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## Effect of Crayfish Waste Meal on Performance Characteristics and Nutrient Retention of Broiler Finishers

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**Abstract:** The study investigated the effect of crayfish waste meal on the performance characteristics and nutrient retention in broiler finisher. 150 one day old chicks were used for the study which lasted for 9 weeks. The result of the study showed that the average dry matter intake ranged from 1918.96 g in broiler chicken fed diet IV (25%FM:75%CWM) to 2141.60g in diet V (100% CWM) chickens. There was no significant differences ( $p>0.05$ ) between treatment means. Birds fed the control diet (100%FM) recorded the highest gain (787.30 g) followed by those fed diet III (50%FM; 50%CWM) while the least gain (679.00 g) was by diet V (100%CWM) chickens. No significant ( $p>0.05$ ) difference was observed between the treatment means. The feed conversion ratio was best (2.48) with chickens fed the control diet (100%FM) and progressively decreased with diet V (100%CWM) chickens recording the least (3.19). There was, however, no significant ( $p>0.05$ ) difference between treatment means. Protein efficiency ratio followed similar trend with the feed conversion ratio. Diet I (100%FM) chickens had the highest value (2.09) followed by diet II (25%FM; 75%CWM) while those fed diet V (100%CWM) was the least (1.64).

**Key words:** Broiler, crayfish waste, finishers, meal, nutrient, performance

### INTRODUCTION

The total consumption of poultry meat and eggs has witnessed dramatic increase during the past five decades and continued to increase ahead of human population growth (Hossain *et al.*, 2003). Poultry industry in Nigeria has however been confronted with the challenges of high cost and scarcity of feed inputs. This stems from the direct competition between man and livestock. Research efforts had been geared towards the use of locally available feedstuff such as agro-industrial by-products and farm wastes that may bring about the expected reduction in feed cost and consequently, poultry products. Fishmeal is one of the acceptable sources of protein for poultry feeds because of its adequacy in the composition of amino acids. However, the downturn in the economy of developing nations especially Nigeria has led to the rising cost of fish, owing to the high demand by its increasing population. As such, fishmeal has become less available with attendant exorbitant price value. Many authors have therefore researched into alternative sources of animal protein to ameliorate the situation. It is against this backdrop that the crayfish waste is being investigated as replacement for fishmeal. This study is therefore aimed at evaluating the potentials of crayfish waste meal as replacement for fishmeal in the diet of broiler chicken. The study was carried out to investigate the effect of crayfish waste meal as replacement for fish meal on

performance characteristics and nutrient digestion of broiler finishers.

### MATERIALS AND METHODS

The study was carried out in the Poultry Section of the Teaching and Research Farm of Lagos State Polytechnic, Ikorodu. Crayfish wastes were collected from Universal Fisheries, Isolo Local Government Development Area, Lagos. A batch was drained and oven-dried at 65°C for 24 hrs followed by plate milling. Another batch was parboiled after collection, drained and oven-dried before milling. Proximate compositions of the samples were subsequently determined using the analytical methods of AOAC (1996). Drained and oven-dried crayfish wastes which had the higher crude protein value (Table 2) was used with other feed ingredients to formulate five experimental diets to meet the NRC (1994) nutrient requirement for broiler chicken (Table 1). Five experimental diets were formulated with graded levels of crayfish waste meal replacing fishmeal as follows: 0%:100% (control), 25%:75%, 50%:50%, 75%:25% and 100%:0%. Each diet was fed for a period of 9 weeks. Records of feed consumption and body weight were kept on weekly basis while body weight gain and Feed Conversion Ratio (FCR) were estimated from the data collected. One hundred and fifty day-old broiler chicks were used for the study. 30 chicks were assigned to each dietary treatment, which was

Table 1: Composition of broiler finisher diet containing crayfish waste meal as replacement for fish meal

Ingredients	Diets				
	100%FM	75%FM: 25%CWM	50%FM: 50%CWM	25%FM: 75%CWM	100%CWM
Maize	47.00	47.00	47.00	47.00	47.00
Wheat offal	5.60	5.99	6.35	6.65	6.85
Maize bran	14.00	13.30	12.71	12.33	12.00
Groundnut cake	18.00	18.00	18.00	18.00	18.00
Fish meal (65%CP)	2.00	1.50	1.00	0.50	0.00
Crayfish waste meal	0.00	0.93	1.86	2.79	3.72
Oyster shell	1.27	1.25	1.20	1.00	0.90
Bone meal	1.40	1.30	1.15	1.00	0.80
Salt	0.25	0.25	0.25	0.25	0.25
Broiler premix	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.08	0.08	0.08	0.08	0.08
Total (%)	100.00	100.00	100.00	100.00	100.00
<b>Calculated nutrient</b>					
Crude protein	19.36	19.36	19.36	19.36	19.36
Energy (kcal/kg)	2844.85	2835.97	2829.27	2826.71	2823.52
Available calcium	1.33	1.34	1.32	1.25	1.18
Available phosphorus	0.42	0.52	0.62	0.71	0.80
Crude fibre	4.92	4.94	4.96	5.01	5.06
Ether extract	4.12	4.12	4.12	4.12	4.12

CWM = Crayfish Waste Meal; FM = Fish Meal

Table 2: Proximate composition of crayfish waste meal

	Parboiled, dried and milled	Dried and milled
Dry matter (%)	80.40	81.30
Crude protein (%)	29.59	35.02
Ether extract (%)	5.36	3.85
Crude fibre (%)	9.87	12.90
Energy (kcal/kg)	1895.00	1454.00

replicated thrice. The chicks were reared on a deep litter system with feed and water supplied *ad-libitum*. Records of feed consumption and body weight were kept on weekly basis while body weight gain and Feed Conversion Ratio (FCR) were estimated from the data collected.

**Nutrient retention trial:** Retention study was carried out during the eighth to ninth week of the experiment. Two birds from each replicate whose weights were close to the mean were selected for metabolic trial with facilities for feeding, water supply and collection of droppings. The birds were allowed to adjust for 4 days before faecal collection for three consecutive days. Known quantities of the diets were served to birds and the left over were properly accounted for. The faeces were separated from feathers and oven dried at 60°C for 48 hrs. The dried samples were milled and stored for subsequent chemical analysis.

**Chemical analysis:** The samples of the test diets as well as faecal output were analyzed for proximate constituents using the procedure of AOAC (1996).

**Experimental design and statistical analysis:** The design of the experiment was a completely randomized design. All data generated were subjected to analysis of variance using SAS statistical package (SAS, 2003). The design employed was completely randomized and significant treatment means were separated using Duncan Multiple Range test of the same software.

## RESULTS

Table 1, 2 and 3 show the composition of broiler (finisher) diet containing crayfish waste meal as replacement for fish meal, proximate composition of crayfish waste meal, performance characteristics and nutrient digestibility of broiler finisher chickens fed crayfish waste meal as a replacement for fish meal as replacement for fish meal. Crayfish waste meal dried immediately after collection had 35.02% Crude Protein (CP), 3.85% Ether Extract (EE) and 12.9% Crude Fibre (CF) whereas crayfish wastes parboiled before drying and milling had 29.59% CP 5.36% EE and 9.87CF respectively. The average dry matter intake ranged from 1918.96 g in broiler chicken fed diet IV (25%FM:75%CWM) to 2141.60 g in diet V (100% CWM) chickens. There was no significant difference ( $p>0.05$ ) between treatment means.

Broiler chickens fed the control diet (100%FM) recorded the highest gain (787.30 g) followed by those fed diet III (50%FM:50%CWM) while the least gain (679.00 g) was by diet V (100%CWM) chickens. No significant ( $p>0.05$ ) difference was observed between the treatment means. The feed conversion ratio was best (2.48) with chickens

Table 3: Performance characteristics and nutrient digestibility of broiler finisher chickens fed crayfish waste meal as a replacement for fish meal

Variables	Treatments					SEM
	100%FM	75%FM: 25%CWM	50%FM: 50%CWM	25%FM: 75%CWM	100%CWM	
Av. Final live weight (g)	1404.00	1391.50	1436.50	1436.00	1279.00	43.51
Av. Weight gain (g)	787.30	758.20	769.84	702.70	679.00	87.87
Av. Dry matter intake (g)	1945.90	2059.50	2110.50	1918.96	2141.60	41.05
Feed conversion ratio	2.48	2.75	2.76	2.86	3.19	0.35
Protein efficiency ratio	2.09	1.90	1.88	1.89	1.64	0.23
Mortality (%)	0.00	0.00	0.00	0.00	0.00	0.00
<b>Nutrient retention</b>						
Dry matter digestibility	82.99	78.30	83.71	82.82	81.09	1.09
Crude protein digestibility	86.18 <sup>a</sup>	72.90 <sup>b</sup>	74.90 <sup>b</sup>	79.74 <sup>ab</sup>	71.01 <sup>b</sup>	3.03

<sup>abc</sup>Means in the same row with different superscripts are significantly ( $p < 0.05$ ) different. FM = Fish Meal; CWM = Cray Fish Waste Meal

fed the control diet (100%FM) and progressively decreased with diet V (100%CWM) chickens recording the least (3.19). Differences between treatment means was however not significant ( $p > 0.05$ ). Protein efficiency ratio followed similar trend with the feed conversion ratio. Diet I (100%FM) chickens had the highest value (2.09) followed by diet II (25%FM:75%CWM) while those fed diet V (100%CWM) was the least (1.64). There was no significant ( $p > 0.05$ ) difference between treatment means.

## DISCUSSION

The proximate composition of crayfish waste meal revealed that samples that were dried without parboiling recorded better values than those parboiled. This disparity could have been caused by heat treatment which probably denatured some of the protein in the samples that were parboiled. The 35.02% crude protein of un-parboiled crayfish waste used for this study is lower than 43.71% reported by Fanimó *et al.* (1996) and 50.89% in tunnel-dried samples (Rosenfeld *et al.*, 1997) but similar to 35.2% reported by Ngoan *et al.* (2000). The nutritional value of crayfish waste is also affected by processing method and collection time. The head, which constitute about 70% of shrimp waste is known to contain some bacteria which during storage can produce a dicarboxylic reaction turning amino acids to biogenic amines, resulting in depletion of the nutritional value with a possible toxic effect (Rosenfeld *et al.*, 1997). Samples used in this study were dried soon after collection to forestall the commencement of the activities of the spoilage bacteria. Therefore, immediate drying (without parboiling) produced a better result.

The performance characteristics of broiler chickens fed with crayfish waste meal as replacement for fish meal showed no significant difference in dry matter intake. These findings are in agreement with Rosenfeld *et al.* (1997) who replaced soyabean meal with crayfish waste meal up to 100% in broiler's diet and those of Oduguwa

*et al.* (2002) when they replaced fish meal with shrimp waste meal and reported no adverse effects on the broiler chicken.

The similarity in dry matter intake between treatments explains the non-significant difference in body weight gain as well as feed conversion ratio. Meyers (1986) reported that crayfish waste meal has a comparable amino acid profile with fish meal and when the feed is similar in composition; dry matter intake and gain would not be different. However, Fanimó *et al.* (1996) reported a significant difference in body weight gain when more than 33% shrimp waste meal replaced fishmeal in chicken diet.

**Conclusion:** Crayfish wastes that were dried immediately after collection had the highest crude protein content and there was no significant difference between treatment means in performance. It is therefore concluded that crayfish waste meal can be used to replace fish meal in the diet of broiler finishers without adverse effect on performance.

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