

Inclusion of Blend of L-lysine, DL-Methionine and Vitamins D3, E in Diets for Broiler; Effects on Growth Performance, Feed Intake and Conversion and Water Intake

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Abstract: The blend comprising of L-lysine, DL-methionine and vitamins D3, E in diets evaluated for growth performance, water intake, feed consumption and conversion ratio and live body weight in broiler was investigated. The study was performed on 360 day old broiler chickens and divided into four groups i.e. A (control), B, C and D (30 chickens in each group) randomly. The birds were fed blend in the diets; group B (40gm / 50 kg feed), group C (80 gm / 50 kg feed) and group D (120 gm / 50 kg feed). The growth parameters of broilers were significant ($P < 0.05$) high in the diet group D in comparison to C, B and A groups respectively. The broiler in group D consumed more feed (4303.20 g/bird) followed by the broiler in C, B and A groups respectively. The significant difference ($P < 0.05$) was determined in water intake of broilers among the groups. The broiler in group D was gained more live body weight (2301.60 g/bird) followed by the broilers in C (2094.50), B (2009.00) and A (1922.20 g/bird). The broiler in group D resulted superior feed conversion efficiency (1.87); followed by the broilers in group C (1.97). The broiler in groups B and A (control) resulted in lowest feed conversion efficiency (1.99 and 2.00) respectively. Overall, the supplementation of the blend in feed 120gm / 50 kg significantly influence on the feed consumption, water intake, live body weight and growth performance in broiler chickens.

Keywords: Lysine, DL-methionine, vitamins, growth, feed, broiler.

1. INTRODUCTION

Growth promoters are supplemented to poultry and livestock feed in order to efficiently metabolize and utilize feed for the better production and economic benefits. The various growth promoters such as vitamins, amino acids, antibiotics, herbal products and minerals are used in poultry feed [1]. The mechanism

of action of different growth promoters varies and mostly depends upon the nature. Generally, the positive actions are expressed through increasing appetite, improving efficiency of feed consumption and conversion, growth performance, enhancing vitality; maintain intestinal micro-flora and improve immunity and health in different animals [2, 3].

DL-methionine, L-lysine are limiting amino acids are commonly used in poultry diet in order to replace expansive natural protein sources [4, 5]. These amino acids are needed for the protein synthesis in avian

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species [5]. The dietary supplementation of these amino acids had been shown improved growth performance, feed efficiency and immune response in broiler chickens [6, 7].

Often, chicken flocks are suffering from vitamin deficiency; due to intestinal flora can synthesis little amount of vitamins. Therefore, the deficiencies of vitamins under intensive conditions develop stress, abnormal physiological disorders in chickens. For example in chickens, deficiency of vitamin A cause loss of appetite, weakness, poor growth, ruffled feathers, impairment in vision, xerophthalmia, in-coordination and ataxia [8]. Generally, vitamin E is supplemented in diet of broiler to reduce the environmental stress, lipid peroxidase effect and immune-regulatory response [9, 10]. The deficiency of vitamin E may lead to encephalomalacia, muscle dystrophy, exudative diathesis, poor growth and reduced reproductive efficiency [9, 11, 12]. Vitamin D is supplemented in the feed of chicken flocks in the crystalline form known as cholecalciferol (vitamin D3). Vitamin D3 is associated with enhances feed intake and conversion efficiency, live body weight, breast muscle yield and decrease the incidences of rickets and tibial dyschondroplasia [13-17]. Deficiency of vitamins B-complex adversely affects metabolism, appetite, production and growth in chicken flocks. Therefore, supplementation of growth promoters and multivitamin-mineral premix in the feed of commercial chicken flocks are considered to be good for prevention of metabolic disorders and better growth performance [18]. In addition to supplementation of growth promoters and multivitamin-mineral premix in the feed of broiler chickens, the antimicrobial agents are also used. These multivitamins and antibiotic growth promoters are causing decrease in pathogenic and menagemental stress and boost the immune response. Usually, antibiotic growth promoters affecting the gut flora, that are related growth performance and health of birds [19].

The direct fed microbial (*Bacillus amyloliquefaciens*) derived from and the basal diet comprising of antibiotic growth promoter (virginiamycin) were supplemented in the feed of poultry flocks. Chicken flocks fed DFM and virginiamycin diets exhibited improvement in the feed consumption and utilization, feed conversion ratio, growth performance and live body weight [20]. It has been reported that broiler chickens fed diets containing antibiotic, probiotic, phytobiotic and symbiotic as the growth promoters. These productive indicators in the diets promoted feed intake and conversion, live body weight. However,

symbiotics and probiotics productive indicators showed better results than antibiotics, and phytochemicals in the diets chickens [21]. The supplementation of phytochemical and digestarom growth promoters in the diet enhanced growth of broiler chickens [22]. The effect of growth promoter and multivitamin-mineral premix supplemented in the diet of broiler chickens indicated the improvement in body weight gain and growth performance [23]. Also, supplementation of organic acids such as; butyric acid fumaric acid and lactic acid in the diet of broiler chickens were shown increased in body weight gains but caused decrease in the caecal viable coliform counts [24].

In normal commercial practices, different blends of vitamins, amino acids and antibiotics are supplemented in the feed of broiler chicken flocks in order to boost the immune response and growth performance. However; their role in growth performance needs further attention in poultry industry. In this regard, present study was designed to evaluate the influence of blend comprising of DL-methionine, L-lysine and vitamins D3, E in diets for broiler.

2. MATERIALS AND METHODS

Three hundred sixty (360) day-old broiler chickens were purchased from Hyderabad, Pakistan were used in this study. Chickens were weighed and distributed into four groups i.e. A (control), B, C and D (30 chickens in each group) randomly. The formulated diets supplemented with the blend (containing L-lysine, DL-methionine and vitamins D3, E at the rate of 40g, 80g and 120g and were fed to group B, C and D, respectively for six weeks.

2.1. Treatment Plan

The blend composition (Table 1) was incorporated in the basal ration at different levels with a control group. The proposed rations was formulated (Table 2) according to the recommendation of NRC (1994) [25].

Table 1: Composition the Blend Feed Premix for the Diets of Brioler

Ingredients	Each 1000 gm contains
Vitamin D3	2 gm
Vitamin E	9 gm
Choline Chloride	100 gm
L-Lysine	25 gm
DL-Methionine	50 gm

Table 2: Proposed Feed Formulation of Starter and Finisher Ration (%)

S. No.	Material	Starter				Finisher			
		Control A	Group B	Group C	Group D	Control A	Group B	Group C	Group D
1	Rice	25	25	25	25	26	26	26	26
2	Maize (corn)	25	25	25	25	25	25	25	25
3	Rice polish	3	3	3	3	3	3	3	3
4	Fish meal	10	10	10	10	9	9	9	9
5	Soyabean meal	7	7	7	7	7	7	7	7
6	Guar meal	3	3	3	3	3	3	3	3
7	Canola meal	15	15	15	15	15	15	15	15
8	Sunflower meal	6	6	6	6	6	6	6	6
9	C.G 30%	3	3	3	3	3	3	3	3
10	C.G 60%	2	2	2	2	2	2	2	2
11	L-lysine	0.32	0.32	0.32	0.32	0.32	0.32	0.32	0.32
12	DLM	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
13	Lime stone	0.11	0.11	0.11	0.11	0.11	0.11	0.11	0.11
14	DCP	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
15	Blend	0	0.04	0.08	0.12	0	0.04	0.08	0.12
16	Premix	0.24	0.2	0.16	0.12	0.24	0.2	0.16	0.12
	Total	100	100	100	100	100	100	100	100
CHEMICAL COMPOSITION OF THE PROPOSED RATION									
i	Energy (ME/kcal)	2813.6	2813.6	2813.6	2813.6	2813.6	2813.6	2813.6	2813.6
ii	Crude protein	21	21.00	21.00	21.00	21.00	21.00	21.00	21.00
iii	Lysine	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
iv	Methionine	0.56	0.56	0.56	0.57	0.56	0.56	0.56	0.57
v	Calcium	1.077	1.077	1.077	1.077	1.077	1.077	1.077	1.077
vi	Available phosphorus	0.518	0.518	0.518	0.518	0.518	0.518	0.518	0.518

2.2. Management

2.2.1. Housing

Floor housing systems was provided to experimental birds, and each bird allocated one square foot space. Before housing of birds, the farm was thoroughly washed, cleaned and disinfected. Entire shed treated with limestone and allowed to dry for 24 hours.

2.2.2. Brooding and Lighting

One day before the housing of chicks artificial brooding was prepared. Each group of the birds was allocated one brooder. During first week, brooding temperature was maintained at 90°F and about 5°F was reduced each subsequent week till 70°F accordingly.

2.2.3. Litter Management

The litter of the house consisted of rice husk. Initially, litter was dried using sunlight for 12 hours and observed for thick particles that were taken out to maintain litter quality.

2.2.4. Vaccination

The broilers of all groups were vaccinated against various diseases protection according to schedule recommended by Pakistan Poultry Association, Hyderabad, Sindh, Pakistan.

2.3. Body Weight (Live) Gain

Before the start and end of the experimental period each bird was weighed using electric weight balance. Also the weights of birds were noted at the each week during the entire experimental period.

2.4. Feed Intake

Feed was provided *ad libitum* two times in a day to each group and consumed and un-consumed feed was calculated on daily basis. For this practice, the following formula was used:

$$\text{Feed intake (g/b/d)} = \frac{\text{Total feed offered} - \text{Total feed refused}}{\text{Total broiler (\#)}}$$

2.5. Water Intake

Each group of experimental chickens was given fresh water. Water intake and refusal were measured on daily basis. Water intake was recorded by using the following formula:

$$\text{Water intake (ml/b/d)} = \frac{\text{Total water offered (ml)} - \text{Total water refused (ml/group/d)}}{\text{Total broiler (\#)}}$$

2.6. Feed Conversion Ratio

Feed conversion ratio (FCR) was measured on the basis of total feed consumed by a broiler bird for gaining one kg weight. The following formula was used:-

$$\text{FCR} = \frac{\text{Total feed intake}}{\text{Total live body weight}} \times 100$$

2.7. Statistical Analysis

Mean and standard deviation were calculated. The statistical analyses were performed with F-test using the Proc-GLM procedure of SAS (Statistical analytic System Ver. 9.2). Multiple comparisons were carried out by student's t-test using SAS (Statistical analytic System Ver. 9.2).

3. RESULTS AND DISCUSSION

3.1. Growth Performance

The blend was supplemented in the broiler ration at the concentrations of 0, 40 g/50kg feed, 80 g/50kg feed and 120 g/50kg feed. In the current study all the growth parameters of broilers was significantly ($P < 0.05$) higher when their ration was added with growth promoter (120 gm/50 kg feed) followed by (80 gm / 50 kg feed) and (40gm/50 kg feed). Previously, dietary supplementation of lysine and methionine caused improvement in growth performance in broiler [26]. In contrast lowest values for all the growth were observed in control group, where broiler ration neither supplied

the growth promoter in feed. Similar results were observed fed lysine and methionine containing diets for broiler [27, 28]. The variation in growth performance of broiler fed growth promoter might be due to prebiotics are indigestible nutrient component on which beneficial bacteria in colon and caecum utilize as substrates [29, 30].

3.2. Feed Consumption (g/bird)

The results (Figure 1) indicates that broiler in group D consumed more feed intake (4303.20 g/bird) followed by the broiler in group-C (4131.10 g/bird) and group-B (4007.20 g/bird). The broiler in group A (control) took lowest feed intake (3851.91 g/bird). The results further revealed that maximum feed intake was recorded in group D where the broiler ration added with the blend at the rate of 120 g / 50 kg feed followed by group C (80 g/50 kg feed) and B (40 g/50 kg feed). Similarly, it has been documented that feed intake efficiency increased with supplementation of lysine, methionine and vitamin E [27, 28]. Statistically, significant difference ($P < 0.05$) was noted in feed intake of broilers between the groups. It has been reported that feeding amyloliquefaciens and virginiamycin as growth promoters promoted feed intake in broiler chickens. Similarly virginiamycin, ferulago angulata and Scrophularia striata diets improved feed consumption in poultry flocks [30]. In contrast, supplementation of probiotic in the diet reduced feed intake in broiler chickens [21].

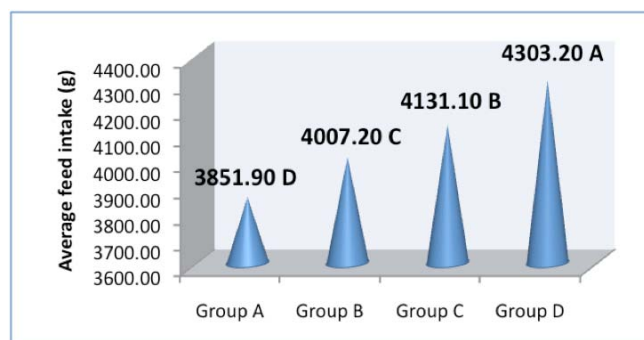


Figure 1: Feed intake (g/bird) of broiler supplemented different levels of the blend.

SE±	=	16.243
LSD @ 0.05	=	19.768
P-value	=	0.0001

Group A = Control.

Group B = 40gm blend/ 50 kg feed.

Group C = 80gm blend/ 50 kg feed.

Group D = 120gm blend / 50 kg feed.

3.3. Water Intake (ml/bird)

The results shows that the broiler in group D took highest volume of water (8606.50 ml/bird), followed by the broilers in group-C (8262.20 ml/bird) and group-B (8014.30 ml/bird) (Figure 2). The broiler in group-A (control) where the broiler feed was not supplemented with the blend took minimum volume of water (7703.90 ml/bird). It was observed that maximum water intake was recorded in group D where the broiler ration added with the blend at the rate of 120 g / 50 kg feed followed by group C (80 g/50 kg feed), and B (40 g/50 kg feed). The supplementation of insoluble fiber from rice, oat and sun flower in diets of broiler chickens increased water intake [31]. In this study, significant difference ($P<0.05$) was noted in water intake among the broilers groups. While, water intake was not influenced with fed 6% concentrated aniseed extract in broiler chicken flock did not influence water intake [32].

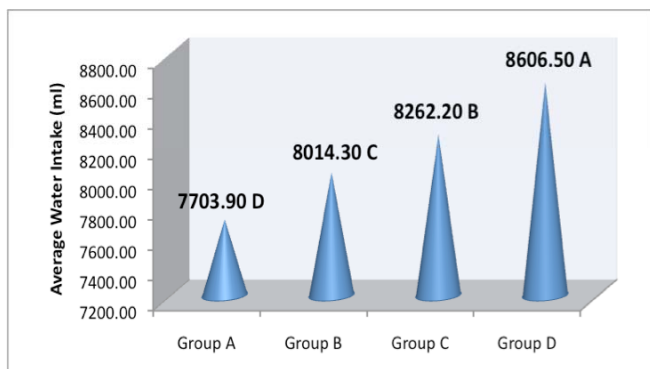


Figure 2: Water intake (ml/bird) of broiler supplemented different levels of the blend.

SE \pm = 24.681
LSD @ 0.05 = 33.486
P-value = 0.001

Group A = Control.

Group B = 40gm blend/50 kg feed.

Group C = 80gm blend/ 50 kg feed.

Group D = 120gm blend / 50 kg feed.

3.4. Body Weight (g/bird) Live

The live body weight is mainly influenced by the quality of feed and ingredients of its composition. The results (Figure 3) indicated that the live body weight of broilers in this experiment varied significantly ($P<0.05$) when their feed was supplemented with the blend at different levels. The broiler in group D gain more live body weight (2301.60 g/bird) followed by the broilers in group C (2094.50) and group B (2009.00). The broiler in group A (control) resulted in lowest live body weight

(1922.20 g/bird). It was observed that the live body weight of broilers inclined with the blend upto 120 g/50 kg feed; and declined with 80 g/50 kg feed and 40 g/50 kg feed. This indicates that excessive addition of the blend returned more in the live body weight of broilers; and the blend at level of 120 g/50 kg feed would be an optimum level for broilers. Similar findings regarding the addition of onion, virginiamycin, ferulago angulata and scrophularia striata as growth promoters in the diet broiler chickens increased live body weight [32, 34]. The difference in live body weight between groups was significant ($P<0.05$).

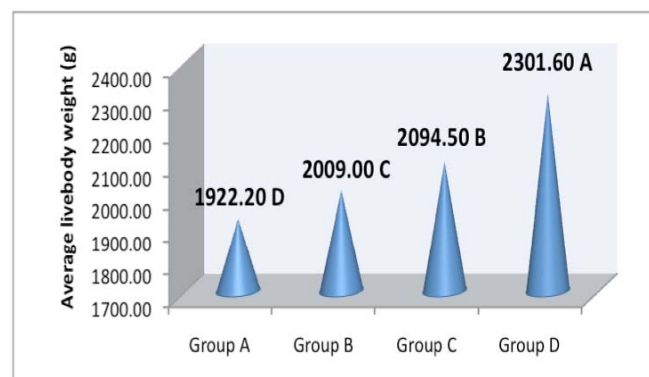


Figure 3: Live body weight (g/bird) of broiler supplemented different levels of the blend.

SE \pm = 9.716
LSD @ 0.05 = 11.256
P-value = 0.0001

Group A = Control.

Group B = 40gm blend/ 50 kg feed.

Group C = 80gm blend/ 50 kg feed.

Group D = 120gm blend / 50 kg feed.

3.5. Feed Conversion Ratio (FCR)

The feed conversion ratio indicates the amount of feed consumed by the broiler for gaining one kilogram live weight and lowering trend of its values indicates improvement in the feed conversion efficiency. The results (Figure 4) showed that feed conversion ratio of a six weeks broiler flock was significantly ($P<0.05$) affected by the feed supplemented with various levels of the blend. The broiler in group D resulted superior feed conversion efficiency (1.87); followed by the broilers in group C (1.97). The broiler in groups B and A (control) resulted in lowest feed conversion efficiency (1.99 and 2.0), respectively. The results suggested that the feed conversion efficiency of broilers improved in broilers of group D as compared to group C. However, differences in feed conversion efficiency between groups were linear and significant ($P<0.05$). It has been

reported that the increase in live body weight and feed conversion ratio may be due antibiotic growth promoters. As antibiotic growth promoters enhance the nutrient absorption and inhibit harmful bacteria that lead to growth suppression [35, 36]. Similar findings regarding feed conversion ratio with fed growth promoter were obtained by previous reports [37, 38].

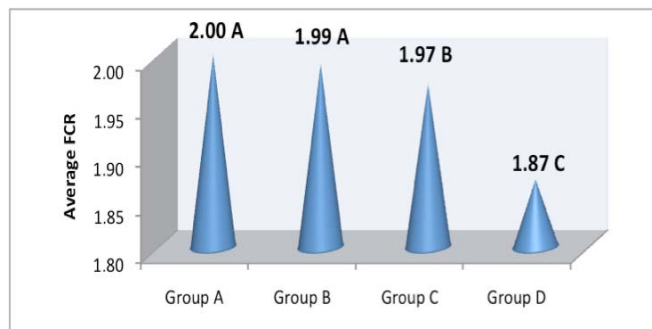


Figure 4: Feed conversion ratio of broiler supplemented different levels of blend.

SE \pm = 8.2663

LSD @ 0.05 = 10.2431

P-value = 0.002

Group A = Control.

Group B = 40gblend/ 50 kg feed.

Group C = 80gblend/ 50 kg feed.

Group D = 120gm blend/ 50 kg feed.

4. CONCLUSION

In conclusion, the growth performance of chicken flock was increased when the blend incorporated at the rate 120 gm / 50 kg feed. The overall data revealed that the use of blend in the diet had a significant effect on growth, water intake, feed consumption, and feed conversion ratio and body weight (live) in broiler flocks.

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