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EFFECT OF FEEDING LOW PROTEIN BROILER FINISHER DIETS SUPPLEMENTED WITH METHIONINE AND LYSINE ON THE OVERALL PERFORMANCE OF BROILER CHICKS

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ABSTRACT

Research was conducted to determine the extent to which the dietary protein may be reduced with adequate methionine and lysine supplementation. Five hundred broiler chicks were kept on commercial starter diet for a pre-experimental period of twently-eight days. On day-29 post hatching, one hundred and sixty mixed chicks were randomly allotted to four experimental treatments with four replicates per treatment. Chicks were fed four different isocaloric diets formulated to contain 20, 18, 16 and 14% crude protein with appropriate supplementation so as to maintain 1.0% lysine, 0.72% methionine+cystine and adequate methionine in each case. Data on body weight gain, feed consumption, feed efficiency and feed cost per kg body weight gain were recorded. On day 46, three birds per replicate were randomly selected and slaughtered to collected abdominal fat and dressing weight of each bird. The mean body weight gain per chick at the end of experimental period was 1062, 1064, 1074 and 914 g for treatment A, B, C and D, respectively. Results indicated that lowering the crude protein level of the diet-up to 16% with adequate methionine and lysine supplementation had no deleterious effect on body weight gain. There was significant drop in weight gain when the level of crude protein was further reduced to 14%. The mean feed consumption per chick during the experimental period was 2785, 2801, 2836 and 2818 g for treatment A, B, C and D, respectively. The mean feed-gain ratio was 2.62, 2.63, 2.64 and 3.08 for treatment A, B, C and D, respectively. There were no significant differences in the feed efficiency among treatment A, B and C. However, feed efficiency was significantly poor in treatment D (14% crude protein diet). The mean abdominal fat weight per bird was 28.8, 28, 28.1 and 32.2 g for treatment A, B, C and D, respectively. Mean abdominal fat expressed as percent of dressed weight was 2.33, 3.00, 3.02 and 3.58% for treatment A, B, C and D. respectively. The mean dressing percentage at the end of experimental period was 58.0, 57.7, 57.9 and 57.8 percent for treatment A, B, C and D, respectively. The mean cost per kg body weight gain was Rs. 26.46, 26.32, 25.56 and 30.08 for treatment A, B, C and D, respectively. The feed cost per kg body weight gain was the lowest for treatment C having 16% crude protein. These results indicated that the NRC (1984) recommendation of 20% protein for finisher period may be reduced with the required level of methionine and lysine supplementation.

Key words: Poultry, feed, diets supplement, methionine, lysine

INTRODUCTION

Poultry farming is one of the profitable enterprises with bright prospects of increasing the supply of high quality protein for human consumption. Feed cost alone contributes to more than half of the total cost of producing eggs and meat. Economical poultry production is, therefore, possible only when the feed cost is reduced and efficiency of feed utilization is increased. Good performance and optimum economic returns are the primary objectives of feeding program for broilers. One of the several aspects on which investigations have been conducted is the appropriate starter and finisher protein levels for achieving the aforementioned objectives, Ronsh (1982), and Hulan and Proudfoot (1981). The cost of protein and energy components used in commercial broiler diet make up approximately 90% of total feed cost. If dietaray protein could be decreased without adversely affecting performance, production cost could be markedly reduced.

Protein and amino acid requirements are generally considered to decrease with increasing age. In practice the most limiting amino acids are lysine and methionine and if these are present in enough quantities the other amino acids are usually adequate. Uzu (1982) reported that only methionine and lysine were limiting in a 16% crude protein diet for 4-to 7- weeks-old broilers.

Under certain conditions, growth of chicks may be depressed when relatively small quantities of an amino acid are added to diet due to imbalance, antagonism or toxicities. Excess protein, even balanced in essential amino acids, results in a slight decrease in growth, reduction in body fat deposition and increase in uric acid levels in blood. It also results in excess water consumption and higher moisture content in litter.

Broiler chickens fed lower protein diets supplemented with methionine and lysine will perform equivalently to those fed higher protein diets containing only intact protein, provided that a sufficient quantity of the third limiting amino acid is present. The present study was designed with the objectives to determine the effect of low protein diets supplemented with DL-methioine and L-Lysine HCl on feed consumption, body weight gain, feed conversion, abdominal fat deposition and dressing percentage and to determine the cost benefit ratio of low protein diet supplemented with the two critical amino acids.

MATERIALS AND METHODS

This study was planned to investigate the effect of supplementary methionine and lysine to low protein broilers diets on the performance of broiler chicks. The feeding trial was conducted at the poultry farm, NWFP Agricultural University Peshawar.

Five hundred Huburd mixed broiler chicks were obtained from a commercial hatchery and were raised in a conventional broiler house. Locally available commercial broiler starter ration ws given from day-old up-to four weeks.

At the end of 4th week, one hundred and sixty mixed chicks were randomly selected and allotted to four experimental treatments including control. Each treatment was replicated four times with ten chicks per replicate. The chicks in each replicate were transferred to individual pen made up of wood and wire gauze having 1m X 1m floor area. Each pen having ten chicks was furnished with a feeder and a drinker. Wood shavings, 7 cm thick, was spread over the floor in each pen to serve as litter. All these sixteen pens were located in one house under identical environmental conditions. The experiment was started on 20th January and terminated on 6th February, 1999. During the seventeen day of experimental period, the chicks in four treatments were fed four different isocaloric finisher diets, custom prepared in a local feed mill (Table-1). The diets were formulated so as to meet NRC (1984) requirements of lysine and sulfur amino acids.

Feed and water were provided ad libitum under a continuous light schedule during the experimental period. The feed was offered on daily basis and left-over feed was measured on the next day to calculate daily feed consumption for each replicate. The birds were weighed at the beginning of experiment, at weekly intervals and at the end of experiment. The birds were fasted for four hours prior to the determination of weight.

At the end of experiment, three birds were selected at random from each replicate and slaughtered to collect the following data.

1. Live weight per bird
2. Dressing weight per bird
3. Abdominal fat pad per bird

All birds were manually slaughtered. Head, feet, feather with skin and viscera were removed, and the dressed weight was determined.

Dressing percentage was calculated as prechill carcass weight (including the abdominal fat) as percentage of live weight. Abdominal fat were recorded as grams per bird and as percentage of prechill carcass weight.

Feed consumption, body weight gain and feed efficiency values were computed from collected data. Feed cost per kg body weight gain of the experimental rations was determined by calculating the feed required per kg body weight gain and the corresponding cost involved in each treatment.

The performance data were subjected to statistical analysis, using the analysis of variance procedure (ANOVA) in Statistical analysis System (SAS Institute Inc., 1988). The means were compared using Duncan's multiple range test. The statistical model used in the analysis was

$$Yij\kappa = \mu + \alpha i + \beta j + eij\kappa$$

Where

$Yij\kappa$ = k-th observation on the dependant variable in the I-th treatment and j- the replicate.
μ = the population constant common to all records
αi = the effect of i-th treatment; =1,2,…….4.
βj = the effect of j-th replicate; j = 1,2…….....4.
$eij\kappa$ = the random residual term associated with each $Yij\kappa$ assumed to be distributed at NIID with mean zero and unit variance.

The above model does not contains βj when the effect of replicate was not considered.

One kg Vit. Min. premix provides vit. A, 3500,00 IU; vit. D3, 450000 IU; vit.E, 1600 mg; vit. K3, 550 mg; vit. BI 300 mg; vit. B2, 1, 800meg; vit. B6, 300mg; vit. B12, 5,000mg; Viotin, 10mg; Folic acid, 100 mg; L lycine, 5,000mg; DL- methionine, 10,000mg; Choline chloride, 10,000mg; postassium lodide, 250mg; Cooper sulphate, 1,000mg; Cobalt chloride, 50mg; Mannanese sulphate, 25,000mg; Feerrous sulphate, 5,000mg; sodium selenite, 50mg; Zinc sulphate, 10,000mg;

Table 1. Composition of Experimental diets.

Ingredients %	DIETS			
	I	**II**	**III**	**IV**
Corn	23.00	27.00	31.00	36.00
Wheat	29.00	30.00	32.00	32.00
Rice	7.90	7.76	7.61	7.44
Rice Polish	7.00	7.00	7.00	7.00
Corn Gluten-Meal	3.00	2.00	2.00	…..
Soybean Meal	16.00	13.00	10.00	7.00
Fish Meal	8.00	7.00	4.00	4.00
Feather Meal	1.00	1.00	1.00	1.00
DCP	1.00	1.15	1.50	1.53
Salt	0.10	0.10	0.10	0.10
Limestone	0.50	0.60	0.81	0.81
Soybean Oil	2.96	2.68	2.06	2.03
Vit. Min. Premixes*	0.50	0.50	0.50	0.50
DL-methionine	…	0.07	0.12	0.20
L-Lysine Hcl	0.04	0.14	0.30	0.39
Total	**100.00**	**100.00**	**100.00**	**100.00**
Calculated analysis				
ME (kcal/kg)	3128	3133	3116	3137
Crude protein (%)	19.78	18.07	16.17	14.31
Methionine	0.39	0.42	0.43	0.46
Lysine (%)	1.00	1.00	1.00	1.00
Methionine + Cystine (%)	0.72	0.72	0.72	0.72
Available phosphorus (%)	0.46	0.46	0.46	0.46
Calcium (%)	0.90	0.91	0.90	0.90
Cost (Rs./kg)	10.09	10.01	9.68	9.76

RESULTS AND DISCUSSION

The result pertaining to body weight gain, feed consumption, feed efficiency (feed/gain), abdominal fat, dressing percentage, and economic of the experimental rations are presented as follows.

Body weight gain

The mean body weight gain per chick at the end of experimental period was 1062, 1064, 1074 and 914 g for treatment A, B, C and D, respectively. Treatment D, having 14% crude protein had significantly ($P< 0.05$) lower body weight gain as compared to other treatments. Results indicated that lowering the crude protein level of the diet up to 16% with adequate methionine and lysine supplementation had no deleterious effect on body weight gain. The results are in agreement with the observations reported by Daghir (1983) who conducted similar study but used different levels of protein with corresponding level of methionine and lysine supplementation and obtained significantly lower body weight gain at 12% crude protein level as compared to 15 and 18% crude protein. The present study also supports the findings of Uzu (1982) who obtained equivalent growth with broilers fed finishing diets containing 16% protein with methionine and lysine supplementation to levels present in the 20% protein diet. The present findings are also in line with the observations of James et al. (1991) who reported that male broilers fed amino acids levels less than 100%. However male broilers fed the 80 and 90% amino acid diets supplemented with methionine and lysine had body weight gain that were not significantly different from those fed 110 and 120% amino acid levels. They reported that the addition of methionine and lysine to the 70% amino acid diet had no beneficial effect. In their study, there was a difference of almost 7% in the crude protein content of the 70 and 120% amino acid diets.

Feed Consumption

The mean feed consumption per chick during the experimental period was 2785, 2801, 2836 and 2881 g for treatment A, B, C and D, respectively. The feed consumption data, when subjected to statisitical analysis, revealed no significant difference among the treatments. Based on the apparent values, a gradual increase in feed consumption was observed from treatment A to C. Similar findings were obtained by Diambra and McCaraney (1985) who reported no significant difference in feed consumption of broilers receiving finisher diet between 42 to 49 days, containing 9, 12, 15 and 18% crude protein level, with lysine and sulfur amino acids supplementation to the NRC recommended level. Based on the apparent values, a gradual increase in feed consumption was indicated in treatment A to C. This trend was in consistent with the observations obtained by Plavink and Bronstein (1978) who reported that broilers, during the finisher period tended to increase their feed consumption to maintain normal growth when amino acids were at margin or protein was limiting. It is relevant to point out the observations of Lipstein *et al*. (1975) who noted that broilers appear to over eat in an attempt to obtain the limiting amino acid required for optimal growth rate, as long as the deficiency is not severe enough to cause an amino acid imbalance.

Feed Efficiency (feed/gain)

The mean feed gain ratio (feed/gain) was 2.62, 2.63, 2.64 and 3.08 for treatment A, B, C and D, respectively. There were no significant differences in the feed efficiency values among treatment A, B and C. However, feed efficiency was significantly ($p<0.05$) poor in treatment D, the lowest level of crude protein (14%). Similar results were obtained by Daghir (1983) who compared 18, 15 and 12% crude protein diets with methionine and lysine supplementation and reported that the 12% protein level significantly depressed feed efficiency as compared to 15 and 18% protein during the roaster period (6 to 9 weeks). The results of the present study are in agreement with the findings of James et al. (1991) who reported that the addition of methionine and lysine to the 90% amino acid level improved feed efficiency when compared with 90% amino acid treatment with out methionine and lysine supplementation. However, the addition of methionine and lysine to the 70 to 80% amino acid levels was not beneficial. They stated that amino acid imbalance as the most probable reason for the lack of response from methionine and lysine supplementation at the 70 to 80% amino acid level, indicating that there was another limiting amino acid involved. Based on the observations in the present study, it can be concluded that feed efficiency of the diet is not adversely affected if the protein level in the finisher diet is reduced upto 16% crude protein level with appropriate methionine and lysine supplementation.

Abdominal Fat

The mean weight of abdominal fat per bird was 28.8, 28.0, 28.1 and 32.2 grams for treatment A, B, C and D, respectively. Mean abdominal fat expressed as percent of dressed weight was 2.33, 3.00, 3.02 and 3.58% for treatment A, B, C and D, respectively. There were not significant differences in the mean abdominal fat content, expressed as grams per chick, among treatment A, B, C. However, chicks in treatment D had significantly higher abdominal fat content as compared other groups. Abdominal fat expressed as percent of dressed weight, was significantly low ($p<0.05$) in treatment A as compared to the remaining three treatments which were not significantly different among themselves. The increase in abdominal fat content obtained as consequences of decrease in protein level is an agreement with several findings reported in the literature (Mario and Park, 1991; Marks and Pesti, 1984; Lee *et al*.. 1990. Uzu, 1982; Daimbra dn McCartney, 1985). The present findings are also in line with the observations of James *et al*. (1991) who reported that male broilers fed diets containing 120% amino acid level had significantly less abdominal fat than those fed the 70% amino acid level. In their study, there was a difference of almost 7% in the crude protein content of the 70 and 120% amino acid diets.

Dressing Percentage

The mean dressing percentage at the end of experimental period was 58.0, 57.7, 57.9 and 57.8 percent for treatment A, B, C and D, respectively, showing no significant difference among the treatments. Similar results were obtained by Mario *et al*. (1991) who formulated a series of diets contain 15 to 27% crude protein in increments of 2% and reported that there were no significant difference in carcass dressing percentage among male and female broilers fed the different experimental diets. The results of our study are also in agreements with male and female broilers were not significantly affected by amino acid levels fed during the 42 to 49 days period, and Lee et al. (1990) who reported no significant differences between treatments in carcass yield during finishing period by feeding 15, 17 or 19% protein with 1.10% lysine and 0.38 methionine.

Economics of the Experimental rations

The mean cost of feed per kg body weight gain was Rs. 26.46, 26.32, 25.56 and 30.08 for treatment A, B, C and D, respectively. The feed cost per kg body weight gain showed significant differences among the treatments. Treatment D having 14% dietary crude protein had significantly ($p< 0.05$) more feed cost per kg body weight gain as compared to other treatments. Treatment C, having 16% crude protein will have a very favourable effect on the total cost of production and on the net income when the fact is taken into account that thousands of broilers are kept by individual broiler farmers and a net saving of Rs. 1350 per every thousand broilers is accomplished. Similar results were obtained by Lee *et al*. (1990) who reported that feed cost per kg body weight gain was least in 17% protein finisher diet as compared to 15 and 19% when the diets were supplemented with methionine and lysine. The results agree with the findings of Daghir (1983) who reported that net return over feed cost was the highest with 15% protein as compared to 12 and 18% protein diets with appropriate levels of methionine and lysine supplementation.

Table 2. Overall performance of broilers chicks fed different level of dietary protein.

Treatment* (Prot.Level)	Men wt. Gain/ chick (g)	Mean feed consumption/ chick (g)	Mean feed-gain ration (F/G)	Mean abd. Fat/ chick (g)	Mean abd. Fat % of dress. Wt.	Mean dressing %age	Mean feed Cost/ gain (Rs.)
A (20%)	1062 a	2785 a	2.62 b	28.8ab	2.33 b	58.0 a	26.46
B (18%)	1064 a	2801 a	2.63 b	28.0ab	3.00 a	57.7 a	26.32
C (16%)	1074 a	2836 a	2.64 b	28.1ab	3.02 a	57.9 a	25.56
D (14%)	914 b	2818 a	3.08 a	32.2a	3.58 a	57.8 a	30.08

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