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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

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Growth Performance and Carcass Yield of Broiler Finishers Fed Diets Having Partially or Wholly Withdrawn Fish Meal

A.G. Yisa, J.A. Edache, A.D. Udokainyang and C.N. Iloama
Department of Animal Production, Federal College of Animal Health and Production Technology, National Veterinary Research Institute, Vom, Plateau State, Nigeria

Abstract: A four-week study was conducted to investigate the effect of partially or completely withdrawing fish meal from broiler finisher diets on growth performance and carcass yield. In a completely randomized design, ninety six (96) four-week-old Marshall Breed of broilers were allotted to four dietary treatments having 0, 50, 75 and 100% of their fishmeal content withdrawn. Each dietary treatment had 24 birds with 3 replicates of 8 birds. Results show that initial weights, final weights, average daily feed intake, average daily weight gain, feed conversion ratio and feed cost per kilogram gain were not negatively affected (P>0.05) by levels of fish meal withdrawal. Dressing percentages were also not significantly different (P>0.05) between treatment means. However, the percent carcass cut-up parts of breast, wings, thighs and drumsticks to live weight of birds fed diets with fish meal totally withdrawn were significantly less (P<0.05) than those of birds fed diets containing fish meal. From this study, it can be concluded that withdrawing fish meal from broiler finisher diets may not have any adverse effect on their growth performance provided protein is obtained from non-animal sources. However, total withdrawal of fish meal negatively affects optimum development of the cut-up parts and as such 0.5-1% fish meal may be included in broiler finisher diets for full development of carcass components.

Key words: Growth performance, carcass yield, fish meal

INTRODUCTION

The importance of protein in the diets of domestic animals especially monogastric livestock is crucial to their development and growth (McDonald *et al*., 1995). The connective tissues, ligaments, enzymes, hormones, haemoglobin in blood and even the hereditary material (DNA) are all made up of proteins (Aduku, 2004). Animals have specific requirements for amino acids rather than protein. Fish meal and any other feed stuff that contributes protein can simply be thought of as a 'vehicle' providing amino acids in the diet (Miles and Chapman, 2012). Animals build proteins from combinations of 22 amino acids. However, animals cannot make all 22 of these amino acids in their body. Amino acids that cannot be synthesized by the animal and therefore must be supplied in the diet are classified as essential. Monogastric livestock such as swine and poultry, unlike ruminants do not have the capacity for the synthesis of amino acids. Thus nearly all their amino acid requirements must be met through their diet (MacDonald *et al*., 1995). Any complete diet must therefore contain some protein but the nutritional value of the protein relates directly to its amino acid composition and digestibility (Wikipedia, 2013). Fish meal is recognized as a high quality, very digestible feed ingredient that is favoured for addition to the diet of most farm animals. It is an excellent source of protein (Aduku, 2004; Miles and Jacob, 2012). It provides a balanced amount of all essential amino acids, phospholipids and fatty acids for optimum development, growth and reproduction (Miles and Jacob, 2012). Addition of fish meal to animal diets increases feed consumption, feed efficiency and growth through better feed palatability and enhances nutrient uptake, digestion and absorption amongst others (Solangi *et al*., 2002). Therefore, its usefulness in ensuring optimum growth and development in poultry and other monogastric and ruminant species is crucial since it is the most valuable animal protein supplement (Mandal *et al*., 2004).

Fishmeal however, is very expensive because there is greater demand for fish meal for use in aqua and livestock feeds than there is supply (Sangsue *et al*., 2013). Apart from the essential amino acids lysine and methionine, fish meal is the most expensive ingredient per unit weight of all the ingredients used in making poultry feed (Diarra *et al*., 2008; Yisa, 2010). Thus, the need to use as little of it as possible otherwise the cost of feed would be high, thereby increasing cost of production which will result in a reduction or even total loss of profit that can be obtained from the enterprise. This study was therefore carried out to investigate how possible it is to curtail the cost of poultry feeding by reducing or completely removing fish meal from the diet of broiler finishers.

Corresponding Author: A.G. Yisa, Department of Animal Production, Federal College of Animal Health and Production Technology, National Veterinary Research Institute, Vom, Plateau State, Nigeria

MATERIALS AND METHODS

Experimental site: The study was conducted within the premises of the Nigerian Institute for Trypanosomiasis Research (NITR) substation, in Vom, Plateau State, Nigeria. Vom is located south of Jos the Plateau State capital which is approximately 1285 metres above sea level. It has mean annual rainfall of 1328 mm with temperatures ranging between 10 to 28°C with a mean value of 23°C. The mean relative humidity values ranges from 14 to 74% depending on the time of the year (Knudsen and Sohel, 1970; NVRI, 2006).

Experimental Birds and Management: A total of ninety six (96), twenty eight day-old Marshall Broiler breed of mixed sex were used for the study. (During the first 28 days, they were fed with singular broiler starter diet). In a completely randomized design, the birds were weighed and assigned to four dietary treatment groups of 24 broilers, with each treatment having 3 replicates of 8 birds. The birds were then fed the formulated broiler finisher experimental diets having 65% protein fish meal withdrawn at 0 (control), 50, 75 and 100% levels (Table 1) for a period of 4 weeks. The experimental birds were kept in cages with drinkers and feeding trough. Feeding and provision of water was *ad libitum*. All recommended health and management practices were strictly adhered to.

Data collection: Data collected during the study were initial weights, final weights, average daily feed intake and average daily weight gain, feed conversion ratio and feed cost per kilogram gain which was calculated. At the end of the four weeks, two birds having their weights closest to the average were selected from each replicate and slaughtered for carcass evaluation. Processing of the carcass was done using the method described by Hann and Spindler (2002). Percentage of the dressed carcasses and their cut-up pieces (breast, wings, thighs, drumsticks and abdominal fat) to live weight were then obtained.

Statistical analysis: All collected data were subjected to analysis of variance using Statistical Package for Social Sciences (SPSS) version 15 (2006). Differences between means were separated using Least Significant Difference (LSD) in the same package.

RESULTS AND DISCUSSION

Table 1 shows the percent ingredient composition of the experimental diets formulated to contain 20% dietary crude protein and between 2800 and 2820 kcal metabolizable energy per kilogram. The calculated values of protein in the diets are within the range of 20 to 22% recommended by Aduku (2004) and Oluyemi and Roberts (2007) for broiler finishers in a tropical environment (Nigeria). The Metabolizable energy values are however slightly lower than the 3000 to 3100 kcal/kg recommended by the same authors. This may not be a problem because finishing broilers have the ability to perform well on very low energy diets (Farrel, 2005). The calcium, phosphorus and lysine content of all the diets are also consistent with recommended values. The methionine content of the diets (0.43-0.44%) are less than the 0.75% recommendation of Aduku (2004) and Oluyemi and Roberts (2007) for broilers in the tropics but are however slightly higher than the methionine levels of 0.30-0.35% recommended by NRC (1994). The performance of the birds in this study (Table 2), show that there were no significant differences (P>0.05) in all the parameters measured. Growth rate and Feed

Table 1: Ingredient composition of experimental diets

	Levels of fish meal withdrawal (%)			
Ingredients	0	50	75	100
Maize	51.57	51.08	50.85	50.59
Wheat offal	6.45	6.39	6.36	6.33
Rice bran	6.44	6.38	6.36	6.33
Soya bean cake	30.29	31.90	32.69	33.50
Fish meal	2.00	1.00	0.50	0.00
Bone meal	1.25	1.25	1.25	1.25
Lime stone	1.25	1.25	1.25	1.25
Salt	0.30	0.30	0.30	0.30
Premix	0.25	0.25	0.25	0.25
Lysine	0.10	0.10	0.10	0.10
Methionine	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated composition				
M E (kcal/kg)	2820.33	2812.79	2810.15	2805.22
Crude protein (%)	21.07	21.07	21.07	21.07
Calcium (%)	1.02	0.98	0.96	0.94
Phosphorus (%)	0.73	0.71	0.70	0.69
Lysine (%)	1.55	1.54	1.54	1.53
Methionine (%)	0.44	0.44	0.43	0.43

ME: Metabolizable Energy

Table 2: Performance characteristics of broiler finishers fed diets with partly or wholly withdrawn fish meal

	Levels of fish meal withdrawal (%)				
Parameter	0	50	75	100	SEM
Initial weight (g)	509.00	616.60	600.00	586.67	4.28^{NS}
Final weight (g)	1737.96	1708.33	1758.30	1729.17	11.01^{NS}
Av daily feed intake (g)	150.22	153.56	148.58	149.78	3.31^{NS}
Av daily weight gain (g)	41.00	38.98	41.37	40.80	4.18^{NS}
Feed/gain (FCR)	3.66	3.94	3.59	3.67	1.85^{NS}
Feed cost/kg gain (N)	295.80	299.85	264.72	261.95	11.47^{NS}
Mortality	0.00	0.00	0.00	0.00	

SEM: Standard Error of the Mean; NS: Not significant (P>0.05).

Table 3: Carcass yield of broiler finishers fed diets containing partly or wholly withdrawn fish meal

	Levels of fishmeal withdrawal (%)				
Parameter	0	50	75	100	SEM
Live weight (g)	1729.87	1705.39	1754.90	1729.17	11.01^{NS}
Dressing %	65.25	71.17	70.14	66.73	26.18^{NS}
Carcass cuts (% live wt)					
Breast	9.97^{a}	11.49^{a}	9.44^{a}	6.43^{b}	1.02*
Wings	7.98^{a}	6.18^{a}	7.34^{a}	5.06^{b}	0.37*
Thighs	10.62^{a}	8.91^{a}	9.64^{a}	5.60^{b}	1.10*
Drum sticks	8.65^{a}	7.55^{ab}	10.12^{a}	5.31^{b}	0.74*
Abdominal Fat	2.14^{b}	4.06^{a}	2.59^{a}	2.47^{ab}	0.48*

^{a,b,} means in the same row bearing different superscripts are significantly different (P<0.05).

Conversion Ratio (FCR) were similar in all the treatments. Feed cost per kilogram gain reduced slightly but not significantly with levels of fish meal withdrawal. Thus, withdrawal of fish meal from the diet did not have any negative effect on growth performance. This is probably as a result of the availability of amino acids from soya bean cake and essential amino acids lysine and methionine in the diets. These results are consistent with the findings of Nwokoro (2003) who fed 3 oilseed based diets [Groundnut cake (GNC), Groundnut cake and Palm kernel cake (GNC/PKC) and Groundnut cake and Cotton seed cake (GNC/CSC)] to 16-20 week-old cockerels without fish meal in 3 out of the 4 treatments for each diet and reported no significant differences (P>0.05) in weight gain and feed conversion ratio between treatment means. He attributed the similarity of parameters between treatment means to availability of plant protein sources or essential amino acid lysine and methionine supplementation or both. In addition, elimination of fish meal from boiler diets prior to slaughter also gets rid of the characteristic fish smell form the meat without affecting quality of the meat (Jassim, 2010). The same results were also obtained when Salih (2009) fed diets containing 0, 1.5, 3.5 and 5% levels of local, disposed, roasted, fish meal to broiler chickens. He reported no significant differences (P>0.05) in broiler performance between the dietary treatment means.

In Table 3, the value of dressing percentages obtained are consistent with the range of 65-70% reported by Oluyemi and Roberts (2007) but slightly lower than the 71-75% reported by Aduku and Olukosi (2000) without the giblets. The carcass cuts and their percentages of live weight are all lower than the 17.40% for the breast, 8.21% for the wings, 12.95% for the thighs and 11.67% for the drum sticks published by Oluyemi and Roberts (2007). This may be as a result of breed differences. It was however, observed that the carcass cut-up pieces of the broilers fed diets having all the fish meal withdrawn (100% fish meal withdrawal) were significantly less (P<0.05) than the other birds fed diets that contained fish meal.

Conclusion: The withdrawal of fish meal from the diet of broilers in this study did not have any negative effect on growth performance. This is attributed to the amino acids obtained from plant the protein source soya bean cake and lysine and methionine supplements. However, total withdrawal of fish meal from broiler diets had a negative effect on the percentage of cut-up pieces to live weight implying poorer development of the meat yielding parts. This indicates that some level of quality fish meal inclusion is necessary for maximum development of meat yielding parts of broilers and it can thus be concluded that between 0.5 and 1% fish meal inclusion in broiler diets is necessary for optimum development of the broiler body.

REFERENCES

Aduku, A.O., 2004. Animal Nutrition in the Tropics. Feeds and Feeding, Pasture Management, Monogastric and Ruminant Nutrition. Typeset by Davcon Computers and Business Bureau. 11 Baptist Church Road, Samaru, Zaria, Kaduna State.

Aduku, A.O. and J.O. Olukosi, 2000. Animal Products, Processing and Handling in the Tropics. Living Book Series. G.U. Publications. P.O. Box, 2280. Abuja.

Diarra, S.S., B.A. Usman, I.D. Kwari and A. Yisa, 2008. Effects of processing methods on the antinutritional factor and nutritional composition of Saseme (*Sasemun indicum* L) seed. Sahel J. Vet. Sci., 7: 16-20.

Farrel, D.J., 2005. Matching poultry production with available feed resources: Issues and constraints. Worlds Poult. Sci. J., 61: 298-307.

Hann, G. and M. Spindler, 2002. Method of dissection of turkey carcases. Worlds Poult. Sci. J., 58: 179-201.

Jassim, J.M., 2010. Effect of Using Local Fishmeal (*Liza abu*) as Protein Concentration in Broiler Diets. Int. J. Poult. Sci., 9: 1097-1099.

Knudsen, P.B. and A.S. Sohel, 1970. The Vom herd: A study of the performance of a mixed Friesian/Zebu herd in a tropical environment. Trop. Agric. Int., 47: 189-203.

Mandal, A.B., A.S. Yadav, T.S. Johri and N.N. Pathak, 2004. Nutrition and Disease Management of Poultry. First Edition. International Book Distributing Company. Charbagh, Lucknow 226004 u.p. (INDIA).

McDonald, I.P., R.A. Edwards and J.F.D. Greenhalgh, 1995. Animal Nutrition. 5th Edn., Educational Low Priced Books Scheme. (ELPBS).

Miles, R.D. and F.A. Chapman, 2012. The Benefits of Fish Meal in Aquaculture Diets. Institute of Food and Agricultural Sciences (IFAS). University of Florida. http://edis.ifas.ufl.edu/pdffiles/FA/FA12200.pdf. Accessed 23/01/2013.

Miles, R.D. and J.P. Jacob, 2012. Fish meal in Poultry diets: Understanding the production of this valuable feed ingredient. Institute of Food and Agricultural Sciences, University of Florida. http://edis.ifas.ufl.edu/ps007. Accessed 23/01/2013.

National Veterinary Research Institute (NVRI), 2006. Programme of the 80th Anniversary of the National Veterinary Research Institute, Vom. October, 12-18. Vom, Plateau State.

Nwokoro, S.O., 2003. Utilization of Blood, Chicken Offal and Fish meal as Cockerel's Dietary Supplement. Pertanika J. Trop. Agric. Sci., 26: 23-101.

NRC, 1994. National Research Council. Nutrient Requirements of Poultry. 9th Revised Edn., National Academy Press. Washington, D.C.

Oluyemi, J.A. and F.A. Roberts, 2007. Poultry Production in Warm Wet Climates. Spectrum Books Limited, Spectrum House, Ring Road, P M B, 5612, Ibadan, Oyo State, Nigeria.

Salih, G.E., 2009. Effects of inclusion of local disposed roasted fish meal on the performance and carcass characteristics of broilers. Egypt Poult. Sci., 29: 735-745.

Solangi, A.A., A. Memon, T.A. Qureshi, H.H. Leghari, G.M. Baloch and M.P. Wagan, 2002. Replacement of fishmeal by soybean meal in broiler rations. J. Anim. Vet. Adv., 1: 28-30.

Sangsue, D., S. Ramos and R. Payne, 2013. A review of amino acid levels in fishmeal in Southeast Asia. www.feedconferences.com. sitebuildercontent/sitebuilderfiles/dhanapong_txt. pdf

SPSS, 2006. Statistical Package for Social Sciences. Pc Version 15. SPSS Inc. 444 N. Michigan Avenue Chicago, United States of America.

Wikipedia, the free encyclopedia, 2013. Fish meal. en.wikipedia.org/wiki/fish_meal?nutrient_composition.

Yisa, A.G., 2010. Utilization of Differently Processed Pigeon pea (*Cajanus cajan* (L.) Millsp Seed meal by Broilers and Cockerels. Ph.D Thesis, Animal Production Department, Abubakar Tafawa Balewa University, Bauchi, Bauchi State, Nigeria.