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EFFECT OF SUPPLEMENTATION OF PHYTASE ENZYME IN DIET ON GROWTH PERFORMANCE OF BROILER CHICKS

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A B S T R A C T

The research was carried out on broiler chicks to determine the effect of phytase enzyme addition in diet on broiler chick growth. Following one week of brooding, 120 birds were randomly selected and divided into three treatment groups: Phyt-0, Phyt-500, and Phyt-1000, with Phytase enzyme (Phyt) at rates of 0, 500, and 1000 FTU/kg in feed. There were 40 birds in each treatment group, with 10 birds per replicate. The trial was divided into two parts: the starter phase (1-21 days) and the finisher phase (22-35 days). Weekly data on body weight gain and feed consumption were collected, and the weekly feed conversion ratio was calculated using this information. Carscass characteristics were measured at end of trial. Birds fed diet supplemented with higher phytase occupied higher growth performance and better carcass characteristics. Birds fed a diet high in phytase performed better in terms of growth.

Keywords: Broiler; Phytase enzyme; Birds; Diet

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INTRODUCTION

Phytate is found in outer bran of cereal grains (Steiner et al., 2007). Chickens have minute endogenous enzymatic movement to break bound phosphorus bringing about lesser accessibility of phosphorus (Dilger et al., 2004). Moreover, phytate likewise chelates different minerals like calcium, sodium, iron and protein bringing about their poor availability. Phytate likewise anticipates the action of pepsin and trypsin and in this manner diminishes digestibility of protein (Selle et al., 2000). High discharge of phytate phosphorus in compost prompts natural contamination (Lenis and Jongbloed, 1999). It has likewise been described that crop pH influences the action of exogenous phytase in birds (Murai et al., 2001).

Dihydrogen phosphate in phytic acid, which comprise of six phosphate radicals and each phosphate have two negative charges. Phytase is a catalyst, which dephosphorylates the phytate, bringing about the release of phosphorus and solid chelated of cations, for example, Mg2+, Ca2+, Zn2+ and Fe2+ to be utilized by birds (González-Córdova et al., 2016). Phytases are originated normally from seeds containing oats, vegetables and other feedstuffs (Viveros et al., 2000). It is likewise found in microorganism (Wyss et al., 1999). In plants around two third of the all phosphorus, which are utilized as phytate in the feed of chicks (Viveros et al., 2000). Phytate is a vital part of plant source and the majority of the phosphorus in poultry feed is greater in phytate phosphorus structure which is around 60-80% (Karimi et al., 2013). Insufficiency of phosphorus results in diminishing in meat generation because of less absorption in bones. Leg bones (femur, tibia, and metatarsus) may influence the nature of meat. Subsequently, in feed of phosphorus level, for example, phytase from microorganisms increment the

accessibility of phosphorus. Phytate respond with proteins (Liu et al., 2008), diminishing grill absorbability, diminishes mineral and endogenous fatalities rises (Cowieson et al., 2004), showing it as an anti-nutrient for birds (Cowieson et al., 2011).

Poultry birds have slight endogenous enzymatic activity to breakdown bound phosphorus causing lesser availability of phosphorus to chicks (Adeola and Sands, 2003; Dilger et al., 2004). Moreover, phytate additionally chelates different minerals like calcium, sodium, iron and protein bringing about their poor accessibility to the chickens Phytate additionally declines the activity of pepsin and trypsin and hence lessens digestibility of protein (Adeola and Cowieson, 2011; Selle et al., 2000; Wu et al., 2004). High discharge of phytate phosphorus in compost prompts natural contamination (Lenis and Jongbloed, 1999).

Inclusion of inorganic phosphorus in the diet of poultry birds is costly (Makiyama et al., 2012). Chicken industry is generally utilizing phytase as a vital part of feed to upgrade the accessibility of bond mineral and supplement. Ciurescu et al. (2020) detailed that feed intake and weight increase expanded in birds feed with phytase addition with changing quantities of accessible phosphorus. Growth was higher in starter stage when contrasted with the finisher stage. The study was designed to accomplish the subsequent objective to conclude the influence of altered levels of phytase on growth parameters of broiler chicks.

MATERIALS AND METHODS

Feed intake

Commercial broiler starter ration was fed to the broilers in the present study. A known weight of feed was offered on daily basis at morning and the remaining was measured at next day morning to evaluate feed consumption on daily basis using the following formula;

$$\text{Feed consumption} = \text{feed offered} - \text{feed refused}$$

Body weight gain

Body weight was calculated on weekly basis by using the formula;

$$\text{Body weight gain} = \text{final weight} - \text{initial weight}$$

Feed conversion ratio (FCR)

The feed conversion ratio (FCR) for each replicate was calculated by dividing the total feed intake by total weight gain on weekly basis as below;

$$\text{FCR} = \frac{\text{Total feed intake}}{\text{Total weight gain}}$$

Morbidity and mortality

Birds were observed for morbidity and mortality and the data was recorded on daily basis and postmortem of dead bird was carried out to find out the possible causes of mortality.

Dressing percentage

At the end of trial, one bird from each replicate was selected randomly and live weight of each selected bird was recorded. The birds were slaughtered immediately and were skinned off. All the non-edible organs were removed including head and feet. The carcass was weighed and dressing percent was calculated;

$$\text{Dressing \%} = \frac{\text{Carcass weight}}{\text{Live weight}} \times 100$$

Visceral organs weight

All the edible organs such as liver, heart, thighs, wings, gizzard full and empty from each selected bird was removed and weighed immediately for the final conclusion.

Statistical analysis

The data was statistically analyzed with typical procedure of analysis of variance using CRD. Means was compared with Duncan's multiple range tests by using statistical analysis program (SPSS).

RESULTS

Growth Performance

The experiment was conducted to investigate the effect of different levels of phytase on live performance and slaughter data of the broilers. The trial was conducted into two phases viz; starter phase (1-21 days) and finisher phase (22-35 days). Growth performance was measured in terms of body weight, feed consumption and feed conversion ratio. Data on body weight gain and feed consumption were recorded weekly and on the basis of this data weekly feed conversion ratio was calculated. The results obtained on weight gain, feed consumption and feed conversion ratio has been reported as under:

Starter phase (1-21 days)

Weight gain

The results was significant difference ($P<0.001$) in weight gain of broilers between different groups during starter phase. Higher weight gain had observed in broilers fed diet Phyt-1000 while lower weight gain had observed in birds fed diet 0, which was a control group (Table 1).

Feed intake

The results showed that was no significant difference ($P>0.05$) in feed intake of broilers fed diets. Maximum

feed intake was observed in birds fed diet Phyt-0, and lower feed intake was found in the birds fed Phyt-1000.

Feed Conversion Ratio

The significant difference (P<0.001) in feed conversion ratio of broilers fed diets during starter phase had better feed conversion ratio in birds fed diet Phyt-1000 whereas the poor FCR was observed in broilers fed diet without supplementations of phytase.

Table 1. Growth performance of broilers fed experimental diets in starter phase (1-21 days).

Variables	Diets			SEM[2]	Significance[3]
	Phyt-0	Phyt-500	Phyt-1000		
Starter phase (1-21 days)					
Feed intake	1056	1082	1093	7.72	NS
Weight gain	671	702	792	22.46	***
FCR	1.57	1.54	1.38	0.01	***

[2]Standard error of mean. [3]NS: Non-significant; *: 0.01<P < 0.05; **: 0.001<P < 0.01; ***: P < 0.001.

Finisher phase (22-35 days)

Weight gain

The significant difference (P<0.05) in weight gain of birds among different groups during finisher phase. Higher weight gain was observed in birds fed phyt-1000 diet and lower weight gain was observed in birds fed control diet (Table 2).

Feed intake

The no significant difference (P>0.05) in feed intake of birds fed diets during finisher phase. Higher feed intake had found in the broilers of group phyt-0 while lower intake had found in the broilers fed diet phyt-1000.

Table 2. Growth performance of broilers fed experimental diets in finisher phase (22-35 days).

Variables	Diets			SEM[2]	Significance[3]
	Phyt-0	Phyt-500	Phyt-1000		
Finisher phase (22-35 days)					
Feed intake	1880	1890	1902	8.88	NS
Weight gain	1012	1035	1058	22.46	*
FCR	1.85	1.82	1.79	0.01	**

[2]Standard error of mean. [3]NS: Non-significant; *: 0.01<P < 0.05; **: 0.001<P < 0.01; ***: P < 0.001.

Feed Conversion Ratio

The significant difference (P<0.001) in feed conversion ratio of broilers fed diets during starter phase had better feed conversion ratio in birds fed diet Phyt-1000 whereas the poor FCR was observed in broilers fed diet without supplementations of phytase (Table 3).

Table 3. Overall growth performance of broilers fed experimental diets.

Variables	Diets			SEM[2]	Significance[3]
	Phyt-0	Phyt-500	Phyt-1000		
Overall phase (1-35 days)					
Feed intake	2936	2972	2995	6.22	NS
Weight gain	1683	1737	1850	25.34	**
FCR	1.74	1.71	1.62	0.05	**

[2]Standard error of mean. [3]NS: Non-significant; *: 0.01<P < 0.05; **: 0.001<P < 0.01; ***: P < 0.001.

Carcass characteristics

At the end of the trial, 2 birds/replicate were selected randomly from each treatment groups weighed individually and slaughtered to get data of dressing percentage, breast meat yield, thigh meat yield, weight of (liver and heart) and abdominal fat. The data showed non-significant difference on dressing percentage across all the treatments (Table 4).

Breast meat yield

The data showed that significant (P<0.05) difference among the treatments on breast meat yield. Higher value of breast meat had obtained in treatment phyt-1000. On the other hand showed that breast meat yield value of phyt-500.

Thigh meat yield

The significant (P<0.05) difference on thigh meat yield among all the treatments. Higher value of thigh meat had found in treatment phyt-1000. The statistical analysis that thigh meat yield value of phyt-500 was minimum than all other treatment groups

Abdominal fat

The non-significant difference among all the treatments higher value of abdominal fat was found in treatment phyt-500 followed by phyt-1000.

Table 4. Carcass characteristics of broilers fed experimental diets[1].

Parameters (%)	Diets			SEM[2]	Significance[3]
	Phyt-0	Phyt-500	Phyt-1000		
Dressing %	55.53	56.05	58.80	0.41	NS
Breast	16.95	16.63	17.57	0.50	*
Thigh	4.40	4.36	4.90	0.05	*
Abdominal Fat	2.21	2.63	1.99	0.12	NS
Heart	0.43	0.52	0.37	0.01	NS
Liver	2.16	2.17	2.28	0.03	NS

[2]Standard error of mean. [3]NS: Non-significant; *: 0.01<P < 0.05; **: 0.001<P < 0.01; ***: P < 0.001.

Heart weight

The no significant effect on heart weight in all groups. The higher value of heart weight was found in phyt-500 and lower value of heart weight was observed in Phyt-0.

Liver weight

The non-significant difference among the treatments in liver weight. Higher value of liver weight was found in treatment phyt-1000 while lower value had found in treatment phyt-0.

DISCUSSION

The results was significant difference (P<0.001) in weight gain of broilers between different groups during starter phase. Higher weight gain had observed in broilers fed diet Phyt-1000 while lower weight gain had observed in birds fed diet 0, which was a control group. Beiki et al. (2013) announced that supplementation routinely with phytase can decrease the low dimension of non phytate phosphorus without having negative impact on the growth of chicks. Moreover, expansion of exogenous phytase protein improve the body weight increase (Gautier et al., 2018; Gehring et al., 2013; Wang et al., 2011). Similarly, Wang et al. (2011) found higher normal day by day gain in birds with supplementation of microbial phytase in the diet. Singh et al. (2013) reported that from 0 to 21 days phytase supplementation with high calcium improve body weight and average daily weight gain when they conduct an experiment and give calcium 9 g/kg with 500 FTU phytase.

Wu et al. (2004) stated that birds fed diet containing different levels of phytase had higher feed intake compared to control. Santos et al. (2008) concluded that phytase supplementation of low levels of apparent metabolizable energy, phosphorus and Ca diet increased the feed intake in broiler.

Walk et al. (2013) also reported that FCR was improved with the supplementation of phytase in broiler bird's diet. Selle et al. (2000) reported the impact of phytase supplementation on FCR of birds by feeding them wheat-sorghum-soyabean meal-based diets containing phytate and dietary available P. FCR was increased by phytase supplementation of diet in all combination of phytate and available phorphorus.

Similarly, De Sousa et al. (2015) stated the phytase importance in broiler diet and concluded that phytase has no effect on gizzard, liver, heart and small intestine weight. Akyurek et al. (2011) stated that phytase addition in low phosphorus diet did not increase the heart, spleen and liver weight.

Dalólio et al. (2015) reported the impact of corn and soybean based enzyme inclusion in diets with 5 inclusion levels complexs (0, 100, 200, 300 and 400) and observed that carcass characteristics of the breast and the wings increased at 42 days of age. Yonemochi et al. (2003) showed that phytase supplementation in low

phosphorous diet had no significant effect on abdominal fat. The higher value of heart weight was found in phyt-500 and lower value of heart weight was observed in Phyt-0. Supplementation of phytase at 1000 FTU/kg had no significant ($P < 0.440$) effect on heart when in wheat, sorghum and corn base diet (Liu et al., 2014).

Akyurek et al. (2011) stated that phytase addition in low phosphorus diet did not increase the heart, spleen and liver weight. Phytase inclusion decreased liver weight significantly when the diets low in non phytate phosphorus were supplemented with 1000 FTU/kg of phytase (Baradaran et al., 2014).

CONCLUSION

It was concluded that higher level of phytase improved the growth performance, in broiler birds as compared to birds fed diet without supplementation of phytase. Birds fed diet supplemented with higher phytase occupied higher growth performance, better carcass characteristics and increased mineralization.

CONFLICTS OF INTEREST

The authors declared no conflict of interest.

AUTHOR'S CONTRIBUTION

All the authors have equally contributed in the manuscript.

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