academicJournals

Vol. 5(7), pp. 113-116, July, 2013
DOI: 10.5897/IJLP2014.0212
Article Number: DA2B15645643
ISSN 2141-2448

http://www.academicjournals.org/IJLP

International Journal of Livestock Production

Full Length Research Paper

Economics of phytase enzyme supplementation in low energy-protein layer chicken diet

P. Ponnuvel*, K. Narayanankutty, A. Jalaludeen and P. Anitha

Centre for Advanced Studies in Poultry Science, College of Veterinary and Animal Sciences, Kerala, Kerala Veterinary and Animal Sciences University, Mannuthy-680651, India.

Received 6 March, 2014; Accepted 28 April, 2014

A production trial was carried out utilizing 200 single comb White Leghorn hybrid Athulya layers to study the economics of phytase supplementation at three different levels in low energy-protein diet with reference to the cost of egg production and net profit per egg for a period of 20 weeks. Phytase was supplemented at 0, 500 and 1000 units/kg in low energy, protein and energy-protein layer diets containing available phosphorus of 0.30% from 21 to 40 weeks of age. Significantly (P < 0.01) lower cost of production of an egg and increased net profit were recorded among various phytase supplemented dietary treatments when compared with standard layer and unsupplemented diets fed treatment groups.

Key words: Phytase, layer, economics.

INTRODUCTION

Indian poultry industry has changed from a back yard unit to a giant commercial egg and meat producing farms in the last three decades. Today, India ranks third in commercial egg production and fourth in broiler meat production in the world (USDA/FAS, 2011). The per capita availability of egg increased from 20 in 1950 to 52 in 2012. In 2012, India's egg production is anticipated to reach 61.5 billion eggs, up 68% from 36.6 billion in 2001(USDA/FAS, 2011). According to the Ministry of Food Processing Industries, about 70% of poultry is in the organized sector and 30% is in the unorganized sector. Nearly 60 to 70% of the broiler and layer industries are located in the southern Indian states. Large integrated operations incorporate all aspects of production.

Integration has resulted in lower average costs of production and lower retail prices of egg and poultry meat. One of the major constraints in poultry production is increasing feed cost due to limited availability of cereals and oil cakes. Several attempts have been made to reduce feed cost by incorporation of alternate feed ingredients and grain's by-products. By products like rice bran and wheat bran are available in plenty, however presence of anti-nutritional factors like phytate and non-starch polysaccharides limited their inclusion levels in poultry feed formulation. Most of the cereals and their by-products used in poultry diet have phosphorus in the form of phytate which is not fully utilized by the birds. Phytate also binds with many minerals, protein and other nutrients and make them unavailable to birds. Supplementation of exogenous phytase in poultry feed may hydrolyse the phytate and releases phosphorus and phytate bound nutrients. The present study was aimed to decrease the cost of feed by supplementing the phytase

*Corresponding author. E-mail: ponnuvelpalanivel@gmail.com

Table 1. Allocation of different dietary treatments to experimental birds.

Treatment	Diets	Crude protein (%)	Metabolisable energy (kcal/kg)	Available phosphorus (%)	Phytase units/kg
T1	SLD	18	2600	0.5	0
T2	LED	18	2400	0.3	0
T3	LED	18	2400	0.3	500
T4	LED	18	2400	0.3	1000
T5	LPD	16	2600	0.3	0
T6	LPD	16	2600	0.3	500
T7	LPD	16	2600	0.3	1000
T8	LEPD	16	2400	0.3	0
T9	LEPD	16	2400	0.3	500
T10	LEPD	16	2400	0.3	1000

SLD: Standard layer diet, LED: low energy diet, LPD: low protein diet, and LEPD: low energy-protein diet.

Table 2. Percent ingredient composition of experimental diets.

Ingredient	SLD	LED	LPD	LEPD
Yellow maize	58.00	46.00	58.50	47.00
Soya bean meal	28.35	27.00	22.10	21.00
Wheat bran	2.00	4.10	4.00	5.10
De oiled rice bran	2.00	13.00	5.50	17.00
Dicalcium phosphate	2.00	0.75	0.75	0.75
Shell grit	7.00	8.50	8.50	8.50
Salt	0.20	0.20	0.20	0.20
Merivite	0.015	0.015	0.015	0.015
DL-methionine	0.100	0.100	0.100	0.100
Tefroli	0.100	0.100	0.100	0.100
Meriplex	0.012	0.012	0.012	0.012
Choline chloride	0.120	0.120	0.120	0.120
Ultra TM	0.100	0.100	0.100	0.100
Total	100	100	100	100

SLD: Standard layer diet, LED: low energy diet, LPD: low protein diet, and LEPD: low energy-protein diet.

in low energy, protein and phosphorus layer feed.

MATERIALS AND METHODS

Two hundred single comb White Leghorn hybrid Athulya hybrid layers of 20 weeks old were distributed at random into 10 treatments viz., T1, T2, T3, T4, T5, T6, T7, T8, T9 and T10 with four replications in each treatment and each replicate having five birds. The production trial was carried out from 21 to 40 weeks of age. Four of diets viz., standard layer diet (SLD), low energy (LED), low protein (LPD) and low energy-protein (LEPD) layer diets were used in this study. A standard layer diet (CP-18%, ME-2600 kcal/kg diet, available phosphorus-0.5%) was formulated as per BIS (1992). Experimental diets from T2 to T10 was formulated with two levels of crude protein (18 and 16%), two levels of metabolisable energy (2600 and 2400 ME kcal/kg diet) and three levels of phytase (0,500 and 1000 units/kg) as detailed in Table 1. The available phosphorus level in all treatments except T1 was 0.3%.

The birds were housed in individual cages. Feed and water were supplied *ad libitum* throughout the experimental period of 20 weeks. The inclusion levels of ingredients in different dietary treatments are given in Table 2. During the production period, the daily egg production of individual bird and weekly feed intake of birds were recorded. From this data, number of eggs produced and feed consumed by individual bird was calculated. In order to assess the cost-benefit particulars of supplementation of phytase enzyme in low energy (LED), low protein (LPD) and low energy-protein diets (LEPD) containing 0.3% available phosphorus, the cost of different diets used in the study was calculated based on the actual cost of feed ingredients which prevailed at the time of experiment (August 2011 to January 2012) and are presented in Table 4.

Cost of production of egg was calculated based on the feed consumed to produce an egg and net profit per egg was calculated based on the average price of egg (NECC-Namakkal) which prevailed during the study period and presented in Table 3. The data on cost of production and net profit were subjected to statistical analysis as described by Snedecor and Cochran (1994).

Table 3. Effect of phytase supplementation in low energy-protein diet on cost of production and net profit of an egg in Athulya layer[+].

Treatment	Production cost per egg (Rs.)	Net profit per egg (Paise)
	Mean** ± SE	Mean** ± SE
T1	2.01^{cd} ± 0.01	68.80^{ab} ± 1.88
T2	2.05^{d} ± 0.01	64.77^{a} ± 0.70
T3	1.87^{b} ± 0.01	83.45^{c} ± 1.36
T4	1.88^{b} ± 0.03	82.11^{c} ± 2.59
T5	2.01^{cd} ± 0.02	69.46^{ab} ± 2.06
T6	1.86^{b} ± 0.02	83.55^{c} ± 1.71
T7	1.86^{b} ± 0.01	84.25^{cd} ± 1.37
T8	1.97^{c} ± 0.02	72.74^{b} ± 1.94
T9	1.81^{a} ± 0.02	89.09^{d} ± 1.61
T10	1.81^{a} ± 0.02	89.43^{d} ± 1.52
P-value	0.00	0.00

[+]Means of twenty values with SE. Means within a column with different superscripts differ significantly **($P < 0.01$).

Table 4. Overall economics of phytase supplementation in different experimental diets.

Treatment	Economics of phytase supplementation						
	Particulars						
	Egg produced (no)	Feed intake (kg)	Feed per Egg (g)	Feed cost** (Rs.)	Cost of production (Rs.)	NECC* Price (Rs.)	Profit per egg (Rs.)
T1	2562	317.01	123.74	16.26	2.01	2.7	0.69
T2	2422	326.38	134.76	15.23	2.05	2.7	0.65
T3	2637	322.14	122.16	15.27	1.87	2.7	0.83
T4	2625	322	122.67	15.31	1.88	2.7	0.82
T5	2460	322.5	131.1	15.29	2	2.7	0.7
T6	2647	321.86	121.59	15.33	1.86	2.7	0.84
T7	2644	319.49	120.84	15.37	1.86	2.7	0.84
T8	2344	317.09	135.28	14.59	1.97	2.7	0.73
T9	2604	321.92	123.63	14.63	1.81	2.7	0.89
T10	2630	323.67	123.07	14.67	1.81	2.7	0.89

*Average egg price of National Egg Co-ordination Committee (Namakkal) during the study period. ** Feed including cost of phytase enzyme (Cost of phytase. Rs. 400/kg).

RESULTS AND DISCUSSION

The data on cost of production of an egg varied from 2.05 to 1.81 rupees. The lowest cost of production was noticed in LEPD supplemented with both levels of phytase fed groups (1.81 rupees) and the highest cost of production (2.05 rupees) was noticed in LED fed (T2) control treatment group. The cost of production of an egg for SLD fed birds was similar to that of birds received LED, LPD and LEPD without supplemental phytase. However, the cost of production for LED and LPD supplemented with different levels of phytase were intermediate. Net profit per egg ranged from 64.77 to 89.43 paise. Highest net profit of 89.09 and 89.43 paise per egg were recorded in phytase supplemented LEPD fed groups (T9 and T10) and lowest of 64.77 paise in LED (T2) fed control group. Phytase supplemented diets fed birds showed more net profit per egg produced when compared with negative and positive control diets fed birds.

Significantly ($P < 0.01$) lowest cost of production was noticed in birds received LEPD supplemented with phytase 500 and 1000 units/kg (T9 and T10) when compared with all other treatments. However, the cost of production in LED and LPD supplemented with phytase (500 and 1000 units/kg) fed groups were comparable and was significantly lower than that of SLD fed group and supplemented negative control groups and higher than birds fed LEPD with supplemental phytase. The cost of

production of an egg in (T8) LEPD fed negative control group was significantly lower than that of LED (T2) fed control group and was comparable with SLD (T1-positive control) and LPD fed (T5) control groups.

Significantly ($P < 0.01$) highest net profit per egg was noticed in birds received LEPD supplemented with phytase 500 and 1000 units/kg (T9 and T10) when compared with all other treatments except birds in T7. Net profit per egg of phytase supplemented LED and LPD fed birds was significantly higher than all control groups and lower than phytase added LEPD fed groups except T7. Significantly lowest net profit per egg was observed in LED fed control group (T2) and was comparable with birds fed SLD (T1) and unsupplemented LPD (T5). However, birds fed unsupplemented LEPD showed significantly more profit than birds in T2 and was comparable with birds in T1 and T5.

The present finding is in disagreement with Sukumar (1999) who found that cost of feed per egg was 85.95, 84.87 and 88.08 paise for addition of phytase at 200, 300 and 400 units/kg in low available phosphorus layer diet, respectively. He also noticed a lowest cost of production (84.04 paise) per egg in unsupplemented diet fed groups and cost of an egg in positive control diet fed group was 85.94 paise. Similarly, no significant difference in the net profit per egg was observed by Kannan (2004).

Supplementation of phytase increased net profit per egg due to production of more eggs and reduction in daily feed intake. Exogenous phytase addition in low energy-protein and low available phosphorus layer diet might have increased the availability of phytate bind nutrients which in turn augmented more egg production. Based on the results of this experiment, it can be inferred that the energy, protein and available phosphorus levels can be reduced simultaneously in layer diet with addition of phytase at either 500 or 1000 units/kg. Incorporation of phytase in low energy-protein layer diet showed a scope for inclusion of higher levels of rice and wheat bran in layer diet thereby opening an avenue for lowering of feed cost.

REFERENCES

Bureau of Indian Standards (BIS) (1992). Poultry Feeds –Specification. Fourth revision. Bureau of Indian Standards, New Delhi. P. 4.

Kannan D (2004). Influence of enzyme phytase supplementation on the performance of layers. Ph.D Thesis submitted to Tamil Nadu Veterinary and Animal Sciences University. P. 160.

Snedecor GW, Cochran WG (1994). Statistical Methods. 8th edition. The Iowa State University Press, Ames, Iowa, P. 313.

Sukumar D (1999). Effect of phytase supplementation on phosphorus utilization and performance in layer chicken. M.V.Sc, Thesis submitted to Kerala Agricultural University, P. 122.

USDA (2011). India's Poultry and Egg Industry. Int. Egg Poult. Rev. 4:34.