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RESEARCH OPINIONS IN ANIMAL & VETERINARY SCIENCES

Enzyme supplementation in broilers performance

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Abstract

This experiment was conducted to investigate the effect of microbial phytase supplementation on broilers performance. A total of 80 day-old Cobb-500 chicks were used in the experiment. Birds were partitioned into two experimental groups of 40 birds. Each treatment was composed of 4 replicates with 10 birds in each. The control group was fed a commercial starter and finisher diet. The second treatment group was fed a phosphorus deficient diet. In the last week of experiment, four birds from each replicate were used in metabolic trial. However, at time of termination of the experiment, the same birds were killed for carcass cuts and tibia ash content investigations. Results of the experiment showed that the addition of phytase enzyme significantly improved ($P<0.05$) broilers performance. However, feed intake, feed conversion ratio and tibia minerals were significantly increased ($P<0.05$) in diets supplemented with phytase.

Keywords: Phytase enzyme; broilers; performance; carcass cuts; digestibility

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Introduction

Phytate is the form in which large portion of phosphorus is present in plant feed ingredients. This makes it difficult for non ruminants to gain their requirements out of being fed with these ingredients (Rezaei et al., 2007). Phytate can bind minerals and proteins in aqueous medium (Sebastian et al., 1997). Phytase can help in improving the availability of phytate bound phosphorus and reducing phosphorus levels in excreta from intensive livestock operations. Nelson (1967) and Kornegay (1999) reported that phytase supplementation improved the utilization of phytate P derived from plant feedstuffs, and decreased excretory P by approximately one-third without depressing performance.

As layer feed differs from broiler feed in respect of among other things, very high calcium content, the supplemental phytase may just not be as effective in presence of high dietary calcium (3.5%) as in case of broilers (1.0%). Experiments carried out in this direction indicated that phytase supplemented layer diets @ 250-300 units/kg improved laying performance, tibial bone ash and phosphorus absorption. The phosphorus excretion also decreased significantly in birds fed the phytase-supplemented diet. Quite contrary to these findings. Some workers did not find any improvement in the production performance of laying birds. However, it has been demonstrated that phytase supplementation @ 250 units/kg in layer eliminated inorganic P supplementation without affecting laying performance.

Phytic acid was considered as the major storage form of phosphorus. Phosphorus from phytic acid is of great importance as this acid has a high P content (28.2%), and the major portion of poultry and pig diets consists of plant derived ingredients, where high levels of phytic acid is available. The ability of poultry and pigs to use phytate P is poor (Ravindran et al., 2006; Wu, et al., 2003) due to insufficient quantities or lack of intestinal phytase secretion. As a result of this, large amounts of P are excreted in feces causing environmental hazards, especially in areas of intensive livestock operations. Focus of recent research was on

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effects of phytase enzyme during the starter phase of broilers, however, effects on growing and finishing phases is lacking.

The objectives of the present study were to investigate the influence of phytase enzyme supplementation on the performance, digestibility, carcass merits and P status (tibia ash contents) of broiler chickens fed corn-soybean based diets.

Table 1: Composition and chemical analysis of the 5 starter experimental rations used in the experiment

Diet	Control	P-low
Diet composition %		
Corn	57	57
Soybean meal	37.5	37.5
Oil	3	3
Limestone	1	1.32
Di-calcium Phosphorous	0.75	0.42
Premix	0.75	0.75
Phytase enzyme	0	0
Chemical analysis%		
Dry matter	90.1	90
Crude protein	22	22.1
Crude fiber	4.25	4.25
Crude fat	5.46	5.46
Ash	5.04	5.04
Calcium	0.77	0.77
Phosphorous	0.4	0.34
ME, kcal/kg	2800	2850

Contents Premix Per 1 Ton Feed: Vitamin A 12 IU, Vitamin D3 3 IU, Vitamin E 50 IU, Vitamin K3 2.5g, Vitamin B1 1g, Vitamin B2 7mg, Panotottic Acid 14mg, Niacin 37mg, Vitamin B6 3mg, Vitamin B12 10mg, Folic Acid 1mg, Biotin 150 mg, Cholin 200mg, Cobalt 0.20mg, Copper 15mg, Iron 20mg, Manganese 80mg, Iodine 1.20mg, Selenium 0.20mg, Zinc 50mg, Lysine 1500mg; *Phytase unit.

Materials and Methods

Ration preparation

An experimental ration was formulated to meet all nutrient requirements as specified by the last edition of National Research Council (NRC, 1994) for chicken and designated as the control diet. Another ration was also formulated to meet the requirement except for phosphorus and designated as P-low diet (Table 2 and 3).

Rations used in the experiment were:

Diet 1: Control diet contains the recommended levels of Ca and P, with no phytase enzyme.

Diet 2: Diet low phosphorous with no phytase enzyme

Performance experiment:

A total 200 of one day-old broiler chicks (Cobb 500) were bought from a local hatchery. Chicks were immediately transferred to the experimental site and divided into five dietary treatment groups of 40 chicks in each. Each group was composed of 4 replicates with 10 chicks in each. Chicks were housed on floor of a suitable size house and managed as any commercial broiler flock. Chicks were weighed at weekly basis till the end of the experiment which lasted for 42 days. Feed intake, body weight and mortality were weekly recorded, and weight gain and feed conversion efficiency were then calculated.

Table 2: Composition and chemical analysis of the 5 finisher experimental rations used in the experiment

Diet	Control	P-low
Diet composition %		
Corn	58	58
Soybean meal	32	32
Oil	5.4	5.4
Limestone	1.86	2.6
Di-calcium Phosphorous	1.37	0.59
Premix	1.37	1.37
Phytase enzyme	0	0
Chemical analysis %		
Dry matter	90	90.1
Crude protein	19.48	19.48
Crude fiber	3.88	3.88
Crude fat	7.93	7.93
Ash	4.87	4.87
Calcium	1.29	1.3
Phosphorous	0.5	0.36
ME, kcal/kg	3000	3050

Contents Premix Per 1 Ton Feed: Vitamin A 8.5 IU, Vitamin D3 2.5 IU, Vitamin E 50 IU, Vitamin K3 2mg, Vitamin B1 0.80 mg, Vitamin B2 6 mg, Panotottic Acid 11mg, Niacin 30 mg, Vitamin B6 2.40 mg, Vitamin B12 8 mg, Folic Acid 0.80 mg, Biotin 150 mg, Cholin Chloride 200 mg, Cobalt 0.20 mg, Copper 15 mg, Iron 20 mg, Manganese 80 mg, Iodine 1.20 mg, Selenium 0.20 mg, Zinc 50 mg, Methionin 1100 mg, Lysine 1200 mg.

Table 3: Average weekly body weights (g) development of broilers on different treatments.

Age, weeks	Control	P-low
0	46.5	46.5
1	114.6a	106b
2	221.1a	197.5b
3	372.1a	328.6a
4	849a	738b
5	1399.2a	1184.1b
6	2012a	1568.7b

Rows of different letters means significantly different (P<0.05)

Table 4: Average daily feed intake (g) of broilers under different treatments

Age/ weeks	Control	P-low
1	19.21a	17.4b
2	33.19a	28.71b
3	41.1a	40.98b
4	78.6a	76.15b
5	121.46a	113.8b
6	151.18a	114.55b

Rows of different letters means significantly different (P<0.05)

Table 5: Feed conversion ratio of broilers under different treatments

Age/weeks	Control	P-deficient
Feed Conversion ratio	1.583a	1.833b

Rows of different letters means significantly different (P<0.05)

Chemical analysis

Feed and feces were analyzed for dry matter (DM), crude protein (CP), fiber, crude fat (CF), Ca and P according to the A.O.A.C (1995) procedures. Tibia Ca and P contents were determined using the flame photometry procedure.

Statistical analysis

All data were analyzed by ANOVA using the linear model procedure of SAS (SAS, 1988) to determine the effect of addition of phytase enzyme to broiler rations on body weight development, feed intake and feed conversion.

Results and Discussion

Broiler performance

The effect of phytase enzyme supplementation on the broilers chicks is shown in Table 3. Reducing P level in the second treatment in both starter and finisher diets depressed body weight starting from week 2, compared to control and diets supplemented with different levels of phytase. This lower body weight was due to the deficiency of P in the broilers fed the lower level of P which is lower than the recommended levels for broilers during starter and finisher periods (NRC, 1994). This effect of P deficiency was also reported in broilers (Mondal et al., 2007) and ducks (Orban et al., 1999).

Phytase supplementation at levels of 1000, 2000 and 3000 PU/kg in both starter and finisher diets solved the problem of P deficiency and resulted in birds average body weights similar to control. Results of this experiment also is in agreement with those of Bozkurt et al. (2006) which reported that the growth rate and feed conversion ratio of broilers fed low P diets containing phytase were comparable or even better than those obtained for broilers fed the standard P diets. These results supported the concept that phytase was improving P availability, and P level can be lowered in corn- soybean meal based broiler starter and finisher by the addition of phytase.

Feed intake

Feed intake of broilers fed P-deficient diets supplemented with phytase at different levels was similar to those fed control diet. Phytase enzyme supplementation improved (P<0.05) feed intake in broilers fed a P-deficient diets. The results indicated that phytase at levels of 1000 PU/kg and higher released phytate P that was utilized for growth in a similar manner as would P supplied by dicalcium phosphate (Table 4). Similar findings were reported by Mondal et al. (2007) when broilers fed with P-deficient diets supplemented with phytase at levels higher than 500 PU/kg. however; phytase levels lower than 500 PU/kg had no impact feed intake and feed conversion efficiency.

Similar intake trends were observed for duck, turkey and layer diets as reported by Ciftci, et al., (2005), respectively.

Feed conversion ratio

Phytase supplementation at different levels improved (P<0.05) feed conversion ratio of broilers at weight of marketing compared to with low P diets (Table 5). Similar findings were reported by previous research Ravindan et al. (2006) who reported that phytase supplementation to broiler diets caused numerical improvement in feed efficiency of broilers fed a P-deficient diets fed without phytase.

Conclusion and Recommendations

The study showed that addition of phytase enzyme had a positive effect on birds performance and feed conversion ratio. Costs of broilers rations might be reduced as commercial sources of P in rations is reduced. However, more research is needed to support these findings.

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