CARCASS AND ORGAN CHARACTERISTICS OF BROILERS FED CRAB MEAL AS REPLACEMENT TO FISHMEAL

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ABSTRACT
Attempt was made to find alternative for fishmeal in broiler diet because of its cost and subsequent influence on cost of production. Crab meal was selected to replace fishmeal as main protein source in broiler diet. Crabs were procured, dried over fire, and ground into meal which was fed to broilers. A total of 200 unsexed day-old broilers were fed 5 levels (0%, 25%, 50%, 75% and 100%) of crab meal as replacement for fishmeal to evaluate carcass and organ parameters at 56 days of age. Twenty birds were used per replicate; and 2 replicates per treatment in a Completely Randomized Design (CRD). Feed and fresh drinking water were provided *ad libitum;* and proper litter management, sanitation and medication were adopted. Average body weight at 56 days were not significantly different ($p>0.05$) being between 2266g – 2337g. Similarly, there were no significant differences ($p>0.05$) in weight of dressed carcass, thigh, breast, head, shank and neck that could be attributed to treatment; but weight of heart from broilers fed crab meal weighed significantly ($p<0.5$) less than those fed fishmeal only. Moreover, liver from broilers fed fishmeal alone were significantly heavier ($p<0.05$) than those fed crab meal; but gizzard of broilers fed crab meal were heavier ($p<0.05$) than those of broilers fed fishmeal. There may have been differences in utilization of crab and fishmeal by these organs; however, the major carcass parameters were not significantly ($p>0.05$) affected by replacing fishmeal with crab meal in broiler ration. Thus crab meal can be used as protein source in broiler ration instead of fishmeal without deleterious effect on carcass yield.

Key words: Crab meal, Fishmeal, Broilers, Carcass, Replacement.

INTRODUCTION

Fishmeal has always had reputation of possessing some unique quality for enhancing animal performance primarily in monogastric animal production including poultry. Fishmeal is expensive in this area, especially those that are imported; thus the use of fishmeal in poultry diet tends to increase the cost of production. Recently, farmers and researchers have tried various other sources of animal proteins in a bid to reduce over-dependence on fishmeal, thereby countering its increasing cost. For instance, Okoye (1998) reported the replacement value of shrimp waste meal for fishmeal in diet of broiler chicken; Ojewola and Annah (2006) compared nutritive and economic values of crayfish dust meal, shrimp waste meal with Danish fishmeal; while Awoniyi *et al.* (2003) used maggot meal in place of fishmeal for broilers with various levels of success. Fanimo *et al.* (1998) also reported performance and carcass quality of broilers fed shrimp waste meal supplemented with synthetic amino acids; while Maiguelema and Gernat (2003) studied the effect of elevated levels of tilapia by-product meal on performance and carcass characteristics of broilers. Crab is one of the protein-rich animals that live in sea as well. In our earlier report (Etuk *et al.,* 2007); replacement of fishmeal in broiler ration with crab meal at 0%, 50% and 100% did not have significant effect on growth, feed intake and feed conversion ratio when fed to eight weeks of age. The fact that crab meal replacement for fishmeal at these levels did not have effect on growth performance of broilers prompted this trial at five different levels aimed at evaluating if there will be effect on carcass and organs of broilers.

MATERIALS AND METHODS:

Sourcing and processing of test material

Fresh crabs were purchased from fishermen along the coast of east Atlantic Ocean in Akwa Ibom State, Nigeria. These were dried over fire for 48 hours and ground into meal (here called crab meal or cbm) which was stored in bags.

Experimental diet

Broiler starter mash was made using maize, guinea corn, soya bean meal, lysine, methionine, salt and premix. Fishmeal was purchased from a distributor of animal feeds, and most other ingredients were bought from same source too. In these diet, fishmeal and crab meal were included at various levels as follows: 0% crab meal (100% fishmeal), 25% crab meal (75% fishmeal), 50% crab meal (50% fishmeal), 75 % crab meal (25% fishmeal) and 100% crab meal (0% fishmeal) as shown on table 1.These constituted the different treatments used in this trail. Similar replacement of fishmeal with crab meal was adopted when compounding broiler finisher diet as shown on table 1. Proximate an[illegible] test

ingredients were reported earlier (Ojewola and Udom, 2005; Ojewola and Annah, 2006). Composition of the experimental diets per treatment is presented on table I. Birds were fed *ad libitum* for eight weeks and fresh drinking water was provided too. Routine management practices were adopted including vaccination, medication and good litter management. Birds were weighed at the beginning of the trial. Subsequently, weight of birds in each treatment was taken on weekly basis and at the end of the trial.

Experimental birds and design

Two hundred day old broiler chicks of Harco strain were used in this experiment. Chicks purchased from a commercial dealer in Uyo, Akwa Ibom State, and were put into five groups randomly to which each of five treatments was randomly assigned. Each treatment was subdivided into 2 replicates consisting 20 chicks each in a completely randomized design.

Carcass evaluation

At 8 weeks, 10 birds were randomly selected from each replicate (giving 20 birds per treatment) for carcass evaluation. They were kept off feed and water overnight after which they were weighed, and killed by neck slitting. Evisceration was done by hand plucking of feathers in warm water before dressed carcass weight was taken. Other parameters measured include weight of thigh muscle, breast, head, shank, neck and wing. Organ weight including heart, liver, gizzard and spleen were also measured. Data collected were subjected to one-way analysis of variance according to Steel and Torrie (1980).

Table 1: Composition (Kg) of experimental diets

	Starter					Finisher				
Ingredients (g) and Analysis	0%Cbm**	25%Cbm	50%Cbm	75%Cbm	100%Cbm	0%Cbm	25%Cbm	50%Cbm	75%Cbm	100%Cbm
Maize	284.50	284.50	284.50	284.50	284.50	304.50	304.50	304.50	304.50	304.50
Guinea Corn	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00	250.00
Soya Bean Meal	310.00	310.00	310.00	310.00	310.00	210.00	210.00	210.00	210.00	210.00
Wheat Offal	100.00	100.00	100.00	100.00	100.00	180.00	180.00	180.00	180.00	180.00
Fishmeal	50.00	37.50	25.00	12.50	0.00	50.00	37.50	25.00	12.50	0.00
Crab Meal	0.00	12.50	25.00	37.50	50.00	0.00	12.50	25.00	37.55	50.00
Lysine	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
DL-Methionine	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Salt	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Premix*	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Total	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00
Calculated Analysis:										
Crude Protein (%)	24.00	23.20	23.20	22.40	22.00	20.90	20.56	20.14	19.71	19.33
Metabolizable Energy (Kcal/Kg)	3092.97	3079.32	3066.07	3052.17	3038.17	3001.30	2987.60	2974.35	2960.15	2946.45
Crude Fibre	3.74	3.74	3.99	4.99	4.10	4.30	3.84	3.87	3.93	3.96

*Composition per 2.5kg: Vitamin A 10,000,000 IU, Vit D 2,000,000 IU, Vit E 20,000 IU, Vit K 2250mg, Thiamine 1750mg, Riboflavin 5,000mg, Pyridoxine 27,500mg, Niacin 27500mg, Vit B_{12} 15mg, Pantothenic acid 7500mg, Folic acid 750mg, Biotin 50mg, Choline chloride 400g, Antioxidant 125g, Manganese 80g, Zinc 50g, Iron 20g, Copper 5g, Iodine 1.2g, Selenium 200mg, Cobalt 200mg. ** Cbm = Crab meal.

Table 2: carcass parameters of broilers fed various levels if crab meal as replacement for fishmeal

Parameters	0% cbm	25%cbm	50%cbm	75%cbm	100%cbm
Dressed carcass weight (g)	1646.25±20.18	1604.46±23.04	1609.00.±28.24	1549.68±27.56	1513.38±22.22
%	70.42	69.56	69.90	68.38	66.10
Thigh (g)	316.52±9.16	311.72±7.58	309.68±6.33	91.36±6.04	295.11±8.46
(%)	13.79	13.52	13.45	12.86	12.89
Breast (g)	53270±8.55	524.46±11.35	526.40±9.60	545.00±9.23	533.75±12.16
(%)	22.79	22.74	22.87	24.05	23.31
Head (g)	81.38±3.88	81.43±4.00	76.50±2.87	77.63±4.51	79.05±4.11
(%)	3.48	3.50	3.32	3.43	3.45
Shank (g)	111.74±4.87	107.88±4.80	100.49±3.64	98.00±4.17	103.16±4.66
(%)	4.74	4.68	4.37	4.32	4.51
Neck (g)	83.12±2.16	78.87±2.24	79.98±3.18	79.35±3.15	78.26±2.87
(%)	3.56	3.42	3.48	3.50	3.42
Wing (g)	132.17±1.92	125.67±2.23	122.50±1.65	130.83±2.71	130.17±1.98
(%)	5.65	5.45	5.32	5.77	5.69
Final body weight(g)	233.68	2306.47	2301.72	2266.30	2289.41

Table 3: Organs of Broilers fed various levels of crab meal as replacement for fishmeal

Parameters	0%CBM	25%CBM	50%CBM	75%CBM	100%CBM
Heart (g)	28.85±2.12	24.21^{b}±2.39	25.12^{b}± 1.92	24.25^{b}±.08	23.56b± 1.96
(%)	1.23	1.05	1.09	1.07	1.03
Liver (g)	91.56^{a}±2.00	78.71^{bc}±3.83	84.54^{b}± 3.19	71.73^{c} ± 2.73	68.33^{c}± 3.06
(%)	3.92	3.41	3.67	3.17	2.98
Gizzard (g)	73.04^{c}±1.44	88.58c±4.62	88.93^{b}± 3.17	89.14^{b}± 2.81	96.41^{a}± 3.04
(%)	3.12	3.84	3.86	3.93	4.21
Spleen (g)	3.27=0.56	2.84=0.91	3.04=0.67	2.97=0.51	2.97=0.74
(%)	0.14	0.12	0.13	0.13	0.13

Abc = Means with different letter superscripts are significant different ($p<0.50$)

RESULTS AND DISCUSSION

Carcass parameters of broilers fed crab meal as replacement for fishmeal are presented on Table 2.

Dressed carcass weighed 1646.25g (TI), 1604.46g (T2) 1609.00g (T3), 1549.68g (T4) and 1513.38g (T5) representing 70.42%, 69.56%, 69.90%, 68.38% and 66.10% respectively of the live weight of broilers in the respective treatments. Hossain *et al.* (2003) obtained similar dressed percentage in the range of 64.49% - 66.03% using broiler offal as protein source in diet. Thigh muscle in TI was 13.54% of live weight, 13.52% in T2; 13.45%, 12.86% and 12.89% respectively in T3, T4 and T5. There was no significant difference ($p>0.05$) between treatment means with respect to these two parameters. Weight of breast muscle did not differ significantly ($p>0.05$) too, being 532. 70g, 524.46g, 526.40g, 545.00g and 533.75g respectively in treatments 1-5 which represented 22.79%, 22.74%, 22.87%, 24.05% and 23.31% of body weights. Shank of broilers on control diet (100% fishmeal) weighed 110.74g while those on 100% cbm weighed 103.16g. There was no significant differences ($p>0.05$) between the means of all the treatments as those on 50% cbm diet weighed 100.49g; those on 75% Fm weighed 107.88g and those on 75% cbm, 98.00g. These constituted 4.32% - 4.74% of the body weight which were slightly lower compared with that reported by Amaefule *et al.* (2006). Weight of neck was not affected by replacing fishmeal with crab meal at the levels used in this trial too. Broilers on 100% Fm had significantly ($p<0.05$) heavier heart (28.85g) than those fed crab meal at various levels which weighed 24.21g (25% cbm), 25.12g (50% cbm), 24.25g (75% cbm) and 23.56g (100 cbm).The proportions of hearts by weight to the body weight of broilers (1.03% - 1.23%) in this study were higher than those reported by Ojewola *et al.* (2005) where they used three different animal protein sources including shrimp waste meal and crayfish dust. Mean weight of liver from broilers on 100% Fm diet was also significantly ($p<0.05$) higher than those in other treatments; and those of broilers in groups fed 25% cbm and 50% cbm were higher significantly ($P<0.50$) than those fed higher quantities of crab meal too. Moreover, diets with higher content of crab meal (50%, 75%, and 100%) tend to increase gizzard size, as expressed by the weight, significantly ($p<0.05$) compared to lower crab meal content (25%) and diet with fishmeal only. This may be attributed to increase muscular activity in the gizzard while breaking down more coarse crab meal in diets compared to fishmeal. Gizzard constituted between 3.12% - 4.21% of the body weight of broilers in this experiment which were higher than 2.04 – 2.49% (Ojewola *et al.,* 2005).

The significantly different values observed with heart, liver and gizzard of broilers fed crab meal and fishmeal in this research suggests that there could be some physiological differences in the utilization of these ingredients by these organs due to structural forms. Generally, the lack of significant difference in major carcass parameters including thigh, breast, shank, neck and wing suggests that crab meal can replace fishmeal successfully in broiler ration where available at cheaper rate.

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