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Replacement of Fish Meal by Oyster Meat Meal in Broiler Ration

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Abstract: The study was to evaluate the feasibility of replacing fish meal by oyster meat meal and to estimate the optimum level of replacement in the diet of broiler. 150 unsexed 7 days old "shaver starbro-15" broiler chicks were divided into 5 groups and each group was given any one of the five treatment/diets varying in oyestermeal and fish meal contents T_1,T_2, T_3, T_4 and T_5. Weight gain was significantly improved in the dietary treatment T_3 than that of T_1 at all ages. The weight gain in T_4 significantly improved during 2-8 weeks and was almost similar to T_1 during the period of 2-8 weeks, while theweight gain in T_5 significantly reduced than T_3 but was similar to T_4. Feed consumption was not affected by dietary difference between treatment.

Feed conversion ratios were not influenced by dietary treatment during 2-6 weeks. However, tendency to better utilization of feed was observed in T_3 all the periods and a significant improvement was observed in 7-8 weeks and 2-8 weeks. Protein efficiency in the dietary treatment T_1, T_2, T_4 and T_5 were similar but significantly improved in T_3 in all the periods. T_3 showed significantly better energy efficiency during 7-8 weeks and 2-8 weeks. While it was almost similar in other treatments. The performance indicator factor was the best in the treatment T_3 from all other treatment. The feed cost per kg live weight gain was significantly reduced with the increasing level of oyster meat meal which replaced fish meal.

Key words: Oyster meat meal, broiler, performance, fish meal.

Introduction

In the developing countries, unemployment and malnutrition are two major problems. Poultry production can play an important role to solve these problems in the shortest possible time. It is a specialized business. For survivability of the poultry enterprise, the production cost should be minimum. The cost of feed ingredients has been steadily increasing all over the world.

Plant proteins are usually low in lysine and methionine (Patrick, 1953; Dagir *et al.*, 1963). To prepare a poultry diet certain amounts of animal protein sources like fishmeal or meat meal must be added to the diet in order of balancing the deficiencies of essential amino acids (Scott *et al.*, 1976). These ingredients are also considered for supplying some un-identified growth factors (Bolton and Blair, 1977). Fish meal is the only source of animal protein being used to overcome these deficiencies. But the price of fish meal is very high and is increasing day by day. Therefore, a strong economic incentive exists to find an alternative animal protein source. Oyster *(lamellidens marginalis)* is one of the most common species of mollusca. It is aquatic in nature and found mostly in fresh water pond, lake and river (Ahmed, 1987). The hard coating of oyster is used as calcium supplement for poultry. The muscle which is left is known as oyster meat and its meal is prepared after drying and grinding. Oyster meat meal is cheaply available and can be used as animal protein supplement in the diet of poultry. African giant snail *(Achatina fulica)* of the same phylum-Mollusca containing approximately 60% protein (DM basis) (Creswell and Kompaing, 1981), can safely be used as a substitute for fish meal at a level of 10% in the chick starter ration (Venugopalan *et al.*, 1976). There is a dearth of information about the food value of oyster meat meal as an animal protein source for broiler. This study was therefore, designed to evaluate the feasibility of replacing fish meal by oyster meat meal and to estimate the optimum level of replacement in the diet of broiler.

Materials and Methods

Birds: The experiment was conducted with 150 unsexed 7 days old "shaver starbro-15" broiler chicks. The chicks were individually weighed and ran domly distributed into 5 treatment groups. Each treatment group had 2 replicates of 15 birds. Any of the diet (T_1, T_2, T_3, T_4 and T_5)was given to one of the 5 groups randomly (Table 1).

Collection and preparation of oyster meat meal: The fresh oysters were collected from haor and beal areas and boiled for 20-30 minutes for easy removal of flesh from the shell and after removal it was dried in sun. It was ground by grinder and stored in a plastic bag until its use for experimental purpose.

Preparation of experimental diets: Iso-nitrogenous diets were prepared by replacing fish meal by oyster meat meal (W/W) at a level of 0, 25, 50, 75 and 100% for the diets T_1, T_2, T_3, T_4 and T_5 respectively. The composition of diets and chemical composition of diet were presented in Table 1 & Table 2 respectively. Feed was prepared weekly and hand mixed.

Feeding and management : All mash dry feed was supplied *ad labitum* throughout the experimental period in all the treatments, fresh water was made available for all times. 1083 cm^2 floor space was allocated for each bird. Rice husk was used as litter materials of about 7.62 cm. depth. Light was given for 24 hrs. throughout the experimental period.

Calculation of different parameter: Feed efficiency was calculated through the ratio of feed consumption (g) and weight gain (g). Protein efficiency was calculated by the formula weight gain (g) divided by protein consumption (g). Energy efficiency was obtained by weight gain (g) divided by energy consumption (ME cal), whole multiplied by 100. Performance Indicator factor (PIF) was calculated as Das (1992), i,e.

$$PIF = \frac{\text{Average live weight (kg)}}{\text{Feed conversion ratio}} \times \frac{\text{Livability}}{\text{age}} \times 100$$

Analytical methods and design of experiment: The fish meal, oil cake and oyster meat meal were analyzed for CP, by

Table 1: composition of experimental diet (g/kg) and cost per kg diet (Tk.)

Ingredients	T_1 100% F.M + 0% OMM	T_2 75% FM + 25% OMM	T_3 50% FM + 50% OMM	T_4 25% FM + 75% OMM	T_5 0% FM + 100% OMM
Wheat	450.00	450.00	450.00	440.00	440.00
Rice polish	155.00	155.00	150.00	150.00	150.00
Toil oil cake (30% cp)	220	220	220	230	230
Fish meal s(55% cp)	150.00	112.50	75.00	37.50	-
Oyster meat meal (45% cp)	-	37.50	75.00	112.50	150.00
Soybean oil	15.00	15.00	15.00	15.00	15.00
Bone meal	5.00	5.00	10.00	10.00	10.00
Salt	5.00	5.00	5.00	5.00	5.00
Embavit-B	2.50	2.50	2.50	2.50	2.50
Cost per kg diet (Tk.)	9.44	8.94	8.47	7.98	7.48

Total 2: Chemical composition of the rations (DM basis)

Treatment	CP (g/kg)	ME (MJ/kg)	Ca (g/kg)	Available p (g/kg)
T_1	211.20	12.38	11.84	6.29
T_2	211.70	12.40	11.00	4.83
T_3	210.90	12.36	11.54	5.02
T_4	210.70	12.34	10.98	4.32
T_5	207.30	12.36	10.23	3.96

Table 3: Effect of replacing fish meal by oyster meat meal on the performance of broiler.

Parameter in Different periods	T_1 100% FM + 0% OMM	T_2 75% FM + 25% OMM	T_3 50% FM + 50% OMM	T_4 25% FM + 75% OMM	T_5 0% FM + 100% OMM	Level of significance
Weight gain (g)						
2-6 weeks	559^{ab}	539^{a}	607^{c}	603^{c}	587^{bc}	*
7-8 weeks	409^{b}	354^{a}	457^{c}	357^{a}	390^{ab}	*
2-8 weeks	968^{b}	893^{a}	1063^{c}	960^{ab}	977^{b}	*
Feed consumption (g)						
2-6 weeks	1586	1579	1610	1593	1599	NS
7-8 weeks	1349	1220	1309	1240	1270	NS
2-8 weeks	2884	2799	2919	2833	2868	NS
Feed efficiency						
2-6 weeks	2.84	2.93	2.63	2.66	2.73	NS
7-8 weeks	3.30^{b}	3.45^{b}	2.88^{a}	3.48^{b}	3.26^{b}	*
2-8 weeks	2.98^{b}	3.14^{b}	2.75^{a}	2.95^{ab}	2.94^{ab}	*
Protein efficiency						
2-6 weeks	1.65^{ab}	1.61^{a}	1.80^{c}	1.81^{c}	1.77^{bc}	*
7-8 weeks	1.42^{a}	1.37^{a}	1.67^{b}	1.38^{a}	1.48^{a}	*
2-8 weeks	1.57^{ab}	1.51^{a}	1.74^{c}	1.62^{ab}	1.65^{bc}	*
Energy efficiency						
2-6 weeks	11.92	11.51	12.76	12.83	12.43	NS
7-8 weeks	10.27^{a}	9.79^{a}	11.82^{b}	9.75^{a}	10.39^{a}	*
2-8 weeks	11.36^{ab}	10.76^{a}	12.33^{b}	11.60^{b}	11.53^{ab}	*
Livability (%)						
2-8 weeks	93.33	86.67	93.34	90.00	90.00	NS
Performance indicator factor						
2-8 weeks	69.00^{b}	56.00^{a}	78.00^{c}	63.50^{ab}	67.50^{b}	*
Feed cost (Tk.) per kg live weight gain	28.09^{b}	28.04^{b}	23.29^{a}	23.54^{a}	21.96^{a}	**

The values in the raw with dissimilar superscripts differ significantly.
Ns = non significant (P > 0.05) * = P < .0.5, FM = Fish meal. ** = P < 0.01, OMM = Oyster meat meal.

A.O.A.C (1980) and Ca & P of the oyster meat meal by Walter (1965) and Olsen *et al.* (1954) respectively. The collected and calculated data were analyzed with appropriate statistical model (CRD) (Steel & Torrie ,1980). Significant differences between treatment means were identified by LSD.

Results and Discussion

The effect of replacing fish meal by oyster meat meal on the performance of broiler are shown in Table 3, It is evident that weight gain was significantly ($P < 0.05$) improved in the dietary treatment T_3 from that of T_1 at all ages. The weight gain in T_4 is significantly ($P < 0.05$) improved during 2-6 weeks and was almost similar to T_1 during the period of 2-8 weeks, while the weight gain in T_5 significantly reduced than T_3 but was similar to T_4.

The fifty percent replacement of the fish meal by oyster meat meal gave better weight gain. This might be due to better amino acids balance in the diet T_3 while higher level of replacement gave poorer growth, but was similar to control diet. These indicated that fishmeal can be completely replaced by boiled oyster meat meal in broiler diet. The results are similar with Venugopalan (1976) and Creswell & Kompiang (1981), but disagree with Arockiam *et al.* (1992). Feed consumption was not affected by dietary treatments as it is revealed from non-significant differences between treatments (Table 3). This difference of opinion might be due to shorter

period (less than 15-20 minutes) of boiling the snail in preparing snail meal in their experiment. Feed conversion ratios were not influenced by dietary treatments during 2-6 weeks. However, tendency of better utilization of feed was observed in T_3 all the experimental periods and significantly ($P<0.05$) improvement was observed during 7-8 weeks and 2-8 weeks. The results are similar with Creswell & Kompiang (1981) but disagreed with Arockiam *et al.* (1992). This discrepancy might be due to processing difference of the snail meal. Protein efficiencies in the dietary treatments T_1, T_2, T_4, and T_5 were similar but significantly ($P<0.05$) improved in T_3 in all the periods. The results were similar with Lodhi *et al.* (1974). The improved protein efficiency value obtained in T_3 (1.74) might be due to better amino acid balance. In treatment T_3 significantly better utilization of energy was noted during 7-8 weeks and 2-8 weeks period, while it was almost similar in other treatments. The results obtained in this study were slightly lower than the values reported earlier (Geriglia *et al.* 1983). This variation might be due to difference in ages. The highest percentage of mortality noted in the treatment group T_2 might be due to prevalence of coccidiosis and fowl pox. But the mortality percentage among the treatment groups as statistically non significant.

The performance indicator factor (PIF) was the best in the dietary treatment T_3 which differ significantly ($P<0.05$) from all other treatments. It might be due to higher body weight gain and feed conversion efficiency. Feed cost per kg live weight gain was significantly ($P<0.01$) reduced with the increasing level of oyster meat meal which replaced fish meal, due to lower cost of oyster meat meal than fishmeal. It may be concluded that fishmeal completely replaced by oyster meat meal. However the replacement of 50% fish meal by oyster meat meal seemed to be the best.

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