# Effect Of Processing Methods Of Bambara Groundnut Offal Diets On Haematology And Carcass Characteristics Of Broiler Finisher Chickens

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Abstract — The objective of the study was to evaluate the effect of two methods of processing Bambara Groundnut Offal (BGO), toasted and enzyme supplemented in broiler chicken diets on haematology and carcass characteristics of broiler finisher chicken. One hundred and eight (108) four- weeks- old unsexed commercial broiler chicks were divided into three groups (T<sub>1</sub>0% T<sub>2</sub>20% T<sub>3</sub>20%) of 36 birds, each replicated three times with 12 birds per replicate in a completely randomized design and fed for 28 days. Haematological parameters were not significantly (p>0.05) affected. Result of carcass characteristics showed that live weight, eviscerated weight, dressed weight, back weight, drumstick weight, breast weight, thigh weight and caecum weight were significantly (p<0.05) affected. Birds fed enzyme supplemented BGO diets recorded higher weights compared with birds fed toasted BGO and the control diets. Other carcass characteristics such as wing weight, neck weight, head weight, shank weight and other internal organ characteristics were not significantly (p>0.05) affected.

From the result, significant parameters have shown that birds fed bioenzyme supplemented BGO diets were superior to birds fed toasted BGO and the control diet. It is therefore recommended that 2g/kg bioenzyme supplemented BGO diet should be used at 20% BGO inclusion rate for finishing broiler chicken without adverse effect on the haematology and for increased carcass weight.

Index Terms — Bambara Groundnut Offal (BGO), Toasted BGO, Enzyme supplemented BGO, Haematology, Carcass characteristics.

### I. INTRODUCTION

Poultry supplies the fast growing human population with high quality protein, contributes significantly to food security, poverty alleviation and ecologically sound management of natural resources [11]. In Nigeria, one of the greatest limitations of the expansion of the poultry industry is the high cost of feed ingredient [3]. It is therefore important to use unconventional materials like Bambara groundnut offal that are obtained at little or no cost.

Bambara groundnut offal (BGO) is a by-product of Bambara groundnut seeds processing. It is a sievate after extracting the flour for human use. It contains 14-24% crude protein [20], 20% crude fibre, 5.36% Ether extract, 41.64% nitrogen free extract.

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The use of BGO in feeding monogastric animals like poultry is limited by its high fibre content and antinutritional factors [9], [10]). Processing methods such as toasting and or enzyme addition are known to reduce or eliminate the anti-nutrients in the material and improve digestibility of BGO based diets [4]. Enzyme supplementation is capable of disrupting the plant cell wall thereby enhancing nutrient absorption [1].

Blood profile examinations give the opportunity to investigate the presence of metabolites and other constituents in the body of the animal which play vital roles in the physiological, nutritional and pathological status of the animal [2], [6] and consequently the overall performance of the animal. The quality of carcass characteristics has direct relationship with nutrition as far as broiler production is concerned. This study was therefore conducted to evaluate the response of broiler finisher chickens to processing methods of BGO diets using hematological indices and carcass characteristics parameters.

### II. MATERIALS AND METHODS

The experiment was carried out at the Poultry Section of the Livestock Unit, Teaching and Research Farm, Federal University of Agriculture, Makurdi Benue State Nigeria. Benue State is situated at the Southern Guinea Savannah belt of Nigeria. Makurdi is located on Latitude 7° 43′ N and Longitude 8° 33' E [15]. BGO used was obtained from Okpa sellers who process the bambara groundnut for the popular Okpa meal. The sievate was derived by grinding whole seeds of bambara groundnut and sieving it through 3.5mm sieve. One portion of the BGO used was processed by toasting. One liter of water was added to 5kg of BGO. The mixture was set over fire and stirred steadily to prevent it from sticking to the pan or burning for 40 minutes at a temperature of 100 °C. This turned brownish and produced a sweet smelling aroma. This was allowed to cool before incorporating into the diets. The other portion of BGO was processed by adding 2g bioenzyme per 1kg BGO based diet and fed to the birds.

### A. Experimental diets

Three isonitrogenous experimental diets  $T_10\%$ ,  $T_220\%$  and  $T_320\%$  were formulated as presented in Table 1. T1 contained 0% BGO, while T2 contained 20% toasted BGO and T3 contained 20% bioenzyme supplemented BGO at the rate of 2g bioenzyme per kilogram BGO based diet.

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TABLE 1 INGREDIENT COMPOSITION OF BROILER FINISHER CHICKEN DIETS (G/100G) DIETARY TREATMENTS

Level of BGO	0%BGO	20% Toasted	20% Enzyme	
Level of BGO	U70DGU	BGO	Added BGO	
Ingredients	$T_1$	$T_2$	T <sub>3</sub>	
Maize	42.83	29.67	29.67	
Full fat soybeans'	37.77	30.93	30.93	
Maize offal	15.00	15.00	15.00	
BGO	0.00	20.00	20.00	
Bone meal	3.50	3.50	3.50	
Salt	0.40	0.40	0.40	
Methionine	0.25	0.25	0.25	
Premix (Min/Vit)	0.25	0.25	0.25	
Bioenzyme	-	-	++	
Total	100	100	100	
Calculated Nutrient	ts			
Energy (kcal/kg)	3,091.34	2,901.36	2,901.36	
Crude protein (%)	20.00	20.00	20.00	
Crude fibre (%)	4.55	5.23	5.23	
Ether Extract (%)	8.90	7.15	7.15	
Calcium (%)	1.40	1.39	1.39	
Phosphorus (%)	0.89	0.81	0.81	
Lysine (%)	1.06	0.85	0.85	
			0.24	

\*Viamin Premix (2.5kg/1000kg): vitamin A (15,000 U.I), vitamin D3(3,000.000 I.U) and vitamin E (30,000 I.U) vitamin k (2,500 I.U).

0.34

Thiamin B, (2,000mg), Riboflavin B2 (6,000mg). Pyridoxine B0 (4000mg) Niacin (40,000mg), vitamin B12 (20mg) panthothenic B6.

(10,000MG), Folic Acid (1,000mg), Biotin (80mg), Chlorine Chloride (500mg), Antioxidant (12g). Managaness (96g), Zinc (60g), Iron.

(24g), Copper (69), lodine (1,4g) Selenium (24g), Cobalt (12g)., ++ = 2g/kg bioenzyme, --= No enzyme, T1 = O% BGO, T2 = 20% BGO, T3= 20% Bioenzyme added BGO.

## B. Experimental design/management of experimental

A completely randomized design was used. One hundred and eight (108) 4 weeks old unsexed experimental broiler chicks were randomly allocated to three dietary treatments each with three replicates containing 12 birds which were fed for 28 days. Water was given ad-libitum, daily routine management activities were cleaning of pens, washing of drinker and feeders. Fresh water and feed were supplied daily.

### C. Data collection

Methionine

Haematological analysis was carried out at the end of the 28 days experimental period. Three (3) birds per treatment (one per replicate) of live weight approximate to the average weight of treatment were selected for haematological evaluation. Blood was collected during slaughter. The birds were starved of feed for 12 hours and the jugular vein was cut with a sharp knife in the early hours of morning. Two 2mls of blood samples were collected from the experimental birds into well labeled sterile bottles per each bird for blood profile analysis.

Carcass evaluation was also done at the end of the 28 days experiment. Three (3) birds per treatment (one per replicate) of live weight approximate to the average weight

of treatment were selected for carcass evaluation. Birds were starved of feed overnight for about 12 hours before slaughter. The jugular vein was cut with a sharp knife, birds scalded in hot water for a minute, and feathers manually removed, birds were eviscerated and weighed to obtain their dressed carcass weight. The organs were removed and weighed using a sensitive electronic and micro weighing scale and grossly examined for any pathological changes. The dressed carcass weights were; eviscerated weight, dressed weight, breast weight, back weight, thighs weight, drumstick weight, wings weight, neck weight, head weight and shank weight, all expressed as relative weights on live weight. While internal organ weights were liver weight, gizzard weight, pancreas weight, spleen weight, kidney weight, abdominal fat weight, small intestine weight, large intestine weight, lungs weight, and caecum weight. These were expressed as relative weight in percentages.

All data collected were subjected to analysis of variance (ANOVA) in a completely randomized design (CRD) as reported by Steel and Torrie [18] using statistical packages. Where significant differences were observed, treatment means were separated using Duncan multiple range test [7].

#### III. RESULTS AND DISCUSSION

The experimental diets contained 20% crude protein (Table 1) in order to meet the protein requirement of Finisher broiler chicken as recommend by NRC [16]. Similarly, metabolizable energy of the diets (2,901.36-3,091.34Kcal/kg), though reduced as BGO was introduced in the diets to replace part of maize and soya bean, were also within the energy requirements of finisher broiler chicken.

The effect of toasting and bioenzyme supplementation of diets on live weight, carcass/internal organ characteristics of broiler finisher chicken is presented in Table 2. There were significant differences (p<0.005) in the processing methods of BGO on live weight, eviscerated weight, dressed weight, back weight, drumstick weight, breast weight and thigh weights of broiler finisher chickens. Internal organ characteristics did not show any significant (p>0.005) difference except for the ceacum weight which was significantly affected (p<0.005). Results of birds fed the test diets (either toasted or enzyme supplemented) were comparable with birds fed the control diet. The significant variation in live weight, eviscerated weight, dressed weight and most whole carcass cuts for birds fed bioenzyme supplemented BGO diets could be attributed to the effect of bioenzyme to hydrolyse non starch polysaccharides for increased energy utilization [19]. Similarly, the effect of enzyme addition is capable of eliminating or reducing the probable negative effect of anti-nutritional factors present in the test ingredient. In this experiment bioenzyme used was able to reduce the anti-nutrients in BGO and also enhance energy utilization hence the observed response.

Results of this experiment disagrees with that of Biswas et al. [5], Kidd et al. [14] and Hassan et al. [12] who reported that carcass weights were not affected due to addition of enzymes to diets of broiler finisher chickens. The non adverse effect of dietary treatments on the internal organ characteristics of broiler finisher chickens could be an indication that birds on both processing methods were able to cope with the level of processed BGO in the diets and or due to enhanced utilization of the test diets occasioned by the processing methods which could have probably remove the negative effect of anti-nutritional factors. Studies have shown that, caecum weight could be affected by the nature of the diet. There was a significant effect observed in the caecum weight of birds on the dietary treatments. Results of this study are in line with reports of Rehman et al. [17] who reported an increase in length and weight of caecum for birds on high fibre diets.

TABLE2: EFFECT OF PROCESSING METHODS OF BGO DIETS ON CARCASS CHARACTERISTICS OF BROILER FINISHER CHICKEN.

Levels of BGO  Parameters	0%	20%	20%	SEM	LS
		Toasted	Enzyme added		
	$T_1$	$T_2$	$T_3$		
Live weight	1.883 <sup>b</sup>	1.852 <sup>b</sup>	2.267ª	0.271	*
Eviscerated weight	1.496°	1.624 <sup>b</sup>	1.826 <sup>a</sup>	0.155	*
Dressed weight	1.387°	1.501 <sup>b</sup>	1.707ª	0.141	*
Back weight	297 <sup>b</sup>	290 <sup>b</sup>	$337^a$	0.180	*
Thigh weight	203°	238 <sup>b</sup>	$260^{a}$	0.070	*
Drumstick weight	194 <sup>b</sup>	233 <sup>ab</sup>	252ª	0.321	*
Breast weight	424°	451 <sup>b</sup>	564ª	1.00	*
Wing weight	143	165	170	0.139	NS
Neck weight	76	83	77	0.538	NS
Head weight	42	50	48	0.153	NS
Shank weight	58	70	71	0.100	NS
Lungs weight	11.00	10.76	10.76	0.833	NS
Liver weight	34.33	34.00	37.33	0.512	NS
Empty Gizzard weight	48.00	40.33	53.33	0.061	NS
Pancreases weight	4.00	5.00	5.67	0.152	NS
Gall bladder weight	1.67	2.00	2.67	0.163	NS
Kidney weight	9.67	10.33	9.00	0.559	NS
Spleen weight	1.67	1.67	1.67	1.00	NS
Heart weight	8.00	8.67	10.67	0.161	NS
Abdomen fat weight	22.33	14.33	20.00	0.344	NS
Small intestine weight	83.67	64.67	76.00	0.280	NS
Large intestine weight	3.00	4.00	4.00.	0394	NS
Caecum weight	8.67°	11.33 <sup>b</sup>	12.67 <sup>a</sup>	0.138	*

abc Rows with different superscripts are significantly different (P < 0.05).

SEM: Standard error of mean, LS= Level of signifinance, T1 = 0% BGO,T2= 20% Toasted BGO, T3= 20% enzyme added BGO. NS=Not significant.

The effect of toasting and bioenzyme supplementation of BGO diets on haematological parameters of broiler finisher chicken is presented in Table 3. There was no significant (p>0.005) variation in all haematological parameters measured. This indicates that both processing methods of BGO did not exert any adverse effect on blood constituents. Values obtained were within the normal range of haematological values for birds.

This suggests that, the subjection of BGO diets to the processing methods could have been responsible for the ability of the birds to resist infection and diseases attacks. The ceacum as internal organ characteristics is known to house some essential microbes that play important role in the health status of the bird [8]. This is shown by the significant variation in weight of ceacum in the dietary treatments which might have contributed to the improved health of the birds.

The normal haematological values observed in birds fed the test diets therefore indicates that, the inclusion of processed BGO in the diets could be responsible for

boosting the immune system of the birds. This is in line with the reports of Joshi et al. [13] who reported that blood is a good indicator of the health of an organism. It also acts as pathological reflector of the whole body hence haematological parameters are important in diagnosing the functional status of animals exposed to toxicants. The processing methods probably may have removed or reduced the negative effect of anti-nutritional factors and toxicants.

### IV. CONCLUSION AND RECOMMENDATION

In conclusion the study revealed that both processing methods (toasting and enzyme addition) of BGO can be used at 20% BGO inclusion rate to finish broiler chickens without any adverse effect on carcass/internal organ characteristics and haematological parameters. Birds fed 20% BGO diets processed with 2g /kg bioenzyme diet gave higher carcass weights and is hereby recommended for finishing broiler chickens."

TABLE 3: EFFECT OF TOASTING AND ENZYME ADDITION OF BGO DIETS ON HEMATOLOGICAL PARAMETERS OF BROILER FINISHER CHICKENS DIETARY TREATMENT

Levels of BGO Parameters	0%	20%	20%	NRBP	SEM	LS
	$\mathbf{T_1}$	$\begin{array}{c} \textbf{To asted} \\ \textbf{T}_2 \end{array}$	Enzyme added			
			$T_3$			
PCV (%)	24.33	25.33	27.33	22-35	0.186	NS
RBC x10 <sup>9</sup> /L	2.03	1.83	2.10	2.5-3.5	0.216	NS
WBC x10 <sup>9</sup> /L	5.47	4.87	5.37	1.2-3.0	0.346	NS
HB g/gl	8.13	8.47	9.13	70-130	0.267	NS
MCV(fl)	122.10	102.17	133.70	90-140	0.468	NS
MCH(pg)	40.63	46.50	43.57	33-47	0.324	NS
Lymphocytes	49.00	44.67	45.67	45-70	0.092	NS
Heterophils (%)	45.00	47.67	49.33	15-40	0.341	NS
Eosinphils (%)	2.00	3.33	1.67	1.6-6.0	0.165	NS
Basophil (%)	0.00	0.67	0.67	-	0.330	NS
Monocytes (%)	3.33	4.33	2.67	5.0-10	0.177	NS

SEM: Standard error of mean, LS= Level of signifinance, T1 = 0% BGO,T2= 20% Toasted BGO, T3= 20% enzyme added BGO. NS=Not significant, NRBP= Normal range of blood profile value (source: jain 1993) PCV=Packed Cell Volume, RBC= Red Blood Cells, WBC= White Blood Cells, HB= Haemoglobin, MCV=Mean CorpscularVolume, MCH= Mean Corpscular Haemoglobin.

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