REPLACEMENT VALUE OF FISH MEAL WITH HYDROLYSED FEATHER MEAL ON GROWTH PERFORMANCE AND ORGAN MASS OF BROILER STARTER CHICKENS

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Abstract
Replacement values of Hydrolyzed Feather Meal (HFM) for Fish Meal (FM) were evaluated in the diets of starter broiler chickens. Five experimental diets were formulated such that diet A is the control while in diets B, C, D and E fish meal was replaced with 25, 50, 75, and 100% HFM respectively. 165 day old broiler chicks (Arbor Acre) were randomly allocated into the 5 dietary treatments of three replicates with each replicate having eleven chicks. The experimental design was a completely randomized design. Feed and water were supplied ad libitum for 4 weeks (starter phase). The growth parameters measured were feed intake, weight gain and feed to gain ratio. The organ parameters monitored included heart, lungs, kidney, liver, proventiculus, gizzard and spleen, while offals are large and small intestine. Results showed that feed intake, body weight, weight gain and feed to gain ratio were significantly ($p<0.05$) influenced by dietary treatments. Birds fed 25% HFM had a significantly ($p<0.05$) heavier weight, weight gain and reduced feed to gain ratio compared to the others. Parameters obtained from organs and offal weights were also significantly ($p<0.05$) different among the diets except for the lungs, gizzard, and large intestine that were not significantly ($p>0.05$) influenced. The findings revealed that broiler chickens can tolerate hydrolyzed feather meal at the levels studied but best performance was recorded at 25% replacement level.

Key words: Hydrolysed feather meal, broiler chicken, performance, organs.

Introduction
One of the major obstacles facing broiler production, in Nigeria, is the extremely high cost of feed ingredients especially protein feedstuffs. Feed usually account for about 75 % of the total production cost, apart from the scarcity of feed ingredients and the high cost of finished feeds, no single ingredient is capable of providing all nutrients in both quantity and quality for optimal animal production (Isika *et al.*, 2006).

A possible means of maintaining supply of broiler meat all year round at cheaper prices is by reducing the cost of production. Cost of production can be reduced by making use of poultry by-products that are produced locally and characterized by easiness of handling and low prices. Feather, offals and blood meals are the three major poultry by-products that could be exploited in animal farming practices. These by-products are usually dumped around production sites. Feather which is meant to be thrown away as a waste after the processing of birds contains 82% crude protein and 0.6 % crude fiber (Chandler, 2009). Feather meal and fish meal both have comparable amount of minerals and amino acids indicating that feather meal can reduce the cost of production (since it is a waste) and as a result make poultry products affordable for consumers (Madubuike *et al.*, 2009). Isika and Agom (2005) and others reported that poultry feather, offal and blood are alternative protein feed sources, only that they are abundant in some nutrients and deficient in others. Van Der-Poel and El-Boushy (1990) reported that feather meal is a good source of leucine and cystein, 4.65% and 3.92%, respectively while lysine, tryptophan and methionine were the first limiting amino acids.

The focus of this research is to replace the notable animal protein source (fish meal) with hydrolyzed feather meal. Measures of response are performance and organ weight indices.

Materials and Methods
The experiment was carried out at the Poultry Research unit of Ladoke Akintola University of Technology Teaching and Research Farm, Ogbomoso, Oyo State Nigeria.

The hydrolyzed feather meal was supplied by Agro Bar-Magen Nig. Limited and was used in replacing fish meal at 0, 25, 50, 75, and 100% for treatments A, B, C, D and E respectively. A total of 165 unsexed day old Arbor Acres broiler chicks were purchased and randomly distributed into 5 dietary groups. Each treatment contained 3 replicates of 11 birds. The birds were raised on a deep litter system under intensive management and were supplied feed and water *ad-libitum* and all necessary routine management practices were carried out.

Data were collected on feed intake, body weight

gain, mortality and feed conversion ratio for growth indices. At the end of 4th week, (3) birds per treatment (1/replicate) were randomly selected for evaluation of organ mass. The chickens selected were fasted for 24hours, weighed and slaughtered by neck decapitation. Dressed carcass was dissected to enable evisceration; the offals and organs were carefully separated, weighed and measured and expressed as a percentage of live weight. Data were subjected to analysis of variance *using completely randomized design of SPSS (2002). Means were separated for significant difference using Duncan Multiple Range Test of the same package at 5% confidence interval.*

Results and Discussion

Table 1 showed the effect of HFM on growth performance of broiler chicken. The growth performance shows that the total feed intake (TFI), final body weight (FBW), total weight gain (TWG) and feed conversion ratio (FCR) of the birds were significantly ($P<0.05$) different among the diets. Birds in treatment B had the highest TFI (500.7) FBW (1196.7), TWG (1157.1) and the most efficient FCR (1.52) while the least value for FBW (1063.3), TWG (1022.6) and the most inefficient FCR was recorded from the birds on treatment D and the least TFI (476.9) was recorded from treatment E at the end of the experiment. The present result was contrary to that of Ahaotu and Ekenyem, (2009) who reported that birds on control diet performed better than those fed 10% HFM. They attributed the poor performance at higher levels of HFM to the presence of keratin. Moritz and Latshaw (2004) described keratin as a long chain, highly cross-linked and relatively indigestible protein material. It is also possible that the only moderating factor is the hydrolysis that has occurred in the hydrolyzed feather meal which is responsible for the breaking down of the long chain peptides of the protein making it more digestible.

Table 2 showed the effect of HFM on the offals and organs of broiler chicken. Values obtained from the organs and offals revealed that there were significant ($P<0.05$) differences in kidney, heart, spleen, liver, proventiculus, and small intestine of the birds. Ra'fat (2008) reported a heavier small intestine in control fed birds than birds fed feather meal which is contrary to findings of this study. The value obtained from liver was not also in line with that of Ra'fat (2008) who reported that there were no significant differences with the control at 5 % inclusion level of feather meal.

There were no significant differences in lungs, gizzard and large intestine among the treatments. The result complements that of Isika *et al.*, (2006) and Ra'fat (2008). The similar ($P>0.05$) weights observed for gizzard indicated that HFM did not pose extra work on the gizzard, whose musculature could have been more challenged to pulverize the feed particles in all the dietary groups (Isika *et al.*, 2006).

Conclusion

It could be concluded from the result obtained that hydrolyzed feather is a good source of protein and at the levels studied can easily replace fish meal. However the optimum level of 25% was recorded in the present study.

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Table 1: Composition of diets

Treatment / Ingredients	A	B	C	D	E
Maize	52.1	52.1	52.1	52.1	52.1
Soya bean meal	27	27	27	27	27
Groundnut cake	8	8	8	8	8
Wheat offal	5	4.9	4.85	4.8	4.9
Fish meal (72%)	3	2.25	1.5	0.75	-
Hydrolyzed feather meal	-	0.75	1.5	2.25	3
DCP	3	3	3	3	3
Oyster shell	1	1	1	1	1
Lysine	0.25	0.25	0.25	0.25	0.25
Methionine	0.2	0.2	0.2	0.2	0.2
Premix	0.2	0.2	0.2	0.2	0.2
Salt	0.25	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**	**100**
Crude Protein	22.95	23.06	23.18	23.29	23.40
Energy (kcal/kgME)	2908.6	2911.5	2914.5	2917.3	2920.3
Ether Extract	3.82	3.82	3.81	3.81	3.82
Crude Fibre	3.65	3.67	3.68	3.70	3.71
Ash	2.02	2.02	2.02	2.02	2.02

Table 2: Effect of graded levels of hydrolyzed feather meal on growth performance of broiler chicken

Parameters	A	B	C	D	E	SEM
Final Body Weight	1143.3 ^{b}	1196.7 ^{a}	1106.7 ^{b}	1063.3 ^{c}	1093.3 ^{b}	16.87
Total Weight Gain	1101.45 ^{b}	1157.1 ^{a}	1065.9 ^{b}	1022.6 ^{bc}	1053.5 ^{b}	16.68
Total Feed Intake	483.1 ^{b}	500.7 ^{a}	499.4 ^{a}	483.9 ^{b}	476.9 ^{b}	3.8
Feed Conversion Ratio	1.76 ^{b}	1.73 ^{b}	1.87 ^{a}	1.89 ^{a}	1.81 ^{ab}	0.03

a, b,c: Treatment means on the same row with different superscripts are significantly different (P<0.05).

Table 3: Effect of graded levels of hydrolyzed feather meal on organs and offals yield of broiler chicken

Parameters	A	B	C	D	E	SEM
Organs (%)						
Kidney	0.55 ^{a}	0.40 ^{ab}	0.28 ^{b}	0.34 ^{b}	0.65 ^{a}	0.09
Lungs	0.65	0.56	0.65	0.53	0.65	0.15
Heart	0.66 ^{a}	0.48 ^{b}	0.65 ^{a}	0.67 ^{a}	0.71 ^{a}	0.17
Spleen	0.14 ^{a}	0.13 ^{a}	0.14 ^{a}	0.09 ^{b}	0.12 ^{ab}	0.02
Gizzard	3.68	3.66	4.05	3.66	3.72	0.46
Liver	2.66 ^{b}	2.28 ^{b}	3.15 ^{a}	2.61 ^{b}	3.06 ^{a}	0.26
Proventiculus	0.67 ^{b}	0.80 ^{a}	0.75 ^{a}	0.66 ^{b}	0.77 ^{a}	0.12
Offals (%)						
Small intestine	5.01 ^{a}	2.87 ^{c}	3.94 ^{b}	3.50 ^{c}	5.15 ^{a}	0.18
Large intestine	0.53	0.48	0.5	0.55	0.45	0.14

a, b,c: Treatment means on the same row with different superscript are significantly different (P<0.05).