Nutritive Value of Locally Prepared Fishmeal (Winnows) on Growth Performance and Economics of Production of Broiler Chickens

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Abstract

An experiment was conducted to assess the replacement value of local fishmeal (winnows) with foreign fish meal on growth performance and economics of production of broiler chickens. One hundred and twenty day old Anak 2000 broiler chicks were randomly allotted to six dietary treatments in which local fishmeal replace foreign fishmeal at 0%, 20%, 40%, 60%,80% and 100%. There were twenty birds per treatment replicated four times (5 birds per replicate) in a completely randomized design (CRD). Results showed that the replacement levels affected daily feed intake, daily weight gain and feed conversion ratio (P<0.05). The replacement value did not affected feed efficiency ratio and survivability (P>0.05). The feed cost was higher in the foreign fishmeal (0%) and lowest in the 100% level of replacement. The feed cost ₦/kg gain was lowest at 60% replacement level as such is the least cost ration. Local fishmeal can replace foreign fishmeal at up to 60% level without deleterious effect on performance with reduction in feed cost.

Keywords: *Fishmeal, Growth performance, Broilers, Economics of production*

Introduction

The protein and energy contents of feed are the major components of the cost incurred on poultry production (Oko *et al*., 2013). The cost of protein in animal production accounts for 65-75% of the total cost of feed production (Haq and Akhtar, 2004). Any complete poultry diet must contain proteins and the nutritional value of protein relates directly to its amino acid composition and its digestibility. Fishmeal is generally accepted as high quality protein supplement for broiler chickens (Solangi, *et al*., 2002). It provides a balance amount of essential amino acids, phospholipids and fatty acids for optimum growth, development and reproduction. Addition of fishmeal in broiler diets increases feed efficiency, growth, feed palatability, digestion and absorption (Miles and Jacob, 2012). The protein contents of various fishmeals vary over a range of about 500–750 g/kg, but the composition of the protein is relatively constant. It is rich in the essential amino acids, particularly lysine, cystein, methionine and tryptophan, and is a valuable supplement to cereal-based diets, particularly where they contain much maize (McDonald *et al*., 2010). It contains all the essential amino acids, especially lysine and methionine in adequate

quantities required for poultry (Singh *et al.*, 1990). Fishmeal is an exceptionally good source of high quality protein 60.00-72.30 (NRC, 1994) energy, minerals, especially calcium, phosphorus, traces minerals (McDonald *et al.*, 1995). The nutrient composition of fishmeal can vary depending on the type and species of fish, the freshness of fish before processing and the processing methods used (Khatoon *et al.*, 2006).Several conventional fishmeal which have been used in Nigeria include Anchovy, Herring, Menhaden and White fish meal (Eyo, 1993). The importance of this fishmeal is on decline in the country because of the high cost, availability and at times adulteration by suppliers (Yisa *et al*., 2013). In Nigeria poultry farmers and feed manufacturers rely on imported fish meal which is expensive and short supply, therefore an alternative source of fish meal must be sought to avoid overdependence on imported fish meal. Different types of fishes exist in Nigeria and winnow fish is selected for this study because the demand is very low in Nigeria due to its small size and stone and sand like properties which make it un pleasant to consumers. The fish spp is available throughout the year. This research reported herein attempt to replace foreign fishmeal with local fish meal (winnows) on growth performance and economics of production of broiler chickens.

Materials and methods

The study was conducted in small animal laboratory of School of Undergraduate studies, College of Education Azare, Bauchi state. Katagum local government is situated in the northern part of Bauchi state, Nigeria. It is located between latitudes 11^0 42' and 11^0 40^0 and longitude 10^0 31' and 10^0 11' east (Anon, 2009). It shares common boundary with Itas/Gadau local government in north west, Jama'are to the west, Dambam to the east, Misau to the south west, Giade to the south and Shira to the southwest (Azare, 2013). It has a landmass of 1,120 square kilometers (NPC, 2009). The climate of the study area is controlled by the inter tropical convergent zone (ITCZ) which is marked by the rainy and dry season. The major climate elements that influence the climate of the study area and affecting the farming system are temperature and precipitation (rainfall), the annual temperature ranged between 22-33^0C from April to May (Bashir *et al*., 2001). The mean annual rainfall ranged between 615.6-985mm with peak between July- August. The study area is in the Sudan savanna, the vegetation is greatly determined by the nature of the soil. The soil in the study area is aerosol with sandy and loamy sand texture and a high percolation rate. The local fishmeal (winnows) was purchased sundried from fish dealers in Azare central market and ground to paste (fishmeal) before incorporating to poultry diets. The commercial fishmeal was purchase from animal care in Kano state and it was certified in the labeled as Herring fish. Six diets were formulated with local fishmeal and imported fishmeal at 0% (control), 20%, 40%, 60%, 80% and 100%. The diets are isocaloric and isonitrogenous and meet the requirements of broiler chickens in the tropics (Oluyemi and Roberts, 2000). The percentage compositions of the experimental diets are shown in Table 2 and 3 for broiler starter and finisher respectively. The fishmeal was analyzed for proximate composition according to AOAC (1990). One hundred and twenty day old broiler chicks were randomly allotted to six dietary treatments. There were twenty chiks per treatment replicated four times (5 birds per replicate) in a completely randomized design (CRD). The birds were fed and given water *ad lib* for fifty six days (56). Records of daily feed intake and daily weight gain were taken. The data generated was used compute feed conversion ratio and feed efficiency ratio. Mortality record was taken. Economics of production was carried out based on prevailing market prices as at the time of the experiment. All the recommended health and management practices were strictly adhered to. All the data generated were subjected to analysis of variance technique (ANOVA) as

described by Steel and Torrie (1980) using the Minitab statistical soft ware. Duncan's multiple range tests was used to separate the means (Duncan's, 1955)

Results and discussion

The proximate composition of locally prepared fish meal is presented in Table 1. Results showed that it contain 52.71% crude protein which is lower than 63.00% reported for herring (foreign fishmeal) in the labeled. The local fishmeal contain 12.26% crude fibre and 6.51% ether extract. The high ash content of locally prepared fishmeal 16.62% can be attributed to small amount of body tissues and high amount of bones in the local fishmeal and these values are in line with earlier reports of Fanimo, (2000). The performance characteristics of broiler chickens fed locally prepared fishmeal are presented in Table 4. Results showed that the initial weight of broiler chickens were statistically similar at the commencement of the experiment ($P>0.05$). The final live weight were affected by the different levels of locally prepared fishmeal ($P<0.05$)(Table 4) . Diet 4 (60% level of replacement) gave the better final weight (2037g) ($P<0.05$) and final weight gain of finished birds in this study partly concurred with 1935-2163g reported by Ingweye *et al*. (2010) who fed broiler chickens with fish and shrimp waste meal and slightly higher than 1729.17-1758.30g reported by Yisa *et al*. (2013). The daily feed intake is affected by the levels of locally prepared fishmeal ($P<0.05$) with diet 4 having the highest value (69.18g) (Table 4) and this can be attributed to the right combinations of local and foreign fishmeal to meet the amino acids of broiler chickens there by stimulating appetite and feed intake (Jassim, 2010). The daily weight gain followed the same trend being relatively higher in diet 4 (30.58g) (Table 4) which is an indication of better feed intake. The feed conversion ratio is affected by the levels of locally prepared fishmeal ($P<0.05$). The feed conversion ratio values are comparable to values of (1.67-3.22) reported by Obun and Ayanwale (2008) in finished broilers chickens. The 60-80% level of inclusion values (2.42) completely differ ($P<0.05$) from 2.27 in diet 4 but statistically similar with other diets. The feed efficiency ratio and survivability were statistically similar ($P>0.05$). The feed cost ₦ /kg and total feed cost (₦) on the control diet are higher than the cost of locally prepared fishmeal, this is because foreign fishmeal are very expensive compared to locally prepared fishmeal and this findings is in agreement with the earlier reports of Obun *et al.* (2005) who reported less cost of feeding broilers with local fishmeal (clupeid) for foreign fishmeal. The feed cost ₦ /kg gain was highest in diet 5 (₦ 172.78) of inclusion of local fishmeal and lowest in diet 4 level of inclusion of fishmeal. Diet 4 is the least cost diet

Conclusion

Considering the results of this study local fishmeal can replaced foreign fish meal up to 60% level without depress in performance with concomitant decrease in cost of production.

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Table 1: Proximate composition of local fishmeal (winnows)

Parameters	Composition (%)
Dry matter	92.62
Crude protein	52.71
Crude fibre	12.26
Ether extract	6.51
Ash	16.62
Energy (MJ kg^{-1})	6.27

Table 2: Percentage composition of the experimental diets fed to broiler starter (1-4 weeks of age)

Ingredients	Levels of locally prepared fishmeal					
	0% (control)	20%	40%	60%	80%	100%
Maize	42.82	42.82	42.82	42.82	42.82	42.82
Full fat soyabean	38.29	38.29	38.29	38.29	38.29	38.29
Imported fishmeal	5.00	4.00	3.00	2.00	1.00	0.00
Local fishmeal	0.00	1.00	2.00	3.00	4.00	5.00
Wheat offal	10.00	10.00	10.00	10.00	10.00	10.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Sodium chloride	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin mineral premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis (%)						
Crude protein	23.00	23.00	23.00	23.00	23.00	23.00
Metabolizable energy (kcal/kg)	2800	2800	2800	2800	2800	2800

Table 3: Percentage composition of the experimental diets fed to broiler finisher (5-8 weeks of age)

Ingredients	Levels of locally prepared fishmeal					
	0% (control)	20%	40%	60%	80%	100%
Maize	48.20	48.20	48.20	48.20	48.20	48.20
Full fat soyabean	30.91	30.91	30.91	30.91	30.91	30.91
Imported fishmeal	5.00	4.00	3.00	2.00	1.00	0.00
Local fishmeal	0.00	1.00	2.00	3.00	4.00	5.00
Wheat offal	12.00	12.00	12.00	12.00	12.00	12.00
Bone meal	2.00	2.00	2.00	2.00	2.00	2.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00
Lysine	0.20	0.20	0.20	0.20	0.20	0.20
Methionine	0.20	0.20	0.20	0.20	0.20	0.20
Sodium chloride	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin mineral premix	0.25	0.25	0.25	0.25	0.25	0.25
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis (%)						
Crude protein	21.00	21.00	21.00	21.00	21.00	21.00
Metabolizable energy (kcal/kg)	3000	3000	3000	3000	3000	3000

Table 4: Performance characteristics of broiler chickens fed locally preferred fishmeal (1-8 weeks of age)

Ingredients	Levels of locally prepared fishmeal						SEM
	0% (control)	20%	40%	60%	80%	100%	
Initial weight (g)	320	322	318	325	320	320	5NS
Final weight (g)	1979 [b]	1896 [b]	1884 [b]	2037 [a]	1838 [b]	1836 [b]	202*
Daily feed intake (g)	68.27 [a]	66.18 [a]	67.21 [a]	69.18 [a]	65.21 [b]	65.10 [b]	4.2*
Daily weight gain (g)	29.62 [a]	28.11 [a]	27.98 [b]	30.58 [a]	27.11 [b]	27.08 [b]	3.2*
Feed conversion ratio	2.31 [a]	2.36 [a]	2.41 [b]	2.27 [a]	2.42 [b]	2.42 [b]	0.16*
Feed efficiency ratio	0.44	0.43	0.42	0.45	0.42	0.42	0.1NS
Survivability (%)	100	100	98	98	98	100	2.0NS
Total feed intake (kg)	3.82	3.70	3.76	3.88	3.65	3.65	21*
Total weight gain (kg)	1.66	1.57	1.56	1.71	1.52	1.52	0.26*
Feed cost (₦/kg)	80.21	78.17	77.61	76.15	75.18	75.00	NSA
Total feed cost (₦)	306.40	289.23	291.81	295.46	274.41	273.75	NSA
Feed cost (₦/kg) gain	184.57	184.22	187.05	172.78	180.53	180.09	NSA

SEM=Standard error of means, abc= Means bearing superscripts within the same raw are statistically different (P<0.05), NSA= Not statistically analyze