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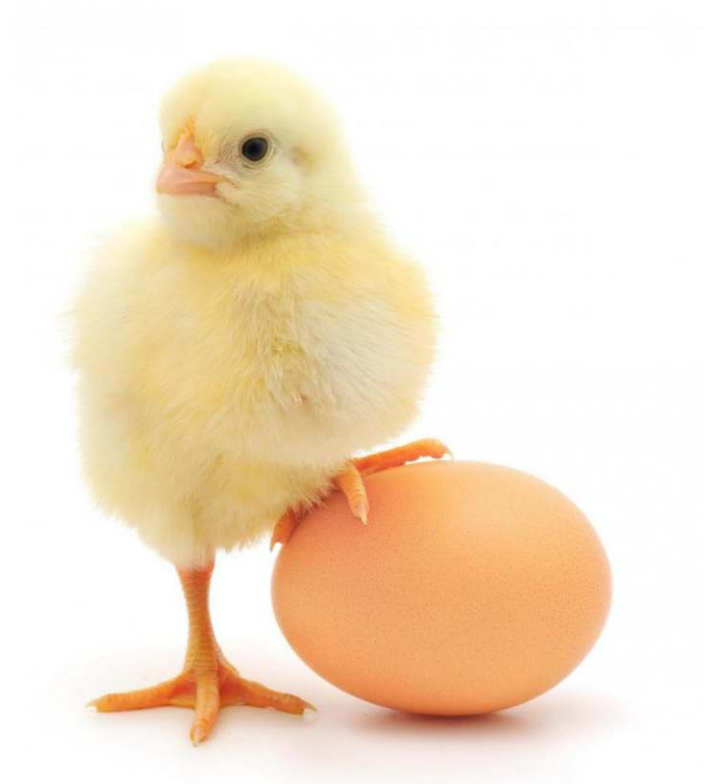

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Effects of Microbial Phytase Supplementation on Feed Consumption and Egg Production of Laying Hens

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Abstract: In this study, the effects of microbial phytase supplementation in diets were investigated on feed intake, egg production and feed efficiency in laying hens. The experiment was carried out between the July 15th to October 15th. 120 Nick Chick White hens at 210 days of age were divided into four groups of 40 each. Each cage contained 5 hens. Treatment groups were fed the basal diet (Control Group) or the basal diet supplemented with 300 U/kg of microbial phytase (Group A) and 600 U/kg of microbial phytase (Group B). Birds in each group were fed a balanced diet ad libitum. Daily feed intake, feed efficiency, egg production and egg weight differed between treatment groups ($P<0.01$). However initial and final body weights were similar in all groups. It can be concluded that supplementation of microbial phytase to diets improved hen productivity.

Key words: Microbial phytase, egg, feed intake, laying hen

Introduction

Phytase is a much studied enzyme, with the first modern series of studies conducted in the 1960's early research on the application of phytase to poultry diets showed promise to improve availability of phytate phosphorus to poultry, particularly in young birds. However, it is not until the 1990's that phytase became economically feasible for use in animal/poultry feed (Remus, 2005). Generally, corn and soybean meal are the major feedstuffs in the diets of poultry. Most plant seeds, including corn and soybeans contain more than 60% of phosphor in the form of phytate (Nelson *et al.*, 1968; Reddy *et al.*, 1982). This phytate phosphor has low availability (NRC, 1994), which leads to the use of inorganic phosphor sources to meet the phosphor requirement of most monogastric animals such as poultry and pigs (Um and Paik, 1999). Phytic acid as a polyanionic molecule forms insoluble complexes with di- and trivalent cations such as calcium, copper, manganese, magnesium, iron, zinc under the pH conditions of the small intestine and, consequently, reduces their bioavailability to animal (Schwarz, 1994). Vohra *et al.* (1965), Davies and Oplin (1979) reported that phytate has the highest binding affinity for copper, zinc, and manganese. Phytate has been shown to impair the bioavailability of zinc in humans, rats, pigs and chicks (Lease, 1966; Lonnerdal *et al.,* 1989; Bobilya *et al.,* 1991).
When phytic acid is hdrolyzed by microbial phytase it may release all phytate-bound minerals. Just as Aoyagi and Baker (1995) have shown that phytase may have increased the zinc bioavailabilty in soybean meal.

The lack of information and contradictions concerning the efficacy of phytase on the availability of trace minerals indicate the need for more investigation. Therefore the aim of this study were to determine the effects of microbial phytase supplementation feed intake, feed efficiency, final body weight, egg weight in laying hens.

Materials and Methods

Animals: At 30 weeks of age, 120 Nick Chick White hens were divided into three groups of each of 40 hens. Each group contained 5 hens in 8 cages. Hen house was provided with 17 h light per day. The hens were randomly assigned according to initial body weights. Feed and water were given ad libitum. Similar management conditions were maintained for all groups.

Dietary Treatments: Treatment groups were fed the basal diet (Control Group) or the basal diet supplemented with 300 U/kg of microbial phytase enzyme (Group A) and 600 U/kg of microbial phytase enzyme (Group B). Microbial phytase enzyme (Natuphos 500 U/g) was provided by a commercial company (Kartal Kimya-Istanbul, Turkey). Ingredients and chemical composition of the basal diet are shown in Table 1. The basal diet was a typical layer diet containing 2750 Kcal/kg metabolizable energy (ME) and 15.00 % crude protein (CP), and was calculated to meet or slightly exceed the nutrient requirements recommended by the National Research Council (1994).

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Table 1: The Composition of diet, %

Feeds	Control %	Group A %	Group B %
Maize	65.00	64.94	64.88
Soybean meal (44 CP)	14.86	14.86	14.86
Sunflower meal	7.62	7.62	7.62
Vegetable Oil	0.92	0.92	0.92
Salt	0.50	0.50	0.50
DL-Methionine	0.12	0.12	0.12
L-Lysine	0.17	0.17	0.17
Vitamin Premix*	0.25	0.25	0.25
Mineral Premix**	0.25	0.25	0.25
Dicalcium Phosphate	1.33	1.33	1.33
Ground Limestone	8.98	8.98	8.98
Phytase Enzyme	-	0.06	0.12
Chemical Analyses (DM basis)			
Dry matter	89.27	89.30	89.32
Crude protein	15.00	15.03	15.02
Crude cellulose	4.28	4.29	4.29
Ash	13.65	13.63	13.62
Ether Extract	6.04	6.06	6.03
Ca	3.75	3.70	3.73
P	0.42	0.41	0.42
Methionine	0.60	0.61	0.61
Lysine	0.79	0.78	0.77
Linoleic Acid	1.83	1.82	1.84
ME+, Kcal/kg	2750	2749	2752

+:ME: Metabolizable energy. * : Per 2.5 kg including; 2.000.000 IU vit A, 2.000.000 IU vit D_3, 35.000 mg vit E, 4.000 mg vit K_3, 3.000 mg vit B_1, 7.000 mg vit B_2, 5.000 mg vit B_6, 15 mg B_{12}, 20.000 mg Niasin, 1.000 mg Folic acid, 45 mg Biotin, 10.000 mg Cal-D-Pentotenat, 125.000 mg Cholin Chlorid and 50.000 mg vit C. **: Per kg including; 60.000 mg Fe, 60.000 mg Zn, 5.000 mg Cu, 1.000 mg I, 200 mg Co, 150 mg Se, 80.000 mg Mn.

Table 2: Effects of Dietary Supplementation Microbial Phytase on Egg Production, Feed Intake and Feed Efficiency Parameters

Item	Control	Group-A	Group-B	SEM	P
Feed intake (g/hen/day)	105.52^c	110.69^b	114.83^a	1.24	**
Initial Body weight (g)	1747.50	1751.63	1756.88	5.73	NS
Final Body weight(g)	1753.63	1774.13	1761.13	4.42	NS
Hen-day egg production, (%)	82.23^c	85.18^b	88.63^a	1.24	**
Egg Weight (g)	64.31^c	67.37^b	70.29^a	0.78	**
Feed efficiency, (g feed/g egg)	2.00^a	1.93^b	1.84^c	0.03	**

NS: Non significant, **: P<0.01, a,b,c: Mean values with different superscripts within a row differ significantly.

Sample collection and laboratory analysis: Feed intake, egg productions were recorded daily by caged. Egg weight and body weight were measured biweekly. Chemical analyses of the diet were run using international procedures of AOAC (2000).

Statistical analyses: All data were analyzed by analysis of variance procedures and Duncan multiple-range test (SPSS, 1993).

Results and Discussion

The effect of phytase on body weight, daily feed intake, egg production, egg weight and feed efficiency are presented in Table 2.

Daily feed intake differed between treatment groups. The intake of the birds fed the diets containing the 600 U microbial phytase/kg enzyme group (114.83 g/d) was the highest and those following the 300 U microbial phytase/kg enzyme group (110.69 g/d) and control group (105.52 g/d) respectively ($p<0.01$). These differences among the groups may be due to from the use of microbial phytase enzyme amount in diets. Because the increase of the amount of phytase enzyme in diets, the feed intake was increased too. The improved to the feed intake with phytase releases P, is potential for other nutrients to show a higher availability or in the case of minerals retention. In particular, positively-charged (cationic) minerals such as calcium, zinc, copper, cobalt, iron, magnesium, nickel and manganese are all known to from complexes with phytate and show higher digestibility values in the presence of phytase (Remus, 2005). In agreement with these result, in studies phytase use reported that, the addition phytase in poultry diets were increased feed intake (Um and Paik, 1999; Jalal and Scheideler, 2001; Punna and Roland, 1999).

The highest egg production and egg weight were determined in 600 U of microbial phytase/kg enzyme group (88.63 %), (70.29 g) and those following the 300 U of microbial phytase/kg enzyme group (85.18 %), (67.37 g) and control group (82.23 %), (64.31 g) respectively ($P<0.01$). In the present experiment, the supplementation of 300 and 600 U of phytase/kg diet to control diet improved hen productivity. Just as Gordon and Roland (1997) reported that feeding 0.1% NPP diet decreased egg production compared to 0.2 to 0.5% NPP diet supplemented with 300 U of phytase/kg diet completely corrected the adverse effects. The highest feed efficiency was determined in 600 U of microbial phytase/kg enzyme group (1.84) and those following the 300 U of microbial phytase/kg enzyme group (1.93) and control group (2.00) respectively ($P<0.01$). In agreement with these result, in studies phytase use reported that, the addition phytase in poultry diets were increased feed efficiency (Jalal and Scheideler, 2001; Van der Klis, 1997). However, initial body weight and final body weight were similar in all groups ($P>0.05$).

It can be concluded that supplementation of microbial phytase diet improved hen productivity.

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