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Effects of replacement of soya bean meal by bambara nut sievate on the carcass and organ parameters of finisher broiler chicks

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ABSTRACT

Eighty 4-weeks old broiler chicks (Anak 2000 strain) were used in a 28 days feeding trial to determine the effects of replacement of soya bean meal (SBM) by bambara nut sievate (BNS) on the carcass and organ characteristics of finisher broiler chicks. BNS replaced soya bean meal by weight for weight at levels 0%, 5%, 10% and 15% for treatments 1,2, 3 and 4; respectively which were replicated four times in a completely randomized design. Feed and potable water were supplied *ad libitum* to the birds. Also, appropriate medication, sanitation and other standard management practices were strictly adopted. At the 28th day, one bird was randomly picked from each replicate, starved of food for 24 hours and then slaughtered and eviscerated for carcass and organ evaluation. Weights were measured with digital weighing scale. Results of analysis of variance of carcass parameters showed significant (P < 0.05) difference in the final live weight, carcass weight and dressed weight. Birds on 0% BNS and 5% BNS were not statistically different (P > 0.05) in the values above but only varied with birds on 10% and 15% BNS. Other carcass parameters were similar (P > 0.05) in value between treatments. The liver, heart, gizzard and intestine significantly varied (P < 0.05) between their treatments. However, kidney values did not differ significantly. From the results, it appeared that 5% BNS inclusion is optimal for carcass and organ characteristics of finisher broilers.

Keywords: Bambara Nut Sievate; Soya Bean Meal; Broiler; Carcass

1. INTRODUCTION

High cost of feed is a recurring limitation to monogastric animal production in Nigeria which has been rated at 70 - 80 percent of total cost of production [1]. Consequently, the cost of poultry production is so high that the products are so dear and unaffordable by consumers thus, predisposing Nigerians to abject animal protein malnutrition. Reference [2] has further blamed this nutritional adversity on geometric increase in the Nigeria human population without a commensurate increase in livestock production, over-dependence on imported livestock products, ignorance, inadequate technical skills, diseases and parasitism, environmental stress and high cost of ingredients. Also, the competition between man and livestock for feed grains [3,4,5] and inadequate production of farm crops to meet human and livestock needs [6] have been implicated as remote causes of poor animal protein intake among Nigerians. Consequently, the fight to reduce the cost of poultry production becomes critically urgent in order to salvage Nigerians from the scourge of sub-optimal animal protein intake and malnutrition.

Soya bean meal is widely used as source of protein for poultry because of its ability to produce indispensable amino acids, high digestibility and low toxic substances. However, it is very expensive. BNS a cheaper ingredient with seemingly good nutritional potentials may therefore be considered for replacement of soya bean meal.

References [7] and [2] have defined bambara nut sievate as a by-product from the processing of bambara nut into its flour for human use. They further stated that BNS has no direct food use by man and are also carelessly disposed within and around the processing plants and thus constitute environmental pollutants. However, recent studies have confirmed their potentials as feed ingredient in poultry production, reducing the cost of products and making them affordable to consumers [8].

This study is done to determine the effect of replacing soya bean meal by bambara nut sievate on the carcass and organ characteristics of finisher broiler.

2. MATERIALS AND METHODS

2.1. Location and Experimental Birds

The experiment was conducted at the Poultry unit of Imo State University Teaching and Research Farm, Owerri, Nigeria. The site is located between longitudes $7^{0}0I^{1}06^{11}$E and $7^{0}03^{1}00^{11}$E and latitudes $5^{0}28^{1}24^{11}$N and $5^{0}30^{1}00^{11}$N.

Ninety six day–old broiler chicks of Anak 2000 strain were purchased from Cejap Livestock Enterprises, Owerri, Nigeria. The birds were brooded in a deep litter house while commercial starter feed (Top brand) and potable water were offered *ad libitum*. Hygienic measures such as cleaning and disinfection, routine deworming and vaccinations against New castle disease and Infectious bursal disease were also carried out. The composition of the experimental diets is as shown in **Table 2**.

At 4 weeks of age, eighty clinically healthy birds were selected and shared into four treatment diets, T_1, T_2, T_3 and T_4 having 0, 5, 10 and 15% toasted BNS replacing SBM weight for weight which were replicated four times in a completely randomized design. Standard broiler management practices were strictly adhered too.

2.2. Procurement and Toasting of BNS

The bambara nut sievate was procured from a bambara groundnut processing mill at Nkwogbe market, Ihiala, Anambra State, Nigeria. The sievate was derived by grinding whole seeds of bambara groundnut and sieving it through 3.5mm sieve. It was further toasted over fire for 10 minutes using a toasting Aluminum pan at 50 - 55˚C temperature. The product gradually turned brown in colour, producing desirable aroma. Sample of toasted bambara nut sievate was analysed at the Animal Nutrition laborary, Federal University of Technology, Owerri, Nigeria to determine its proximate composition according to AOAC (1995). Result of the analysis is as shown in **Table 1**.

Table 1. Proximate analysis of toasted BNS.

Nutrients	Composition %
Moisture	9.91
Crude protein	15.75
Crude fibre	6.75
Ether extract	4.75
Ash	1.95
Nitrogen free extract	60.89
Gross energy Kcal/kg	1478.63

The proximate analysis was the basis for calculating the nutrient content of the various treatment diets.

Table 2. Composition of the experimental diets.

Ingredients	Treatments % BNS			
	T_1(0%)	T_2(5%)	T_3(10%)	T_4(15%)
Maize	35	35	35	35
Groundnut cake	15	15	15	15
Soya bean meal	15	10	5	0
Bambara nut sievate	0	5	10	15
Wheat offal	9	9	9	9
Palm kernel cake	10	10	10	10
Fish meal	9	9	9	9
Blood meal	3	3	3	3
Bone meal	3	3	3	3
Salt	0.5	0.5	0.5	0.5
* Vitamin premix	0.5	0.5	0.5	0.5
Total %	100	100	100	100
Calculated nutrient content				
Crude protein	25.43	24.12	22.81	21.49
Crude fibre	4.87	4.88	4.89	4.90
Ether extract	19.69	19.75	19.82	19.88
Calcium	0.20	0.19	0.18	0.17
Phosphorus	0.27	0.24	0.19	0.18
Lysine	1.17	1.10	1.03	0.95
Methionine	0.36	0.35	0.34	0.33
ME(Kcal/kg)	2708.53	2647.46	2586.39	2525.32

2.3. Experimental Design

Eighty 4-weeks old broiler chicks selected from the brooded population were randomly assigned to four dietary treatment groups of T_1, T_2, T_3, T_4 containing 0%, 5%, 10% and 15% BNS respectively, which replaced soya bean meal weight for weight. The treatments were also replicated four times in a completely randomized design.

2.4. Data Collection

At the end of the 4 weeks experimental period, sixteen birds were randomly picked one from each replicate, starved of food for 24 hours and slaughtered.This measure was to decongest the intestine and avoid its bursting during processing which could introduce faecal matters into the stomach. Their individual live weights were measured before they were slaughtered by severing their

jugular vein with a sharp knife. The birds were well bled and dipped in hot water for 2 minutes, and the feathers subsequently plucked.

The carcass were then eviscerated, removing the gut system—the organs and the intestine. They were weighed separately and recorded as organ weights. The heads and shanks were cut and their weights recorded.

Dissection of the wings and breast were made by severing the lumeoscapular joint with cut being made close to the body and by cutting laterally through the head to the shoulder girdle respectively. Also, dissection of the drumstick was made and individual weights determined and expressed as percentage of dressed weight.

2.5. Statistical Analysis of Data

Data collected during the study were subjected to analysis of variance [10]. Significantly ($P < 0.05$) different means were separated using the Duncan's Multiple Range Test as outlined by [11].

3. RESULTS

Results of carcass parameters of the birds (**Table 3**) shows that 10% and 15% BNS replacement significantly ($P < 0.05$) reduced live weight gain, carcass weight and dressed weight, However, treatment means of head and shank, wings, thigh and breast region were similar ($P > 0.05$).

Results of organ weights of the experimental finisher broilers (**Table 4**) shows significant difference between treatments of liver, heart, gizzard and intestine. However, kidney values were similar ($P > 0.05$) between treatments. Weights of liver, heart, and intestine reduced ($P < 0.05$) with increasing levels of BNS. On the other hand, the weight of gizzard increased ($P > 0.05$) with increaseing levels of BNS.

4. DISCUSSION

Results of the carcass parameters showed significant differences ($P < 0.05$) between treatments for the live weight, carcass weight and dressed weight, but head and shank weight, wings, thigh and breast region had similar treatment values ($P > 0.05$). There was a consistent reduction in the values of parameters as the inclusion level of BNS increased. However, treatments 0% BNS and

Table 3. Carcass parameters of the birds fed varying levels BNS.

Parameters	Treatments			
	T_1(0%)	T_2(5%)	T_3(10%)	T_4(15%)
Final live weight (kg)	$1.85^a \pm 0.01$	$1.83^a \pm 0.04$	$1.68^b \pm 0.02$	$1.65^b \pm 0.01$
Carcass weight (kg)	$1.75^a \pm 0.02$	$1.73^a \pm 0.01$	$1.65^b \pm 0.04$	$1.56^b \pm 0.01$
Dressed weight (kg)	$1.33^a \pm 0.02$	$1.30^a \pm 0.03$	$1.23^b \pm 0.04$	$1.15^b \pm 0.03$
Dressing percentage (%)	$76.00^a \pm 0.06$	$75.14^a \pm 0.05$	$74.55^a \pm 0.05$	$73.72^a \pm 0.04$
Head and shank (kg)	$0.15^a \pm$ o.0.01	$0.15^a \pm 0.02$	$0.15^a \pm 0.01$	$0.15^a \pm 0.01$
Wings (kg)	$0.22^a \pm 0.01$	$0.22^a \pm 0.01$	$0.21^a \pm 0.02$	$0.20^a \pm 0.01$
Thigh (kg)	$0.44^a \pm 0.04$	$0.42^a \pm 0.06$	$0.41^a \pm 0.07$	$0.04^a \pm 0.03$
Breast region (kg)	$0.25^a \pm 0.04$	$0.25^a \pm 0.05$	$0.23^a \pm 0.03$	$0.23^a \pm 0.04$

a,b:Means on the same row having different superscript letters are significantly different ($P < 0.05$).

Table 4. Organ parameters of the birds fed varying levels BNS.

Parameters	Treatments			
	T_1(0%)	T_2(5%)	T_3(10%)	T_4(15%)
Liver (g)	$41.50^a \pm 0.02$	$41.48^a \pm 0.04$	$41.00^b \pm 0.03$	$40.10^c \pm 0.03$
Kidney (g)	$1.40^a \pm 0.03$	$1.40^a \pm 0.04$	$1.38^a \pm 0.04$	$1.37^a \pm 0.05$
Heart (g)	$7.95^a \pm 0.06$	$7.90^a \pm 0.07$	$7.50^b \pm 0.09$	$7.50^b \pm 0.06$
Gizzard (g)	$65.50^c \pm 0.04$	$65.50^c \pm 0.01$	$66.70^b \pm 0.02$	$68.50^a \pm 0.01$
Intestine (g)	$91.80^a \pm 0.01$	$91.15^a \pm 0.02$	$89.45^b \pm 0.01$	$85.00^c \pm 0.04$

a,b,c: Means on the same row having different superscript letters are significantly different ($P < 0.05$).

5% BNS were observed to be similar ($P > 0.05$) in all the carcass parameters.

The result partly varies with that of [7] who reported increase in carcass values with up to 10% inclusion of BNS which declined afterwards with increasing values. Also the carcass weights 1.75 kg, 1.73 kg, 1.65 kg and 1.56 kg for treatments 0%, 5%, 10% and 15% BNS respectively reflected a direct relationship with the live weights (**Table 3**). The results of dressed weight, 1.33, 1.30, 1.23 and 1.15 kg varied significantly ($P < 0.05$). The dressed weight of birds fed 0% BNS weighing 1.33 kg were similar to birds fed 5% BNS which weighed 1.30 kg but significantly varied from those fed 10% BNS with 1.23 kg which in turn was significantly ($P < 0.05$) heavier than birds fed 15% BNS which weighed 1.15 kg. This finding agreed with that of [7] who stated that eviscerated weight of birds fed BNS followed same pattern as final body weight. The dressing percentage of 76.00%, 75.14%, 74.55% and 73.72% for values on birds fed 0%, 5%, 10% and 15% BNS respectively also revealed similarity with the results on live weight, carcass weight and dressed weight. This result appears to agree with [12], who stated that the distribution of muscle is influenced by total carcass muscle and not by nutritional treatment. This is typical of the results on wings, thigh and breast regions, though no significant difference ($P > 0.05$) was realized. Reference [13] had also stated that eviscerated weight and weight of broiler carcass changes as brewers dried grain, corn brain or palm kernel cake increased in diets. This is likely because of increasing levels of crude fibre with increasing levels of BNS in the diets [9,7]. Thus, results show that 5% inclusion of BNS is optimum considering the outstanding performances of this treatment relative to the control. This however differs from [7] mainly because of age difference of the birds as they used older birds (layers), who had higher capacity to digest the increasing fibre levels for which 10% level was their optimum.

The results of organ weights (**Table 4**) showed that the weights of liver 41.50, 41.48, 41.00 g and 41.10 for treatments 0, 5, 10 and 15% BNS respectively differed significantly ($P < 0.05$) between treatments while those of 0 and 5% were similar ($P > 0.05$). Values of the kidney, heart and intestine followed same trend as they reduced with increasing levels of BNS. Higher weights were however observed for gizzard which is attributable to muscle expansion arising from the stress of chunning of food materials.

5. CONCLUSIONS

Varying levels of BNS in diets of finisher broilers significantly ($P < 0.05$) affect the values of carcass and organ parameters. From the result, it appears that 5% level of inclusion of BNS is optimal for carcass and organ parameters of finisher broiler chicken.

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