Feather Meal as Enhancer of Protein in Starter Broiler Birds (A Case Study in Ishiagu, Ebonyi State)

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Abstract*—The study was conducted with one hundred and forty-four (144) day old "Sayyed" broiler birds to determine the effect of replacing fishmeal with feather meal on the growth performance and cost benefit analysis of starter broiler birds. The birds were randomly distributed into four treatment groups, each comprising of three replicate per treatment with twelve birds per replicate laid out in a completely randomized design (CRD). Four isocaloric and isonitrogenous diets were formulated with inclusion of the feather meal to replace fishmeal at the rate of 0%, 25%, 50% and 75% corresponding to T1, T2, T3 and T4 respectively. Feed and water were given ad-libitum and relevant drugs and vaccination were duly administered as at when due. Proximate composition of feather meal and the experimental diet were carried out. Data obtained from proximate analysis showed that the feather meal had a crude protein of 79.50%, ether extract of 3.98%, ash content of 4.47%, crude fiber of 1.30% and nitrogen free extract of 1.54%. Growth performance was significantly ($P<0.05$) influenced across the treatments with control having a superior ($P<0.05$) value for final body weight, average daily weight gain and feed conversion ratio with values of 765.41g, 25.50g and 2.28 respectively. Cost benefit analysis showed that profit obtained and cost benefit ratio were superior in treatments 4 (75%) with values of #645.43 and 1.63 respectively. Thus, it can be concluded that feather meal up to the inclusion levels of 75% in the diet of starter broilers to replace fishmeal is viable, without any negative impact on the final weight of the birds and leads also to better profit at the short and long run.*

Keywords*— *Feather meal, fishmeal, starter broilers, growth performance, cost benefit analysis.

I. INTRODUCTION

The significant role played by poultry in the provision of animal protein required by man has made the poultry industry to occupy a prominent position in animal production (Olabode *et al*., 2020). In line with this indispensable position of poultry in protein supply in the daily protein intake, great emphasis is continually placed on research to ensure continued substance of the poultry industry (Ojewola and Annah, 2011). A major challenge is the increasing price of conventional feedstuff with resultant effect of shortage in animal protein and high cost of poultry production and hence poor animal protein intake among Nigerians. Thus, the low level of animal protein intake by Nigerians has generated concerns as it affects both physical and mental development in Nigerian youths and labour force. Among the ways of tackling this 'hydra' headed problem is focusing on the production of animals with higher and faster growth rate, of which one is the poultry birds. According to Olabode *et al*. (2020) poultry birds are the quickest source of meat as it matures very quickly as compared to other livestock produced in the country.

Feather meal is a by-product of processing poultry; it is made from poultry feathers by partially grinding them under elevated heat and pressure and then grinding and drying. Although total nitrogen levels are fairly high (up to 12%), the bioavailability of this nitrogen may be low. Feather meal is used in formulated animal feed and in organic fertilizer (Crawshaw, 2019). Feather meal is made through a process called 'rendering'. Steam pressure cookers with temperatures over 140^{o}C (284^{o}F) are used to "cook" and sterilize the feathers. This partially hydrolyses the proteins, which denatures them. It is then dried, cooled and ground into a powder for use as a nitrogen source for animal feed (mostly ruminants) or as an organic soil amendment. Feathers represents 3-7% weight of the live bird, therefore producing a considerable mass of protein (Soni *et al*., 2019).

II. MATERIALS AND METHOD

The experiment was conducted at the poultry unit of the Animal Production Department, Federal College of Agriculture, Ishiagu, Ebonyi State. The feathers were sourced from Artisan market Enugu in Enugu state where there is surplus heap of feather lying as waste from processed chickens. The feathers were adequately washed and boiled at 140-145^{o}C for about fifty minutes. It was later dried in the sun and ground in the hammer mill using a 1.5mm screen mesh and then incorporated into the diets of the birds at the levels of 0%, 25%, 50% and 75% corresponding to treatments 1, 2, 3 and 4 respectively.

TABLE 1
EXPERIMENTAL DIET FOR STARTER BROILERS FED DIFFERENT LEVELS OF FEATHER MEAL TO REPLACE FISHMEAL

	Treatments			
Ingredients	**T1**	**T2**	**T3**	**T4**
Maize	53.5	53.5	53.5	53.5
Wheat offal	9.5	9.5	9.5	9.5
Soya bean meal	10	10	10	10
Groundnut cake	17.15	17.15	17.15	17.15
Fishmeal	3	2.25	1.25	0.75
Feather meal	0	0.75	1.75	2.25
Bone-meal	2	2	2	2
Limestone	1.5	1.5	1.5	1.5
Bloodmeal	2.5	2.5	2.5	2.5
Methionine	0.2	0.2	0.2	0.2
Lysine	0.1	0.1	0.1	0.1
Starter premix	0.3	0.3	0.3	0.3
Salt	0.25	0.25	0.25	0.25
Total	**100**	**100**	**100**	**100**
Calculated Analysis				
Crude protein (%)	23.4	23.58	23.76	23.94
Met. Energy (Kcal/kg)	2850.74	2846.16	2841.59	2832.02
Crude fiber (%)	3.68	3.59	3.53	3.44
Ether extract (%)	4.08	3.98	3.87	3.68

TABLE 2
PROXIMATE COMPOSITION OF FEATHER MEAL

Components	% Composition
Dry matter	90.79
Moisture	9.21
Crude protein	79.5
Crude fiber	1.3
Ether extract	3.98
Ash	4.47
Nitrogen free extract	1.54

The completely randomized design (CRD) was used. One hundred and forty-four (144) day old "Sayyed" broiler chicks were used for the research work. Each treatment had thirty-six birds with three replicates consisting of twelve birds each. Feed and water were given *ad-libitum* and vaccinations were given as at when due according to standard practices. The initial weight of the birds was taken at the beginning of the study and then subsequently on a weekly basis. Feed intake was also recorded

as the difference between the quantity of feed given the previous day and the quantity that was left the next day. Feed conversion ratio was obtained as the ratio of feed intake divided by the body weight gain. Data collected were subjected to analysis of variance (ANOVA) according to procedure. Significantly different means were separated according to the method of Duncan multiple range test. Proximate analysis of feather meal was carried out using the standard procedure of AOAC (2015). Cost benefit analysis was calculated using the following formulas;

- **Cost of bird =** Amount expended or spent on purchase of bird
- **Cost per kg of feed** = Cost of feed/25kg
- **Cost of feed consumed** = Total feed intake x cost per kg of feed/1000
- **Other cost**
- **Total cost of production**
- **Revenue** = Average final Weight of birds x cost per kg of current market price of 1kg meat of broiler/1000
- **Benefit/Profit** = Revenue – cost of production
- **Cost benefit ratio** = Cost of production/Benefit

III. RESULTS AND DISCUSSION

The performance characteristics of starter broilers fed replacement levels of feather meal was presented in table 3. Dietary effects showed no significant (P>0.05) difference across the treatments studied for average daily feed intake. Value of 90g was observed in treatment 1, which did not differ (P>0.05) from the values of 90.72g, 90.99g and 92.06g obtained for birds in treatments 2, 3 and 4 respectively. The progressive increase obtained numerically in the values of daily feed intake could be due to the low level of energy obtained from control treatment to treatment 4. Oluyemi and Robert (2007) had earlier reported that birds eat to satisfy their energy requirement; the lower the energy in the diet, the higher the consumption rate. This work contradicts the report of Madubuike *et al.* (2009) who observed an increase in the feed intake of broiler birds when feather meal was included in their diets. Also, Caires *et al*. (2010) observed superior (P<0.05) feed consumption in control which was closely followed by those of birds in treatments fortified with feather meal to replace fishmeal at 2.5, 7.5 and 7.5% respectively.

TABLE 3
PERFORMANCE CHARACTERISTICS AND COST BENEFIT ANALYSIS OF STARTER BROILER BIRDS FED FEATHER MEAL AS REPLACEMENT FOR FISHMEAL

	T1	T2	T3	T4	SEM
Parameters	**0%**	**-25%**	**-50%**	**-75%**	**-**
Initial body weight (g)	230	230	230	230	-
Final body weight(g)	965.41^{a}	960.75^{a}	949.19^{b}	938.25^{c}	11.08
Average daily feed intake (g)	90	90.72	90.99	92.06	4.67
Average daily weight gain(g)	35.02^{a}	34.76^{b}	34.21^{b}	33.72^{c}	0.92
Feed conversion ratio	2.57^{bc}	2.61^{b}	2.66^{b}	2.73^{a}	0.03
Cost of day-old chick (#)	450	450	450	450	-
Cost per kg of feed (#)	169.46^{a}	156.34^{b}	142.80^{c}	131.68^{d}	9.36
Cost of feed consumed (#)	320.28^{a}	297.85^{b}	272.86^{c}	254.57^{d}	4.92
Other expenses (#)	350	350	350	350	-
Total cost of production (#)	1120.28^{a}	1097.85^{b}	1072.86^{b}	1054.57^{b}	20.33
Revenue (#)	1700	1700	1700	1700	-
Benefit/Profit (#)	579.72^{d}	602.15^{c}	627.14^{b}	645.43^{a}	14.8
Cost benefit ratio	1.93^{a}	1.82^{b}	1.71^{c}	1.63^{d}	0.04

Results obtained for average daily weight gain revealed that birds in control had a higher ($P<0.05$) value of 35.02g which differ from those of T2 (34.76g) and T3 (34.21g), while 33.72g obtained in treatment 4 had the least value for average daily weight gain for starter broiler birds. The lower level of weight gain obtained in treatments with inclusion level of feather meal could be related to amino acid imbalance and the relatively low digestibility and biological value associated with the feather meal. The results obtained in this study agrees with the observations of Xavier *et al*. (2011) who observed reduced weight gain in starter broiler birds fed diet supplemented with feather meal to replace fishmeal. Effect of diets on feed conversion ratio were significantly ($P<0.05$) influenced. Higher ($P<0.05$) value of 2.73 was observed in treatment 4, which was significantly ($P<0.05$) different from those obtained in treatments 2 (2.61) and 3 (2.66). The lowest value of 2.57 which also represents the most viable treatment was seen in treatment 1. This suggest that the inclusion of feather meal in the diets of starter broiler birds to replace fishmeal could not sustain the increase in weight in relation to the quantity and quality of feed consumed by the birds. This agrees with the report of Ahaotu and Ekenyem (2009) who observed higher feed conversion ratio value in treatments fortified with feather meal to replace fishmeal up to 100% level of replacement. Cost benefit analysis values for benefit/profit and cost benefit ratio were significantly ($P<0.05$) better at the inclusion level of 75% corresponding to treatment 4, which was closely followed by those in treatment 3 (50%) with values of #645.43 and #627.14 and 1.63 and 1.71 for cost benefit ratio respectively. The least value of #579.72 and 1.93 for benefit and cost benefit ratio was reported in treatment 1. This was similar to the work carried out by Olabode *et al*. (2017) who observed better and cost effectiveness in treatments fortified with an alternative source of protein to fishmeal in starter broiler birds.

IV. CONCLUSION

Results obtained from the experiment showed that feather meal up to the level of 75% at starter phase can be used conveniently to replace fishmeal in the diet of broiler birds, without any negative impact on the performance of the birds and also more and better profit can be achieve especially at 75%.

REFERENCES

[1] Ahaotu, OE and Ekenyem, BU (2009). Replacement value of feather meal for fishmeal on performance of finisher broiler chicks. *International Journal of Tropical Agriculture and Food Systems* 3(3); 117-126.

[2] AOAC, (2015). Official Methods of Analysis, 20th Edition. *Association of Official Analytical Chemistry*. Rockville, MD, USA.

[3] Caires, CMI., Fernandes, EA., Fagundes, NS., Carvalho, AP., Maciel, MP and Oliveira, BR (2010). The use of animal by-products in broiler feeds. Use of animal Co-products in broiler diets. *Revista Brasileira de Ciencia Aviccola*, 12(1).

[4] Crawshaw, R (2019). Co-product feeds in Europe; Animal feeds derived from Industrial processing. Lulu.com.

[5] Madubuike, FN., Ekenyem, BU and Ahaotu, EO (2009). Effect of dietary substitution of feather meal for fishmeal on the performance of starter broilers. *Animal Production Research Advance*, 5(1). 1-5.

[6] Ojewola, GS and Annah SI (2005). Nutritive and Economic value of Danish fishmeal, cray fish dust and shrimp meal in finishing broiler diet. *African Journal of Biotech*. 5: 19-25.

[7] Olabode, AD., Ugwuowo, LC., Agu, CI and Ojuoloruntaye, TJ (2017). Lizard meal as protein source enhanced broiler growth at starter phase and reduced cost of production in Ishiagu, Ivo Local Government Area, Ebonyi state. *Nigerian Journal of Animal Production*. 44(5):99-103.

[8] Olabode, AD., Adetutu, OI., Ojuoloruntaye, TJ and Eli, E (2020). Lizard meal as replacement for fishmeal in broiler finisher birds. *International Journal of Agriculture and Biosciences*.9(3): 125-127.

[9] Oluyemi, J.A. and Robert, F.A. (2007). Poultry production in warm wet climate. Golden Wallet press, Ibadan. Pp. 12-19. Revised edition.

[10] Soni, A., Chand, S and Talukder, S. (2017). Feather meal and its nutritional impact. Poultry World, Misset Uitgeverij. B.V.

[11] Xavier, SAG., Stringini, JH., De-Brito, AB., Andrade, MA., Café, MB and Leandro, NSM (2011). Feather meal and blood meal in pre-starter and starter diets for broilers. *Revista Brasileira Zootec*, 40(8), 1745-1752.