EFFECT OF DIFFERENT LEVELS OF DIGESTIBLE THREONINE ON GROWTH PERFORMANCE OF BROILER CHICKS

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ABSTRACT

This investigation was carried out to determine the effects of different levels of digestible threonine on growth performance, dressing percentage and breast meat yield of broiler chicks. One hundred and twenty day old chicks were randomly divided into four groups A, B, C and D which were fed on four diets having (CP 21% and ME 2950 Kcal/kg) with four different levels of digestible threonine 0.678, 0.728, 0.778 and 0.828 % of the dietary CP respectively. On 35th day at the end of the experiment it was observed that the weight gain, feed consumption, FCR, dressing %age and breast meat yield were significantly ($P<0.05$) differed among the experimental groups. The weight gain and feed consumption was increased with an increase in digestible threonine level except the group B in which these parameters were decreased. The group B fed on diet containing digestible threonine level (0.728%) gives best dressing %age, breast meat yield and FCR value. The results of the present study showed that the digestible threonine level (0.728%) gives the best result than other levels.

Key words: Feed conversion ratio, Crude protein, Metabolizable energy

INTRODUCTION

Protein and amino acids perform different functions such as the biosynthesis of tissues and animal products. Protein is amongst the most expensive nutrient of the feed and broilers have high dietary crude protein requirements. Although all amino acids are equally important and none can be stated as unimportant, yet some being relatively more indispensable than others are known as critical amino acids. In poultry nutrition, the essential amino acids are of great concern and of which threonine is the third limiting amino acid after methionine and lysine in diets of broiler chickens (Han *et al.* 1992).

Adequate digestible threonine levels are needed to support optimum growth (Kidd *et al*. 1999) because it serves as important component of body protein and plays an important role as precursor of lysine and serine (Ojano and Waldroup, 2002). Threonine is needed for optimal immune response and gastrointestinal mucine production. It has been reported to improve the livability of heat stressed broilers (Kidd, 2000). Increased dietary threonine concentration is known to improve nitrogen retention in broiler chicks; therefore changing level of threonine concentration is an important tool to improve nitrogen utilization (Dozier, 2001).

An important objective of the least cost formulation of broiler diets is to provide sufficient amounts of most limiting amino acids to support the needs of tissue maintenance and growth (Kidd, 2000). Marginal dietary deficiencies of digestible threonine may result in economic losses from increased feed conversion and reduced breast meat accretion. It is, therefore, important to meet the minimum digestible threonine levels in a broiler diet. As digestible threonine has its role in optimal growth, therefore, meeting the digestible threonine requirement in least cost formulation with the supplementation of crystalline L-threonine may reduce dietary crude protein, which ultimately can reduce the feed cost. Therefore the main objective of present study is to analyse broiler growth and carcass response on varying levels of dietary digestible threonine.

MATERIALS AND METHODS

One hundred and twenty (120) day-old broiler chicks (Hubbard) of mixed sex were used for this study. They were randomly divided into twelve experimental units of ten chicks each. Three replicates were allotted to each treatment randomly. Four isonitrogenous and isocaloric experimental diets were prepared and designated as A, B, C and D. All the rations had a crude protein 21%, metabolizable energy 2950 kcal/kg and digestible threonine levels were 0.678, 0.728, 0.778 and 0.828 percent of the dietary crude protein in rations A, B, C and D, respectively. The rations were fed *ad libitum* to the birds from day one to day thirty-five. Ingredients and nutrients composition of these rations is shown in table-1. In which synthetic threonine was added at different levels 0.00, 0.05, 0.10 and 0.15% to get the desirable levels 0.678, 0.728, 0.778 and 0.828 % of CP in the rations.

Brooding room temperature was maintained at 95°F for first week and later on day and night cyclic temperature was followed. Fresh and clean water and light was made available round the clock throughout the

experimental period. Proximate analysis of ingredients and experimental rations for dry matter, crude protein, crude fiber and ether extract was carried out (AOAC 1990).

At the end of the experiment (35^{th} day), two birds from each treatment were picked up randomly, weighed and slaughtered to record breast meat yield and dressing percentage.

The data on various parameters were subjected to statistical analysis using analysis of variance technique in completely randomized design (CRD) and means were compared by Duncan's Multiple Range test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

The weekly data on average body weight gain, feed consumption and feed conversion ratio was recorded during the experimental period of five weeks. At the termination of the experiment dressing percentage data was also recorded. Overall data recorded during the experiment is presented in table-2.

Feed consumption: The average feed consumption per broiler chick fed on different experimental rations A, B, C, and D was 2995, 2873, 3268 and 3423 gm, respectively. Analysis of variance of the weekly feed consumption data revealed significant differences among the treatments. Maximum amount of feed was consumed by the chicks fed on ration D containing 0.828 percent digestible threonine while minimum amount of feed was consumed by the chicks fed on ration A containing 0.678 percent digestible threonine. Statistical analysis of the data regarding feed consumption revealed significant difference ($P< 0.05$) among the various groups of the diets tested. The findings were supported by Suzuki and Mitsuhashi, (1982) who found that depression in feed intake due to increasing methionine level in the diet was significantly improved by digestible threonine supplementation. The results of the present study demonstrated that feed consumption increased with increasing the levels of digestible threonine except the group B in which the feed consumption was decreased. These results are also in accordance with the findings of Koid and Ishibashi (1995) who reported increased feed consumption by chicks as dietary digestible threonine level was increased. Douglas *et al.* (1996) noted that an improvement in feed consumption due to threonine supplementation in the diet. They further demonstrated that threonine requirement should be 70 percent of lysine requirement in chicken. The findings of Trindade-Riberio *et al.* (1999) also supported our results who reported that threonine levels in the diets had significant effect on feed intake in both sexes of the broiler chicks.

Weight gain: The average weight gain per broiler chick fed on rations A, B, C and D was 1659, 1653, 1742 and 1759 gm, respectively.

Table-1 Composition of broiler rations

Ingredients	Rations			
	A (%)	B (%)	C (%)	D (%)
Corn	53	53	53	53
Soybean meal	30.5	30.5	30.5	30.5
Wheat bran	4.6	4.6	4.5	4.4
Corn gluten meal 60%	3.7	3.65	3.7	3.75
Soybean oil	2.7	2.7	2.7	2.7
Molasses	2.0	2.0	2.0	2.0
DCP	1.7	1.7	1.7	1.7
Limestone	1.3	1.3	1.3	1.3
Premix (Vit.&Min.)	0.5	0.5	0.5	0.5
L-threonine	0.00	0.05	0.10	0.15
Weight gain (gm)	1659	1653	1742	1759
Feed consumption (gm)	2995	2873	3268	3423
Feed conversion ratio(FCR	1.80	1.73	1.87	1.94
Dressing percentage (%)	60.23	63.14	61.25	61.83
Breast meat yield (%)	27.17	30.24	26.54	27.46

Analysis of variance of weight gain data revealed significant differences among the treatments. The group A is significantly differed from the groups C and D but there was no difference between the groups A and B. Similarly the group C significantly differed from group A and B but there was non significant difference among the group C and D. Maximum weight gain (1759 gm) was observed in chicks fed on ration D containing 0.828 percent digestible threonine while lowest weight gain (1653 gm) was noted in chicks fed on ration B containing 0.728 percent digestible threonine. The results of present study revealed that growth rate improved as digestible threonine level was increased from 0.678 to 0.828 percent in the diets of broiler chicks.

Previous work on the digestible threonine requirement of broiler chicks indicated that different levels of digestible threonine in the diets improved the growth performance. The results of the present study are in agreement with those of Robbins (1988) who estimated the threonine requirement of commercial broiler chicks and reported that crude protein levels in excess of 20 percent might influence the threonine requirement. These findings are similar to the results reported by Smith and Waldroup (1988) who offered diets to broiler chicks containing different dietary threonine levels. They observed that weight gain was significantly improved in birds fed on diets containing supplemental threonine as

compared with non-supplementary threonine diets. The results are also in line with the findings of Chung *et al.* (1995) who found that body weight gain improved with increasing levels of dietary threonine. Ojano-Diranin and Waldroup (2002) also reported similar results when threonine was supplemented in the diets of broiler chicks under moderate temperature stress.

Feed conversion ratio: Average feed conversion ratios per broiler chick fed on different experimental rations A, B, C and D were 1.80, 1.73, 1.87 and 1.94, respectively. The statistical analysis of the data revealed significant difference in the feed conversion ratio of chicks in different experimental rations. The best feed conversion ratio was observed in the chicks fed on ration B containing 0.728 percent digestible threonine, whereas, the lowest feed conversion ratio was observed in case of chicks fed on ration D containing 0.828 percent digestible threonine.

Results of our study have been supported by Martinez *et al,* (1999) who reported that the threonine requirement is 70 percent of lysine in the diets for better feed conversion ratio in broiler birds. However, Kidd *et al.* (1996) reported that threonine supplementation did not show any significant improvement in feed conversion ratio in broiler birds. The results of the present study indicated that as threonine level was increased from 0.778 percent, feed conversion ratio was not improved. The results show that threonine supplementation upto 0.778 is ideal.

Dressing Percentage: Dressing percentage was calculated as carcass weight including internal organs viz. heart, liver and gizzard of the bird. The average dressing percentage of chicks on rations A, B, C and D were 60.23, 63.14, 61.25 and 61.83 percent, respectively. The difference among various treatments was found statistically significant ($P<0.05$). The average breast meat yield of broiler birds fed on rations A, B, C and D was 27.17, 30.24, 26.54 and 27.46 percent, respectively.

The results of the experiment demonstrated that breast meat yields of different groups were significantly altered due to higher concentration of digestible threonine in the diets of broiler chicks. There are various reports which suggest that broiler diets containing higher than recommended level of threonine improved edible meat production. Dietary lysine and threonine have been reported to interact on breast meat yield (Kerr *et al.* 1999). Kidd and Kerr (1997) conducted experiment to determine threonine dose responses in broilers which indicated that threonine needs for breast meat yield were higher than that reported for weight gain. Chung *et al.* (1995) reported that body weight gain and feed efficiency improved in both starting and finishing phases as dietary threonine levels increased. They also reported that breast meat yield and thigh meat increased in response to threonine supplementation.

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