ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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International Journal of Poultry Science 4(7): 458-461, 2005
ISSN 1682-8356

Evaluation of Shrimp Waste Meal as a Probable Animal Protein Source for Broiler Chickens

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Abstract: Sixty unsexed Anak broiler chickens were used to evaluate the effect of dietary inclusion of Shrimp waste meal (swm) in broilers diet. They were randomly allotted to four treatment diets which were both isocaloric and isonitrogenous. The text ingredient was included in the four diets at 0.0%, 10%, 20% and 30% respectively for diets 1, 2, 3 and 4, both at the starter and finisher phases. There were 15 birds per treatment and 5 birds per replicate. The trial lasted 8 weeks. The result showed that the dietary treatments had significant ($p<0.05$) effects on body weight gain, feed intake and feed-to-gain ration at the starter phase while the feed-to-gain ratio and weight gain were not significant ($p>0.05$) influenced at the finisher phase. At the starter and finisher phases, average body weight gain ranged from 446.56 to 600.00g/bird and 1096.67 to 1166.67g/bird with corresponding average total feed intake which ranged from 1318.00 to 1462.42g/bird and 2712.00 to 2880.00g/bird. Birds fed diets 1 and 2 had statistically comparable weight gain while those fed diets 3 and 4 were depressed at the starter phase. At the finisher phase all the diets were comparable. The study revealed that swm is a valuable animal protein source for broilers and can be included up to 10% in both starter and finisher broiler diets.

Key words: Shrimp waste meal, broilers diet, animal protein

Introduction

Poultry is the quickest source of meat and its production involves the least hazardous and arduous process in relation to other livestock enterprises (Obioha, 1992). It also suffers no ecological constraints or social taboo. Despite these advantages, most poultry farms have folded up because of the high cost of protein supplements and the incidence of disease. This also has led to the reduction of animal intake of the citizenry. Research interest has therefore been awakened in the area of alternative feed resources which have comparative nutritive value but are cheaper than the conventional protein sources Agunbiade *et al.* (2003). swm is one of the unconventional protein sources of animal origin (Rosenfeld *et al.*, 1997) with a good potential. swm is a by-product of shrimp consisting of mainly the head, guts and exoskeleton of shrimps processed for export and local consumption (Fanimo and Oduguwa, 1999). It is particularly rich in lysine, which makes it an ideal supplement for cereals (Fanimo *et al.*, 1996). It is palatable and has a pleasant aroma. It contain an average of 46.7% crude protein, 27.8% mineral matter (Frank, 1984) and 27% ash (Fanimo *et al.*, 1996). swm is high in calcium and phosphorous. Calcium carbonated is responsible for the scleratization of the exoskeleton and represents most of the mineral matter in swm. Swm can partially or totally replace soybean meal in broiler ration (Rosenfeld *et al.*, 1997) while Fanimo *et al.* (1996) revealed that swm in broiler ration and weaned pig diets can replace up to 66% of the protein contributed by fish meal without significantly affecting the performance. Of major concern with swm is the chemical nature of the exoskeleton of shrimp, which is mainly composed of chitins, an N- acetylated glucosamine polysaccharide that forms part of the protein complex and is considered to have low

Table 1a: Proximate Composition of swm

Nutrient (%)	% Composition on Dry Matter Basis (DM)
Dry matter	99.79
Crude protein	43.71
Ether extract	8.64
Crude fibre	3.60
Ash	17.04
Energy (MJ/kgME)	10.58

Source: Fanimo *et al.*, 1996

Table 1b: Proximate Composition of swm

Nutrient (%)	g/100g (DM)
Crude protein	46.3
Crude fibre	4.3
Ether extract	9.04
Ash	17.04
Chitin	9.82
Calcium	7.00
Phosphorous	3.03
ME(kcal/kgDM)	2500

DM (Dry matter). Source: Fanimo and Oduguwa, 1999

Table 2: Composition of the Experimental Broiler Starter Diet

% Feedstuffs	1	2	3	4
Maize	45.0	45.0	45.0	45.0
Shrimp waste meal	0.0	10.0	20.0	30.0
Groundnut cake	24.0	21.0	11.0	2.0
Brewers dried grain	12.3	13.3	11.3	8.3
Fish meal	5.0	0.0	0.0	0.0
Palm Kernel Cake	10.0	7.0	9.0	11.0
Bone meal	3.0	3.0	3.0	3.0
Vitamin Premix*	0.25	0.25	0.25	0.25
Salt	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	100.0	100.0	100.0	100.0
Calculated analysis:				
Crude protein (%)	22.82	22.49	2.51	22.76
Metabolizable Energy (kcal/kg)	2874	2849	2850	2851
Calcium (%)	1.53	1.91	2.59	3.29
Phosphorous (%)	0.97	1.09	1.33	1.57
Determined analysis				
Crude Protein (%)	22.53	22.25	22.58	22.20

*Composition per 2.5kg diet Vitamin A. 10,000,000m; Vit. B_2, 2,000,000IU; Vit. K.250mgr; Thiamine B_1, 750mg; Riboflarin, B_2, 5000mg, Pyridoxine; B_6 2,750mg; Niacin 27,500mg, Vit. B_{12} 15mg; Pantothenic Acid 7,500mg; Folic acid, 7,500mg; Biotin 50mg, Choline Chloride, 400g, Antioxidant 125g, Manganese 80g, Zinc 50g; Iron 20g, Copper 5g, Iodine 1.2g, Selenium 200mg Colbat, 200mg.

Table 3: Composition of the Experimental Broiler Finisher Diet

% Feedstuffs	1	2	3	4
Maize	56.0	56.0	56.0	56.0
Shrimp waste meal	-	10.0	20.0	30.0
Groundnut cake	16.0	15.0	4.0	0.30
Brewers dried grain	10.30	7.30	9.30	1.00
Fish meal	5.0	0.00	0.00	0.00
Palm Kernel Cake	9.0	8.0	7.0	9.0
Bone meal	3.0	3.0	3.0	3.0
Vitamin Premix*	0.25	0.25	0.25	0.25
Salt	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	100.0	100.0	100.0	100.0
Calculated analysis				
Crude protein (%)	19.67	19.49	19.51	20.71
Metabolizable Energy (kcal/kg)	2972	2951	2946	2947
Calcium (%)	1.51	1.89	2.57	3.24
Phosphorous (%)	0.90	1.02	2.57	1.49
Determined analysis				
Crude Protein (%)	19.28	19.09	19.663	19.99

*Composition per 2.5kg diet Vitamin A. 10,000,000m; Vit. B_2, 2,000,000IU; Vit. K.250mgr; Thiamine B_1, 750mg; Riboflarin, B_2, 5000mg, Pyridoxine; B_6 2,750mg; Niacin 27,500mg, Vit. B_{12} 15mg; Pantothenic Acid 7,500mg; Folic acid, 7,500mg; Biotin 50mg, Choline Chloride, 400g, Antioxidant 125g, Manganese 80g, Zinc 50g; Iron 20g, Copper 5g, Iodine 1.2g, Selenium 200mg Colbat, 200mg.

digestibility when fed to animal (Austin *et al*., 1981). The production of shrimps both in off-shore and Lagos Lagoon amounted to 637,000 metric tonnes in 1990 (Nigerian Agro. Vet. News, 1994). According to Nigerian institution of Oceanography and Marine Research (1991), not less that 3000 metric tonnes of swm is produced annually in South western Nigeria only. This constitutes a natural resource base from which feed millers, Nutritionists and poultry farmers can tap from. This trial was, therefore, carried out to determine the inclusion level of swm that can make for efficient productive performance of broiler chicken.

Table 4: Performance of Broiler Chickens Fed Varying Levels of Shrimp Waste Meal (swm)

(a) Starter Phase (0-4wks)

Parameters (g)	Diets				
	1	2	3	4	SEM
Initial Live weight (g/bird)	700.50[a]	100.30	100.40	100.40	2.36[NS]
Final Live weight (g/bird)	600.00[a]	650.30[a]	546.96[b]	546.96[b]	13.62
Mean total weight gain (g/bird)	29.52[a]	550.00[a]	446.56[b]	446.56[b]	15.23
Mean daily weight gain (g/bird)	1462.42[a]	26.35[a]	21.26[b]	21.26[b]	0.61
Mean total Feed intake (g/bird)	69.64[a]	1391.33[c]	1402.00	1318.00[d]	0.00
Mean daily feed intake (g/bird)	2.44[c]	62.25[c]	66.76[b]	62.76[d]	0.00
Feed-to-gain ratio	100.50	2.52b[c]	3.16[a]	2.97a[b]	0.08

a-d values in same row with different superscripts are significantly different ($p<0.05$).

(b) Finisher Phase (4-8 weeks)

Parameters (g)	Diets				
	1	2	3	4	SEM
Initial Live weight (g/bird)	740.00[a]	680.00[a]	573.33[b]	573.33[b]	13.62
Final Live weight (g/bird)	1926.66	1800.00	1730.00	1670.00	40.60
Total weight gain (g/bird)	1166.67	1116.67	1156.67	1096.67	92.45
Daily weight gain (g/bird)	41.67	39.88	41.31	39.16	1.69
Total Feed intake (g/bird)	2880.00[b]	2712.00[d]	2930.36[a]	2836.66	0.00
Daily feed intake (g/bird)	102.85[b]	96.86[d]	104.86[a]	101.31[c]	0.00
Feed-to-gain ratio	2.48	2.43	2.63	2.64	0.12

a-d values in same row with different superscripts are significantly different ($p<0.05$).

Materials and Methods

Processing of text ingredient: Shrimp waste meal was bought from a local market in Umuahia, Abia State. Nigeria. It was dried under the sun for some days and then milled to fine particles.

Experimental diets and composition: Four isocaloric and isonitrogenous diets were formulated (Table 2 and 3). The text ingredient was included in the four diets at 0, 10, 20 and 30%respectively for diets 1, 2, 3 and 4, both at the starter and finisher phases. Maize constitutes the major energy source while Brewer's dried grain and palm kernel meal were used to adjust for both the protein and energy. The diets were supplemented with 0.1% methionine and lysine respectively.

Experimental animals and their management: A total of sixty unsexed Anak breed broiler chickens purchased from Owerri, Iwo State. Nigeria were individually weighed and then randomly allotted to the four treatment diets. There were 15 birds per treatment and 5 birds per replicate in a completely randomized design. The birds were housed in floor-littered pens under identical environmental conditions. Feed and Water were supplied *ad libitum*. The starter and finisher phases lasted for four weeks respectively. Routine management practices were maintained while vaccinations (Newcastle disease vaccine and infections bursa disease vaccine) and drugs (chicks terramycin and glucose) were administered.

Data Collection: Initial average weight of the broilers was taken on arrival. Average weight and weight gain were taken on weekly basis. Feed-to-gain ratio was calculated by dividing the average feed intake by the average weight gain. Data collected were subjected to analysis of variance (ANOVA) while Duncan's Multiple Range Test (Steel and Torrie, 1980) was used in assessing the significant differences among the treatments.

Results

Table 4 revealed that dietary treatments had significant ($p<0.05$) effects on body weight, feed intake and feed-to-gain ratio at the starter phase which the feed-to-gain ratio and weight gain were not significantly ($p>0.05$) influenced at the finisher phase. At the starter and finisher phase, average body weight gain ranges from 446.56 to 600.00gl bird and 1096.67 to 1166.67g/bird with corresponding average total feed intake which range from 1318.0 to 1462.42g/bird and 2712.0 to 2880.0g/bird. The birds fed Diets 1 and 2 had statistically comparable weight gain which those fed diets 3 and 4 were depressed at the starter phase At the finisher phase all the diets were comparable. Feed-to-gain ratio ranged from 2.44 to 3.16 and 2.43 to 2.64 for starter and finisher phases, respectively Birds fed Diet 1 gave the best feed- to- gain ratio (2.44) at the starter

phase. This was closely followed by bird fed diet 2. At the finisher phase birds fed diet 2 gave the best feed -to-gain ratio (2.43) which was closely followed by diet 1. Body weight gain at starter phase decreased with corresponding increase in the inclusion level of swm from 0 to 30% while they were all comparable at the finisher phase.

Discussion

The decline in performance of bird fed 20 and 30% swm diets especially at the starter phase agree with the finding of Fanimo *et al*. (1996) which states that increased level inclusion of swm in broiler diets leads to an increase in the total chitin content in the diet resulting in low digestibility of nutrients and absorption in the gastro-intestine tract of broiler. The comparable performance observed at the finisher phase could be as a result of maturity and or age . This is because, as the birds increase in age the gastro -intestine tract and absorption capacity become more efficient in carrying -out digestive processes. An indication that older birds were better able to take up chitin than the younger birds. The performance of birds fed diet 1 could be explained by the superiority of fish meal over other animal protein sources.

This study revealed that swm is a valuable animal protein source for broiler and can be included up to 10% level in both starter and finisher broiler diets.

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