



Performance of Commercial Broiler Chicks as Affected by the Supplementation of both Probiotics and Enzymes

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ABSTRACT

The objective of this study was to evaluate the influence of probiotics and enzymes on performance of commercial broiler chicks. Two enzyme levels (without and with enzyme supplementation) were considered for the study. The experiment consisted of two replicates for enzyme groups. The performance of broiler was evaluated in terms of growth and feed efficiency at 6th week of age. Data were analyzed on survivor and equal number of bird's per subclass basis. Analysis of variance revealed that the difference between replicates were not significant for the different traits under study as such all subsequent analysis was performed on combined sex basis. Inclusion of enzyme in diet had highly significant effect in both the sexes. Group of chicks fed with diet E (with enzyme) were significantly heavier than those fed with diet E₀ (without enzyme) at second week body weight. It indicates that the enzyme supplementation had weighty effect on early growth of chicks. Inclusion of enzyme in diet had significant effect at third week age of body weight, the group of chicks fed with enzyme supplemented diet (E) had significantly higher body weight than the group fed without enzyme supplemented diet (E₀). It indicates that inclusion of enzyme in diet had positive effects on growth of chicks. Inclusion of probiotics and enzymes revealed significant effects on body weight. Chicks showed higher body weight with diet having probiotics and enzymes.

Keywords: Probiotic, Enzymes, Performance, feed efficiency, Chicks

About 85-90 per cent of poultry feed consists of raw materials. About 2/3 of the phosphorus in raw materials is present in the form of phytate phosphorus. Phytate phosphorus is not available to poultry. By incorporation of phytase enzyme, phosphorus can be released from phytate phosphorus which enables birds to utilize it. Biotechnology of this nature saves lot of dicalcium phosphate which is otherwise scarce and costly commodity. The biotechnological developments in the field of animal production involve at least four major areas:-Improvement of Poultry species through recombinant DNA technology and gene transfer technology, the management of health and welfare. Prospects for manipulation of physiology and biochemistry and Improvement of crops and feeds for the production and upgrading of feed stuffs.

The antinutrients in poultry diets like high crude fiber and presence of various non-starch polysaccharides increase the passage of feed in poultry thus reducing the nutrient

supply. Poultry do not produce enzymes like cellulose, hemicellulose and betaglucanase which are required for digestion of cell wall of plant materials. Dietary addition of enzymes will have following practical benefits: -High fiber diets which the birds cannot digest are broken down and more nutrients made available. Better utilization of low quality feeds and Production improvements by increased live weight gain, higher feed conversion ratio reduced sticky dropping and better livability of birds.

Probiotics have been introduced as an alternative to antibiotics. The use of antibiotics as routine feed additives has been banned in some countries because of public concern over possible antibiotic residual effects and the development of drug-resistant bacteria. The commercial use of probiotics in poultry industry is relatively new. Probiotic represents a single or mixed culture of live microorganisms which when applied to animals, affects the host beneficially by improving the properties of

indigenous microflora. Probiotics come under the category of as generally recognized as safe (GRAS) ingredients classified by Food and Drug Administration (FDA). They have no side and residual effects. Probiotics regulate the microbial environment in the gut, reduce digestive upsets and prevent pathogenic gut bacteria, thereby improve live weight gain, improve feed conversion ratio, reduce mortality, increase feed conversion ratio in layers and increase egg production. Probiotics commercially available contain strains of genera lactobacillus (mainly), *Bifidobacterium*, *streptococcus*, *Bacillus*, *Bacteroides*, *Pediococcus*, *Leuconostoc*, *Propionibacterium*, *Saccharomyces cerevisiae* and *Aspergillus oryzae*.

MATERIALS AND METHODS

The experiment was conducted to study the influence of probiotics (P) and enzymes (E) on the performance of day old sexed four hundred and eighty commercial broiler chicks. A group of twenty broilers distributed in 12 treatments replicated twice. The chicks were reared in electric battery brooders under same environmental conditions. These chicks were allotted at random to each treatment.

The probiotic named “Bioboost – YC” each gram provides Live Yeast Culture (Strain SC-47), will be used as culture containing 20 million CFU kg⁻¹

The “Abizyme forte” enzymes containing the amylase 9,000-11,000 U/g, Phytase 90-110 U/g, cellulose 3800-4300 U/g, xylanase 2400-3300U/g beta-glucanase 2300-2600U/g and Proteases 900-1100U/g and mixed @ 200 mg Kg⁻¹ of feed.

Observations

Data pertaining to performance traits such as growth, feed efficiency, conformation traits and per cent mortality, body weights were recorded by weighing individual chicks at weekly interval up to 6 weeks of age. Chicks were fed experimental ration *ad-libitum*. Difference in initial and final body weight represented the weight gain by chicks over the corresponding period. Weighed amounts of diet were provided to chicks. Feed consumed and weight gain was recorded weekly. The per cent mortality was also regularly recorded for each group.

Traits measured: The following traits were measured for comparative evaluation and their interaction effects of all

treatments: -On weekly basis 1. Body weight (gm.), 2. Feed efficiency 3. Mortality (%)

The following recording and sampling procedures were adopted during the experimental period.

Feed intake

The weekly records of the feed offered and residual amounts of weigh backs were maintained for each replicate to calculate the feed consumption per bird.

Body weight

The birds were weighed individually at weekly intervals and the body weights were recorded to calculate body weight gains.

Feed conversion ratio

The feed conversion ratio was calculated as follows:

$$FCR = \frac{\text{Total feed consumed (g)/bird}}{\text{Total body weight gain (g)}}$$

Mortality

Daily observations were made to record the occurrence of deaths in different experimental treatments.

Cost of broiler production

The cost of rising 6 weeks broilers under different treatments include the cost of day old chick, feed, probiotic and cost of labor. Cost of other inputs was not included in this study.

Statistical analysis

The data collected under study were analyzed as 3×2×2 factorial completely randomized design according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Effect of enzymes on performance of broiler: Body weight

The enzyme supplementation with the grains containing

high crude fiber and polysaccharide helps to improve the growth significantly as reported by many earlier workers.

Harthi (2006) showed that, the diet supplementation with a combination of Avizyme, phytase and 2 g/kg of condiments significantly increased the gain of body weight during the first growth period (7-21 days of age). The average live body weight gain increased significantly on using phytase supplementation alone by 7.6% compared to the unsupplemented control for the whole experimental period. Phytase supplementation also has a pronounced effect on the biological responses associated with the performance at the rest of the growth period.

The results revealed improvement in the performance of broilers fed with low energy diets which was much higher than that of broilers fed with high-energy diets. The birds fed with low energy diets supplemented with enzyme performed as well as those fed with high-energy diet. (Baker *et al.*, 2007) demonstrated that phytase supplementation to a LPC based diet had a positive impact on broiler chick growth.

(Deek *et al.*, 2008) showed an improvement on performance when compared to that of the control diet supplemented with enzymes mixture.

The performance of broiler was evaluated in terms of growth (weekly body weight from day old to 6 week of age), feed efficiency and percent mortality at 6th week of

age. Data were analyzed on equal number of bird's per subclass basis. Analysis of variance revealed that the difference between replicates were not significant for the different traits under study as such all subsequent analysis was performed. The beneficial effect of probiotic supplementation to broiler diet in terms of increased body weight and body weight gain is well documented in literature (Banday and Risam, 2001). Similar findings as observed in the study for effect of probiotics on growth performance were reported by (Jin *et al.*, 2000; Yu *et al.*, 2003; Murry *et al.*, 2004; Sieo *et al.*, 2005; Apata *et al.*, 2008). Results reported by (Samli *et al.*, 2007) that highly significant differences were observed between control and probiotic supplemented groups with respect of total weight gain was in close agreement with the observation in the present study. Supplementation of *E. faecium* enhanced broiler chick performance with respect to weight gain and FCR Concluded by (Samli *et al.*, 2007).

The baby chicks had a well-developed proteolytic enzyme system at one day of age and the feeding of enzyme in the earlier stages did not improve the growth. However, enzyme supplementation with the feed ingredients containing high crude fiber and polysaccharides helps to improve the growth significantly also indicated in literature reported by many earlier workers.

Deek *et al.* (2008) reported that the body weight gain in the enzyme supplemented groups were better than control

Table 1: Growth performance of commercial broiler chicks due to Enzyme effects on weekly basis

FACTORS	Day old	I week	II week	III week	Iv week	V week	VI week
ENZ E ⁰	42.28	105.74	260.41 ^a	371.43 ^a	676.91 ^a	976.14 ^a	1142.67 ^a
E ¹	42.74	106.61	270.72 ^b	388.21 ^b	687.96 ^b	1010.78 ^b	1163.95 ^b
SE Range	0.43- 0.45	0.44-0.47	3.11-3.65	2.72-3.45	3.90-4.25	4.04-5.20	5.82-6.51

*Means having similar super-scripts do not differ significantly.

Table 2: Growth performance of commercial broiler chicks due to Probiotic effects on weekly basis

Factors	Dayold	I week	II week	IIIweek	Iv week	V week	VI week
Prob. P ⁰	42.33	106.01	264.85	375.30 ^a	669.93	957.30 ^a	1073.92 ^a
P ¹	42.69	106.35	266.34	384.34 ^b	694.93	1029.61 ^b	1232.70 ^b
SE Range	0.43-0.44	0.44-0.47	3.12-3.76	2.72-3.16	3.89-4.15	4.05-4.85	5.81-6.45

*Means having similar super-scripts do not differ significantly.

groups were also in agreement to the results observed in present experiment. (Fallah *et al.*, 2013; Rahman *et al.*, 2013) also observed that probiotics and enzymes supplementation enhanced the body growth rate of chicks. The results of the study, probiotic, Biogen, up to 1 kg/ton-1 improved the growth performance of the broiler chicken concluded by (Mahmoud *et al.*, 2017; Ahmed *et al.*, 2017),

Feed consumption and feed efficiency

Enzyme supplementation increased the digestive capacity of the birds, improved the feed conversion efficiency, the digestibility of the feed components and reduced sticky droppings. Purushothaman and Natanam (1999) included multi enzymes in the treatments consisting of 0, 30 or 40 per cent raw little millet. They found that the supplementation of multi enzymes, (500g/ton) improved ($P < 0.05$) feed conversion efficiency (FCE) and Phosphorus balance whereas feed intake improved in the 40 per cent little millet diet. Waldroup *et al.* (2006) concluded that there were significant interactions in BW and FCR for Arginine and Lysine., (Mathlouthi *et al.*, 2003) concluded that supplementation of diets based on wheat and barley with xylanase and β -glucanase significantly improved body weight gain and feed efficiency. Various researchers have reported that the inclusion of enzyme significantly increased weight gain, feed conversion efficiency (Sundu *et al.*, 2006; Waldroup *et al.*, 2006). Added enzyme

(xylanase) improved ($P < 0.05$) body weight, body weight gain, feed intake and feed conversion ratio (Pourreza *et al.*, 2007). Apparent digestibility of energy and protein were increased ($P < 0.05$) due to supplemental enzyme. Superior feed efficiency in enzymes supplemented diet over the control was observed in the present experiment.

The present findings are in agreement with the findings of other researchers (DaSilva *et al.*, 2000; Zulkifli *et al.*, 2000; Senani *et al.*, 2000; Kim *et al.*, 2001; Gupta *et al.*, 2003; Manna *et al.*, 2003; Sharma *et al.*, 2003). They observed that the feed efficiency ratio were lower in probiotic fed group than control. They observed that broilers diet supplemented with probiotic showed improved feed intake than the control. This can be substantiated from the fact that the experimental birds had consumed significantly more feed than control ones due to increased digestive efficiency.

The Various Studies revealed that the broilers fed with probiotics significantly improved feed to gain ratio of the broilers. Present findings also indicated significantly better weekly feed conversion efficiency, when the probiotic was supplemented in the diet of commercial broiler chicks (Banday and Risam, 2001; sieo *et al.*, 2005; Karaoglu and Durdag, 2005; Onderci *et al.*, 2006; Gunal *et al.*, 2006; Ahmad, 2006; O'dea *et al.*, 2006; Onderci *et al.*, 2007). The *Saccharomyces cerevisiae* was used as a probiotic in the diet and added at the normal recommended rate in the

Table 3: Feed Efficiency of commercial broiler chicks due to Enzyme effects on weekly and overall basis

Factors	I week	II week	III week	IV week	V week	VI week	Overall FE
ENZ E ⁰	1.63	1.67	1.78 ^b	1.97	2.16 ^b	2.29 ^b	1.86 ^a
E ¹	1.62	1.66	1.77 ^a	1.97	2.15 ^a	2.22 ^a	2.10 ^b
SE Range	0.003-.004	0.003-.004	0.003-.004	0.003-.004	0.002-.004	0.017-0.02	0.03-0.047

*Means having similar super-scripts do not differ significantly.

Table 4: Feed Efficiency of commercial broiler chicks due to Probiotics effects on weekly and overall basis

Factors	I week	II week	III week	IV week	V week	VI week	Overall FE
Prob. P ⁰	1.63	1.68 ^b	1.78 ^b	1.97	2.16 ^b	2.26	2.12 ^b
P ¹	1.62	1.66 ^a	1.77 ^a	1.97	2.15 ^a	2.26	1.84 ^a
SE Range	0.003-.004	0.003-.004	0.003-.004	0.003-.004	0.002-.003	0.01-0.02	0.04-0.05

*Means having similar super-scripts do not differ significantly.

various combinations of the diet and it was found that the diet supplemented with probiotic preparation had superior overall feed utilization efficiency than the control. The weekly feed efficiency exposed significant effect of enzyme for weekly feed efficiency. Averaged overall other effects, the enzyme was also found to have significant effect on over all feed efficiency and the trend remained same as was found for weekly feed efficiency. The results of the study, probiotic, Biogen, up to 1 kg/ton-1 improved the feed efficiency of the broiler chicken concluded by various workers (Fallah *et al.*, 2013; Rahman *et al.*, 2013; Mahmoud *et al.*, 2017; Ahmed *et al.*, 2017),

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