SBSM = sprouted baobab seed meal, ns = not significant, (P<0.05) = significant at 5% levels