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ANIMAL SCIENCE

Performance of Commercial Broilers as Affected by the Supplementation of Enzymes and Dried Poultry Excreta

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ABSTRACTS

The objective of this study was to evaluate the influence of DPE 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. Group of chicks fed with diet E (with enzyme) were significantly heavier than those fed with diet E_0 (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 (E_0). It indicates that inclusion of enzyme in diet had positive effects on growth of chicks. Inclusion of DPE and enzymes revealed significant effects on body weight. Chicks showed higher body weight with diet having DPE and enzymes.

Highlights

- Inclusion of DPE and enzymes revealed significant effects on body weight. It indicates that inclusion of enzyme had positive effects on growth of chicks

Keywords: Enzymes, DPE, 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 scare 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.

Broiler production from 14 million in 1971 to about 2000 million in 2005 and total poultry meat production has increased from 70,000 MT in 1971 to 1900,000 MT in 2005 from 2000 million birds (FAO, 2006). The per capita availability of eggs per year has increased from seven in 1961 to 44 in 2004-05, and poultry meat from 160 g to about 1900 g during the same period. Due to increase in human population, production of eggs and poultry meat did not result in similar increases in per caput consumption.

The production level of grains is not increasing proportionally to meet out the demand. Hence, the sparing capacity will influence the future growth of the poultry industry which necessitate for the search of alternative feed resources such as crop and industry byproducts, organic wastes, aquatic wastes, marine wastes etc. This huge amount of waste may be recycled in order to provide nutrients for growing of crops and keeping the pollution free environments. More over these wastes are managed and processed appropriately in relation to the economic viable potency of poultry operation which may be enhanced.

MATERIALS AND METHODS

The experiment was conducted to study the influence of DPE 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 "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.

The composition of experimental ration having 0, 5 and 10 per cent Dried Poultry Excreta is given in the Table 1.

Table 1: Composition of experimental ration

Ingredients	D0 (0% DPE)	D1 (5% DPE)	D2 (10% DPE)
Maize	56	56	56
DORP	05	02	—
Soya-Cake	15	14	08
GNC	11	12	13
Jawala Fish	10	08	10
Min. Mix.	2.5	2.5	2.5
Vit. Mix.	0.5	0.5	0.5
DPE	—	5	10
Total	**100**	**100**	**100**

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:-

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

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.

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 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 concluded by (Harthi 2006; Ahmed *et al.* 2017).

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; Mahmoud *et al*. 2017) showed an improvement on performance when compared to that of the control diet supplemented with enzymes mixture.

Effect of DPE on performance of broiler: Body weight

The DPE supplementation with the grains helps to improve the growth significantly as reported by many earlier workers.

Second Week: At two weeks of age the mean body weight recorded at 0, 5 and 10 per cent DPE level of diet. Differences between these levels were significant at this age, body weight was highest for the groups received the 5 per cent DPE level of diet.

Sixth Week: The body weight of chicks at 6th weeks of age was found nonsignificant effect of DPE in the diet. The body weight also showed similar trend. More or less similar body weight was recorded for 0, 5 and 10 per cent DPE level of diet. However, tendency of higher body weight at 5 per cent DPE level was also noticed at this age of body weight.

Table 2: 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 3: Growth performance of commercial broiler chicks due to DPE effects on weekly basis.

FACTORS	Day old	I week	II week	III week	Iv week	V week	VI week
DPE D0	42.24	103.76	234.71^{ab}	352.59	628.72^a	960.00	1090.38
D1	43.24	102.31	246.81^b	353.03	664.83^b	969.07	1110.75
D2	42.97	101.34	229.24^a	345.65	661.36^b	962.42	1097.42
SE Range	0.37-0.41	0.34-0.37	2.38-2.55	2.48-2.55	3.14-3.50	3.66-4.10	4.66-5.10

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

Growth: The overall means for weekly body weights along with standard error measured for commercial broiler chicks according to different main and interaction effects have been presented in Table 5.

Jadhav *et al.* (1994) incorporated the safe and economic level of DPD (5,7.5 and 10 % DPD) and found that body weights were not significantly different among the treatment but the diet containing 5 per cent DPD showed increased live body weight as compared to 10 per cent DPD diet due to improved metabolism of the former diet. These findings are in good agreement with the findings of the present experiment. On the contrary Flegal and Zindel (1971), Sloan and Harms (1973), Cunningham and Lillich (1975) reported significantly lower body weight of broilers on or above 5 per cent DPD in diet.

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 groups were also in agreement to the results observed in present experiment(Fallah *et al*. 2013; Rahman *et al*. 2013) also observed that enzymes supplementation enhanced the body growth rate of chicks.

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, (Sundu *et al.* 2006; Waldroup *et al.* 2006) concluded that the inclusion of enzyme significantly increased weight gain, feed conversion efficiency, (Pourreza *et al.* 2007) Added enzyme (xylanase) improved ($P< 0.05$) body weight, body weight gain, feed intake and feed conversion ratio. 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 weekly feed efficiency exposed highly significant effect of DPE at all ages except at 6th weeks of age. Better feed efficiency was obtained for the groups

Table 4: 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 5: Feed Efficiency of commercial broiler chicks due to DPE effects on weekly and overall basis

Factors	I week	II week	III week	IV week	V week	VI week	Overall FE
DPE D0	1.62	1.65^a	1.76^a	1.96^a	2.15^a	2.26	1.96^a
D1	1.62	1.67^b	1.77^b	1.97^b	2.16^b	2.26	1.96^a
D2	1.63	1.68^c	1.78^c	1.98^c	2.16^b	2.27	2.00^b
SE Range	0.003-.005	0.003-0.01	0.004-.005	0.002-.004	0.004-.005	0.01-0.03	0.05- 0.08

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

of chicks those fed with diet without inclusion of DPE. Inclusion of 5 per cent DPE in diet also showed significantly better feed efficiency than the 10 per cent DPE level. This trend clearly indicates that higher level of DPE in feed results in higher feed conversion.

The Overall feed efficiency also showed the similar trend as was obtained for weekly feed efficiency. The overall feed efficiency obtained were 1.96, 1.96 and 2.00 respectively at 0, 5 and 10 per cent DPE dietary groups.

The inclusion of DPE in the diet indicated significant effect on weekly feed efficiency. On overall feed efficiency basis, it indicated that the broilers fed on diet containing 10 per cent DPE required more feed than the control as well as 5 per cent DPE. The feed efficiency of the broiler fed on DPE diets was not significantly different from that of control for 6th week feed efficiency, showing more or less similar feed efficiency of the broilers on different experimental diet. The broilers fed on diet containing 5 per cent and 10 per cent DPE also resulted significant difference between them for 2nd, 3rd and 4th weeks feed efficiency whereas for 5th week, nonsignificant difference was observed. It reveals that at higher ages, these two DPE dietary levels showed similar feed to gain ratio. These findings are in close agreement with present findings. Biely (1972), Bhargava and O'Neil (1975), Blair and Herron (1982) and Khire et al. (1983) also reported significant difference for feed conversion efficiency for the broilers fed with all levels above 5 per cent DPE in the diet which reduced the feed efficiency.

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, (Deek *et al.* 2008; Mahmoud *et al*. 2017) reported that the feed efficiency in the enzyme supplemented groups were better than control groups were also in agreement to the results observed in present experiment, (Fallah *et al.* 2013; Rahman *et al.* 2013) also observed that enzymes supplementation enhanced the feed efficiency of chicks.

CONCLUSION

It can be Conclusion on the basis of Present findings that the Inclusion of enzyme in diet has beneficial for the growth of body weight, the group of chicks Inclusion of DPE and enzymes revealed positive effects on body weight. Chicks showed higher body weight with diet having DPE and enzymes. It indicates that inclusion of enzyme in diet had positive effects on growth of chicks.

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