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Response of broiler chickens fed single straight diet fortified with fish meal

*Onunkwo, D. N. and Okocha, C. N.
College of Animal Science and Animal Production,
Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria
**Corresponding email: donunkwo1@gmail.com., +2348033388622*

Abstract

This study was carried out to evaluate the growth performance, cut parts characteristics and organ proportions of broiler chickens fed single straight diet fortified with fish meal. The basal diet was augmented with fishmeal to take the crude protein from 22% to 28%. One hundred and twenty day-old broiler chicks were used in this study which lasted for six weeks. The birds were randomly distributed into 4 treatments (T_1, T_2, T_3 and T_4) that were replicated three times with 10 birds per replicate. The replicate T_1, T_2, T_3 and T_4 had different inclusion rate of crude protein which were 22%, 24%, 26% and 28% all with an energy level of 2900kcal/kg. Parameters measured were the initial body weight, final body weight, values calculated include average daily feed intake, average body weight gain and feed conversion ratio. There were no significant differences observed in all the growth parameters measured. No significant differences ($p>0.05$) were observed in the cut parts characteristics and internal organ proportions measured. Taking all the parameters measured into consideration it suggests that in this single straight diet for broiler chicken, there were no adverse effects on their growth performance. Therefore, the four treatment diets were good enough to give body weight in the range of 2-2.5kg that resulted in dressed carcass weight of 1.35-1.5kg, a range of weight that the fast food lines desire.

Keywords: Broiler chickens, fish meal

Introduction

The poultry industry in Nigeria is faced with several problems which have kept production at subsistence level. These problems include inadequate supply of feed at the right quality and quantity to the birds (Egenuka *et al*., 2005). Fish meal has a high crude protein content ranging from 62% to more than 70% (Sauvant*et al*, 2004) and a high amino acid quality (Medale *et al*., 2009). Fish meal has a high biological value in poultry diets not only as a protein source but also as source of minerals such as potassium and calcium and trace elements such as selenium and iodine. Including fish in broiler diet increases the body weight gain and feed intake fish meal has greater impact on growing broilers than on starters. It is highly valuable to young turkeys (Blair, 2009). The nutrients in fish meal aid in disease resistance by boosting and helping to maintain a healthy functional immune system. It also allows for formulation of nutrient-dense diets which promote optimal growth. Fish meal is sought after as an ingredient in aqua culture diets because it contains compounds that make the feed more palatable. This allows the feed to be ingested rapidly.

Materials and methods

Location of study

The study was carried out at the poultry unit of Teaching and Research farm of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. Umudike is located at latitude 5/28 North and longitude 7/31 East of the equator and has altitude of 122 above sea level. Its relative humidity is within the range of 50-82%. The area is characterized b long duration of rainfall and short period of dry season. The average annual rainfall is about 2200mm which is evenly distributed over 8 months (March – November). In 148-155 rainy days with the peaks in June and July and a short break

during August (NRCRI, 2017).

Experimental animal

A total of one hundred and twenty (120) day-old broiler chicks were purchased and brooded intensively in a deep litter system during which they were fed a single straight diet. Before the arrival of the birds, the brooding house and all the equipment needed for rearing the birds were washed. The floor of the pen was also washed with detergent and was disinfected with Izal after which the floor was spread with wood shavings at 2-inches depth. Heat was provided for 24 hours before the arrival of the chicks and during brooding and rearing of the birds. The birds were treated against bacterial infection; the chicks were vaccinated against New castle disease in the first and third week and against Gumborro disease in the second and fourth week. An anti-stress formula (vitalyte) was given to the birds at regular intervals throughout the period of the experiment. Heat was supplied using electric bulb and kerosene lamps. The gross composition of the experimental diet is shown in Table 1

Table 1: Gross composition of the experimental diet

Ingredients (%)	Trt1	Trt2	Trt3	Trt4
Maize	43.00	43.00	43.00	43.00
Soyabean meal	31.00	31.00	31.00	31.00
Fishmeal	2.5	7.00	11.5	16.00
Wheat offal	20.00	15.5	11.00	6.5
Bone meal	3.00	3.00	3.00	3.00
Vit/min/premix	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25
Calculated values	100	100	100	100
Crude protein	22%	24%	26%	28%
ME kcal/kg	2900	2900	2900	2900

Experimental design and management of the experimental birds

The birds were selected randomly and assigned to four (4) treatment groups, each group having 30 birds replicated 3 times (10 birds per replicated) in a completely randomized design (CRD). The birds were weighed at the beginning of the experiment and, thereafter, on weekly basis, while feed intake was recorded daily. Feed and water were provided *at libitum* and routine vaccinations were strictly adhered to. The birds were subjected to standard broiler management conditions. The statistical model is $Yij = \mu + Ti + Eij$

Where

μ = Population mean (Overall mean)

Yij = Observation in the treatment

Ti = Effect of treatment

Eij = Random error

Data collection and statistical analysis

Initial and final body weights of the broilers were measured on arrival to the poultry Farm and at the end of the experiment respectively. Subsequently, body weights and other growth performance parameter were taken at weekly interval throughout the study. All weight measurements were done using electronic weighing scale (OHAUS Champ II). Weight gain was calculated from the difference between the final weight and initial weight. Feed intake and mortality were recorded while feed conversion ratio was calculated. At the end of the 6-week experiment, 3 birds sampled from each replicate were slaughtered. The internal organs were collected and weighed. The carcass analyses were carried out immediately after dressing. Data collected were subjected to analysis of variance

(ANOVA) (Steel and Torrie; 1980) and were mean difference were significant, means were separated using Duncan's Multiple Range Test (Duncan, 1955).

Results and discussion

The growth performance of broiler chickens fed single straight diet fortified with fish meal is shown in Table 2**.** There was no significant difference (P>0.05) observed in the feed intake, average body weight gain, final body weight and feed conversion ratio in all the treatments. The absence of significant difference in feed intake may be caused by the similarity of the metabolizable energy concentration of the diets since birds eat to satisfy their energy requirements (Onu*et al*., 2010). Absence of significance agrees with the works of the following authors: Kalbande *et al*. (2009) who supplemented diets of broilers with different levels of methionine; Bouyeh (2012) who tested excess lysine and methionine on the immune system and performance of broilers; Kaur *et al.* (2013) where performance of commercial broilers were compared after replacing Herbomethione® with DLmethionine in their diets; Egenuka *et al*. (2015) where increasing level of dietary level of blood meal and reduced supplementary lysine were tested on performance of broilers and Ahmed and Abass (2015)who evaluated the broiler performance and carcass characteristics when herbal methionine versus dl-methionine were supplemented in broiler diets.

Broilers fed diets containing 24% and 26% crude protein seemed to have higher daily weight gain values (0.10). Absence of significant difference in daily weight gain is in line with the works of Kaur et al. (2013), Egenuka *et al*. (2015) and Ahmed and Abass (2015). Statistically similar values observed across treatments may be attributable to a more balanced combination of amino acid profile in broiler diets.

Observed absence of significant difference in feed conversion ratio is in line with previous works (Kaur *et al.*, 2013; Egenuka *et al*., 2015; Ahmed and Abass, 2015).

Table 2: Growth parameters of bird fed single straight diet

Parameters	Trt1	Trt2	Trt3	Trt4	SEM
Initial weight (g)	0.084	0.087	0.087	0.089	0.08
Final body weight (g)	2.06	2.23	2.25	2.10	0.05
Av. daily body weight gain (g)	0.009	0.010	0.010	0.009	0.3
Av. daily feed intake (g)	2.92	2.93	3.40	3.40	0.26
Feed conversion ratio (g)	1.47	1.36	1.57	0.69	0.45

The cut parts characteristics of broiler chickens fed single straight diet fortified with fish meal is presented in Table 3**.** There were no significant differences (P>0.05) in the cut parts parameters. Live weight and dressing weight were highest for treatment 3(2025.00 and 1058.00 g, respectively). Absence of significant difference was supported by the findings of El-shinnawy (2015) who supplemented betaine in methionine adequate diet of broilers. It also aligns with the work of Poosuwan *et al. (*2015) who evaluated the effects of varying levels of liquid DL-methionine hydroxyl analog free acid in drinking water on production performance and gastrointestinal tract of broiler chickens at 42 days of age. Dressing percentages were comparable with the highest percentage recorded for the positive control (96.68%) and lowest for negative control (95.69%). Breast meat yield was highest for treatment 2 (533.33) and lowest for treatment 1 (433.33)and 4 (433.33). Breast meat yield constitutes a major portion of protein synthesis and is sensitive to amino acid

status in diets (Jialin *et al.*, 20004). This sensitivity may have contributed to the variations in the breast yield. The observed significant increase in breast muscles was supported by the reports of Bouyeh (2012) and Ebrahimzadeh *et al.* (2013) who checked the effects of chromium methionine supplementation on performance, carcass traits, and the Ca and P metabolism of broiler chickens under heat-stress conditions and El-shinnawy (2015).

Table 3: Cut parts characteristics of birds fed single straight diet

Cut Parts(g)	Trt1	Trt2	Trt3	Trt4	SEM
Live Weight	2006	2023	2025	2010	0.05
Dressed weight	1044	1057	1058	1040	0.04
Thigh	266.67	233.33	250.00	200.00	12.56
Neck	100.00	83.33	100.00	83.33	5.62
Head	66.67	50.00	50.00	50.00	4.17
Drumstick	250.00	250.00	233.33	200.00	12.81
Back	283.33	316.67	300.00	300.00	10.66
Breast	433.33	533.33	483.33	433.33	19.60
Wings	183.33	190.00	166.67	166.67	9.48

The organ proportions of broiler chickens fed single straight diet fortified with fish meal is shown in Table 4**.** The finding from this study showed that the result of the organ parts showed no significance differences ($p>0.05$) in the Small intestine, Large intestine, Spleen, Lungs, Proventiculus, Kidney, Gizzard, Heart, Shank and Liver. This suggests that the diet did not alter any of the organ part in all the treatment groups. Values of intestinal length were relatively comparable which shows their capacity to extract and maximize nutrients from the diets (Sibley, 1981). Absence of significant differences in the weight of liver agreed with the findings of the following authors: Memon *et al*. (2002) when effect of blood meal on the growth and carcass yield of broilers were studied; Khawaja *et al*. (2007) and Nasr and Kheiri (2012) who investigated the effects of lysine levels of diets formulated based on total or digestible amino acids on broiler carcass composition; Ebrahimzadeh *et al*. (2013), El-shinnawy (2015) and Ndelekwute *et al*. (2016) who combined fish meal and blood meal at different proportions and checked for broilers' response in terms of carcass yield and internal organs. Absence of significant differences in the weight of heart and gizzard agreed with the findings of Memon *et al*. (2002) and Khawaja *et al*. (2007).

Table 4: Internal organs proportion of the birds fed single straight diet

Organ Part (%)	Trt1	Trt2	Trt3	Trt4	SEM
Liver (%)	63.33	58.33	58.33	55.00	6.25
Kidney (%)	10.67	12.33	10.83	9.83	0.68
Heart (%)	25.00	25.00	28.83	16.67	1.63
Shank (%)	100.00	100.00	100.00	83.33	4.17
Gizzard (%)	50.00	50.00	43.33	41.67	2.55
Small intestine (%)	100.00	91.67	100.00	83.33	2.82
Large intestine (%)	31.67	15.83	20.83	25.00	2.65
Spleen (%)	6.33	4.67	4.67	14.00	1.72
Crop (%)	15.83	11.67	16.67	20.83	1.88
Lungs (%)	29.17	25.83	20.00	25.00	3.16
Proventiculus (%)	11.67	16.67	12.67	16.67	1.44

Conclusion

The findings from this study it concludes that any of these single straight diet from this work was good enough to give a final body weight of 2-2.5kg that resulted in dressed carcass weight of 1.35kg-1.5kg a range dressed weight that the fast food lines required.

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