Original Research

Influence of Super Dosing of Phytase Enzyme on Performance of Broiler Chicken

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Abstract

An experiment was conducted to evaluate the performance of broiler by super dosing of phytase. 375, one days old Vencobb[400] straight run chicks were weighed and distributed randomly into five treatment groups viz, A, B, C, D and E with three replicates of 25 chicks each. The recommended nutritional matrix for 500 FTU was used as per manufacturer guidelines. Treatment group A was control, B was fed with phytase enzyme with @ 500 FTU matrixes/ ton of feed, C was fed with phytase enzyme with @ 1000 FTU with 500 FTU matrix/ ton of feed, D was with phytase enzyme with @ 1500 FTU with 500 FTU matrix/ ton of feed and E was fed with phytase enzyme with @ 2000 FTU with 500 FTU matrix/ ton of feed. The cumulative body weights, feed consumption and FCR up to 6th week of age were non-significant. The performance of Phytase supplemented groups was at par to that of control even by reducing the nutrients as per matrix and best performance was observed for treatment groups D. The serum calcium values at 42 days differ significantly (P<0.05), however serum phosphorus values showed non-significant differences. An enhanced profitability was recorded for super dosing treatment groups using nutritional matrix with increasing the doses level. An increase in profitability was due to lower feed cost, thereby reduced cost of production. It concluded that super dosing of phytase increased the better utilization of nutrients thereby improved performance than non-supplemented group. The diet prepared as per nutritional matrix phytase @ 500 FTU of feed and super dosing with 1500 FTU of feed was more beneficial from bird's performance and improved profitability.

Key words: Broiler Performance, Calcium and Phosphorus Retention, Economics, Nutritional Matrix, Phytase, Supplementation

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Introduction

An antinutritional effect of phytic acid causes deficiency related diseases in monogastrics which might lead to poor quality egg and meat in poultry. Phytate forms a strong complex with some protein and resist their proteolysis (Kumar *et al*., 2010). Phytate intake was found to reduce the blood glucose response (Lee *et al*., 2006). Removal or degradation of phytic acid would therefore increase the bioavailability of many cations and improve nutritional value of the meal (Bohn *et al*., 2008). Phosphorus is the second most abundant mineral in the animal body. As with calcium, the formation and maintenance of bone are quantitatively the most important function. The 20% of Phosphorus not present in the skeletal tissues is widely distributed in the fluids and soft tissue of the body; it serves a range of essential function, dietary additions of feed phosphates not only increase the feed and production cost but may also lead to an increase of soluble P in the excreta. Due to phytate, phosphorus is unavailable or poorly utilized by broiler birds. This unavailability is because of the very low phytase activity found in the digestive tract of the birds. Therefore, diets of broiler birds are often supplemented with sources of inorganic Phosphorus to meet the Phosphorus requirements of the birds, it increase the cost of the diets and contributes to environmental pollution (Wang *et al*., 2013).

It may be a more complex strategy involving the use of high doses of phytase to accommodate the replacement of expensive animal protein meals with cheaper vegetable alternatives. The use of super dosing levels of microbial phytase in the diets of poultry results in increase feed intake and commensurate weight gain probably via phosphorus availability mechanism. Feed conversion ratio (FCR) may be improved via inositol liberation and phytate destruction. The use of higher levels of phytase is wide spread and performance enhancement is observed. The mechanisms are still not entirely clear. Phosphorus availability, inositol liberation and phytase destruction these three components work together and contribute to the overall positive effect reported in the literature. With all this in view, the present experimental design is planned to study the effects of super dosing of phytase enzyme on performance of broiler.

Materials and Methods

Formulation of Experimental Ration

One unit of phytase activity was defined as the quantity of enzyme required to free 1 µmol of inorganic Phosphorus /min. from 5 mol sodium phytate at pH 5.5 at 37^0c. (PU/ FTU indicate Phytase activity). The rations were prepared as per BIS,2007 and recommended nutritional matrix for 500 FTU was considered as per manufacturer guidelines (phytase was supplied by AB Vista, South Asia, Pune) and phytase enzyme added in experimental treatment groups B, C, D and E @ 500, 1000, 1500 and 2000 FTU, respectively with use of 500 FTU matrix for each treatment group. The experimental diets A were basal diet without phytase enzyme. The feed was prepared at Feed Mixing Plant, College of Veterinary and Animal Sciences, MAFSU, Parbhani. The diet composition and nutritional level in feed during pre-starter, starter and finisher are presented in Table 2 and 3 respectively. The nutritional matrix values

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(Table 1) of commercial enzyme product was considered for broiler as per recommended by manufacture for an inclusion of 100 gm phytase/ ton of feed ensuring 500 PU/FTU.

Table 1: Nutrient matrix value of 500 FTU phytase for broiler

	500ftu/kg (100gm/t)
Available P (%)	1500
Ca (%)	1650
Sodium (%)	350
Lysine (%)	170
Methionine (%)	39
Cystine (%)	351
Methionine + Cystine (%)	390
Threonine (%)	330
Tryptophan (%)	190
Glysine + Serine (%)	570
Arginine (%)	130
Valine (%)	230
Isoleusine (%)	255
Crude Protein (%)	4210
ME (MJ/Kg) (%)	2170
ME (Kcal/Kg) (%)	520000

Table 2: Percent ingredients, rate, cost, composition of prestarter rations for control and super dosing phytase enzymes groups

Ingredient		Prestarter									
Kg/100 Kg	Rates/kg	Control	Amount	500 FTU	Amount	1000FTU	Amount	1500FTU	Amount	2000 FTU	Amount
Corn	15	53.2	798	54.76	821.4	54.76	821.4	54.76	821.4	54.76	821.4
Soy meal	46	41	1886	39.5	1817	39.5	1817	39.5	1817	39.5	1817
Soy oil	75	3	225	2.5	187.5	2.5	187.5	2.5	187.5	2.5	187.5
DCP	38	1.5	57	1.3	49.4	1.3	49.4	1.3	49.4	1.3	49.4
LSP	3	1	3	0.7	2.1	0.7	2.1	0.7	2.1	0.7	2.1
Salt	7	0.3	2.1	0.34	2.38	0.34	2.38	0.34	2.38	0.34	2.38
SBC	40	....	.....	0.15	6	0.15	6	0.15	6	0.15	6
lysine HCl	200	0.17	34	0.15	30	0.15	30	0.15	30	0.15	30
Methionine	380	0.18	68.4	0.2	76	0.2	76	0.2	76	0.2	76
L-threonine	150	.....	.....	0.05	7.5	0.05	7.5	0.05	7.5	0.05	7.5
Vitamin	440	0.15	66	0.1	44	0.1	44	0.1	44	0.1	44
Mineral	300	0.3	90	0.1	30	0.1	30	0.1	30	0.1	30
Ch-Ch	90	0.06	5.4	0.1	9	0.1	9	0.1	9	0.1	9
Coccidiostat	200	0.05	10	0.05	10	0.05	10	0.05	10	0.05	10
Total			3244.9	100	3092.28	100	3092.28	100	3092.28	100	3092.28
Cost/Kg			32.44		30.92		30.92		30.92		30.92
Phytase	600	......	.....	0.01	6	0.02	12	0.03	18	0.04	24
Total			3244.9		3098.28		3104.28		3110.28		3116.28
Cost/Kg			32.44		30.98		31.04		31.1		31.16

The pre-starter ration was offered for first eight days, starter ration was offered from 9th day up to end of 21st day of age and finisher ration was offered thereafter up to 42nd day of age. The cost of rearing the chicks for complete experiment was calculated by taking into consideration the cost of chick, cost of total feed consumed by bird, cost of litter, vaccination, medication expenses.

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Table 3: Percent ingredients, rate, cost, composition of starter rations for control and super dosing phytase enzymes groups

Ingredient		Starter									
Kg/100 Kg	Rates/kg	control	Amount	500 FTU	Amount	1000FTU	Amount	1500FTU	Amount	2000 FTU	Amount
Corn	15	54	810	60.75	911.25	60.75	911.25	60.75	911.25	60.75	911.25
Soy meal	46	39	1794	34.5	1587	34.5	1587	34.5	1587	34.5	1587
Soy oil	75	4.2	315	2.2	165	2.2	165	2.2	165	2.2	165
DCP	38	1.5	57	0.73	27.74	0.73	27.74	0.73	27.74	0.73	27.74
LSP	3	1	3	0.76	2.28	0.76	2.28	0.76	2.28	0.76	2.28
Salt	7	0.3	2.1	0.2	1.4	0.2	1.4	0.2	1.4	0.2	1.4
SBC	40	......	.....	0.15	6	0.15	6	0.15	6	0.15	6
L-lysine HCl	200	0.13	26	0.15	30	0.15	30	0.15	30	0.15	30
Dl methionine	380	0.19	72.2	0.25	95	0.25	95	0.25	95	0.25	95
L-threonine	150	......	.....	0.06	9	0.06	9	0.06	9	0.06	9
Vitamin	440	0.15	66	0.05	22	0.05	22	0.05	22	0.05	22
Mineral	300	0.3	90	0.1	30	0.1	30	0.1	30	0.1	30
Choline chloride	90	0.06	5.4	0.05	4.5	0.05	4.5	0.05	4.5	0.05	4.5
Coccidiostat	200	0.05	10	0.05	10	0.05	10	0.05	10	0.05	10
Total		100	3250.7	100	2901.17	100	2901.17	100	2901.17	100	2901.17
Cost/Kg			32.5		29.01		29.01		29.01		29.01
Phytase	600	......	...	0.01	6	0.02	12	0.03	18	0.04	24
Total					2907.17		2913.17		2919.17		2925.17
Cost/Kg			32.5		29.07		29.13		29.19		29.25

Experimental Birds and Data Collection

The experiment was carried out on commercial straight run broilers for a period of 42 days at the Department of Poultry Science, College of Veterinary and Animal Sciences, MAFSU, Parbhani. Total 375 day old Vencobb[400] broiler chicks were obtained from Private Hatchery. On arrival, the chicks were weighed and distributed randomly into five treatment groups viz. A, B, C, D and E with three replicates of 25 chicks each (Table 5).

Table 5: Experimental design used for super dosing of phytase on performance of broilers

Treatment group	Treatment group Details	birds/pen/ replication	Replicate	Total birds
A	Control –Basal Diet	25	3	75
B	Diet with recommended matrix + 500 FTU phytase	25	3	75
C	Diet with recommended matrix + 1000 FTU phytase	25	3	75
D	Diet with recommended matrix + 1500 FTU phytase	25	3	75
E	Diet with recommended matrix + 2000 FTU phytase	25	3	75
	Total number of birds			375

The cumulative weight gain, feed consumption, FCR and mortality were recorded replicate wise at weekly interval. The cost of rearing the chicks for complete experiment was calculated by taking into consideration the cost of chick, cost of total feed consumed by bird, cost of different litter, vaccination, medication expenses. However, gross profit per bird was calculated by subtracting the cost of production per bird from the price fetched per bird after selling it in the local market on live weight basis.

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Estimation of Serum Calcium and Phosphorus

At the end of the trial serum was collected from two birds from each group and serum calcium was estimated by Co- CPC method (Berthelot,1973) and phosphorus was estimated by UV Molybdate method in Semi- Auto Analyzer (ERBA-chem. – 7) at Central Instrumentation and Analytical facility, College of Veterinary and Animal Sciences, Parbhani.

Statistical Analysis

Data, thus collected were subjected to statistical analysis by using F Randomized block design by Snedecor, and Cochran, (2007). The treatment means were compared by Critical Differences (CD) and Analysis of Variance.

Results and Discussion

Cumulative Weight Gain

The mean cumulative weight gains at 6th week of age for treatment A, B, C, D and E were 1753.7, 1717.9, 1784.8, 1889.0 and 1799.0g respectively (Table 6).

Table 6: Influence of super dosing of phytase enzyme on performance of broilers

	Cumulative body weight gain(gm)							
Treatment / Weeks	**A**	**B**	**C**	**D**	**E**	**SE ±**	**CD**	**CV %**
I	82.73	82.36	82.29	83.33	78.89	2.0069	6.3135	4.24303
II	245.57	255.15	248.56	251.51	243.68	4.2561	13.389	2.96180
III	447.75	459.35	459.67	462.64	448.91	7.1503	22.494	2.71794
IV	807.60	831.93	860.59	863.91	821.88	14.564	45.818	3.01317
V	1172.8	1199.5	1208.9	1255.7	1211.6	25.332	79.694	3.62715
VI	**1753.7**	**1717.9**	**1784.8**	**1889.0**	**1799.0**	**35.823**	**112.70**	**3.46844**
	Cumulative feed consumption (gm)							
I	90.77	101.83	90.62	89.72	90.12	2.882	9.0665	5.38987
II	340.87	365.01	345.97	349.03	341.47	6.2512	19.666	3.10712
III	692.93b	746.12a	711.98ab	715.09ab	692.71b	11.027	34.692	2.68349
IV	1303.9	1378.0	1345.6	1360.5	1300.0	20.133	63.336	2.60698
V	2048.6	2119.4	2126.6	2202.8	2083.9	32.496	102.23	2.65966
VI	3062.9	3101.7	3161.8	3261.6	3095.5	53.934	169.67	2.97816
	Cumulative FCR							
I	1.0967b	1.2367a	1.1000b	1.0733b	1.1467ab	0.0299	0.0941	4.58429
II	1.3900	1.4300	1.3933	1.3900	1.4033	0.0230	0.0725	2.84847
III	1.5500	1.6267	1.5500	1.5433	1.5433	0.0302	0.0950	3.34972
IV	1.6167	1.6600	1.5633	1.5733	1.5833	0.0254	0.0801	2.75871
V	1.7500	1.7667	1.7567	1.7567	1.7200	0.0225	0.0708	2.22784
VI	1.7467	1.8100	1.7733	1.7300	1.7233	0.0276	0.0871	2.73007

The analysis of variance for the mean cumulative weight gain at different weeks revealed non-significant differences among the treatment groups (Table 7).

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Table 7: Analysis of variance for weekly cumulative weight gain, feed consumption and feed conversion ratio of broilers at different age with super dosing of phytase

Source	**DF**	**1st week**		**2nd week**		**3rd week**	
		MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	9.1149	0.75438	63.218	1.1633	140	0.91279
Error	10	12.083		54.342		153.38	
		4th week		**5th week**		**6th week**	
		MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	1799.6	2.8281	2689	1.3968	12322	3.2008
Error	10	636.34		1925.2		3849.8	
Cumulative Feed Consumption							
Source	DF	**1st week**		**2nd week**		**3rd week**	
		MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	80.105	3.2148	290.31	2.4764	1431.8	3.9246*
Error	10	24.917		117.23		364.82	
		4th week		**5th week**		**6th week**	
		MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	3575.1	2.9401	9913.7	3.1293	18451	2.1144
Error	10	1216		3168		8726.5	
Cumulative Feed Conversion Ratio							
		1st week		**2nd week**		**3rd week**	
Source	DF	MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	0.01265	4.7109*	0.00086	0.5397	0.00387	1.4136
Error	10	0.0026		0.00159		0.00274	
		4th week		**5th week**		**6th week**	
Source	DF	MSS	'F' value	MSS	'F' value	MSS	'F' value
Treatment	4	0.00465	2.3921	0.00095	0.625	0.0037	1.6449
Error	10	0.00194		0.00152		0.0023	

***P < 0.05*

However, the highest mean for weekly cumulative weight gain was recorded for the treatment group D followed by E, C, A and B. An average cumulative body weight at different weeks for all treatment groups were below the standard weight of cobb broilers. The lower average cumulative weights may be due to heat stress as the experiment was carried out during month of May- June2014, when outer environmental temperature was ranging from 44-47^{0}c. The results of the present study are in accordance with the result of Akyurek *et al.* (2005), Junqueira *et al*. (2012), Amin and Hamidi (2013). However, these authors considered only the availability of the phosphorus, calcium when adding the phytase enzyme and did not consider other nutrition's that are supposedly complexed in the phytic acid. The non-significant influences of phytase super dosing on cumulative weight gain are not consistent with those revealed by Shirley and Edwards (2003), Ahmed *et al.* (2004), Kamiri (2005), Baker *et al*. (2007), Manangi and Coon (2008), Jadhav *et al.* (2011), Johnson *et al.* (2014). These authors revealed that the addition of phytase to the diet of poultry improved weight gains. However, the data cannot be comparable with the results of the present study, because these authors did not consider the enzyme nutrition matrix when formulating the experimental diet. Non-significant influence of phytase supplementation in different treatment groups indicated they were at par to that of control and concluded that phytic acid was a factor limiting phosphorus availability from plant derived foodstuffs. The present results concluded that the

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adverse effect of phytic acid can be effectively overcome by supplementation of phytase. It might have increased AME, digestibility of phosphorus and amino acid in broilers fed on maize soya diet which had reflected in compensative performance in phytase supplemented groups compared to control group A. The findings are in accordance to Cabahug *et al.* (1999).

Cumulative Feed Consumption

From the data (Table 6) observed that, the birds of treatment group C receiving diet super dosing with phytase @ 500FTU recommended matrix consumed numerically higher feed at the end of 6th week. The birds from group D receiving diet with @1000 FTU phytase consumed the lowest feed compared to all other groups, however, statistically non- significant differences were observed (Table 7). These non-significant findings were contrast to the findings observed by Augspurger *et al*. (2007), Santos *et al.* (2008), Saima *et al*. (2009). They reported that increase in feed intake by supplementation of phytase at different doses levels compared to the control group, however, these workers did not used nutrient Matrix. It indicated that the birds fulfilled their nutrient requirement by taking less amount of feed (Wilson *et al*., 1999), concluding improved availability of nutrients by phytase supplementation.

Cumulative Feed Conversion Ratio

The mean cumulative feed conversion ratio at 6th week of age for treatment groups A, B, C, D and E were 1.74, 1.81, 1.77, 1.73 and 1.72, respectively (Table 6). The analysis of variance (Table 7) for mean cumulative feed conversion ratio at this week showed non-significant differences among the treatment groups. The excellent mean cumulative feed conversion ratio was recorded for E followed by D, A, C and B. The results in the present study were in accordance with the previous report by Ahmed *et al.* (2004) and Viveros *et al.* (2002). The better feed conversion ratio was observed for super dosing at 1000, 1500 and 2000 FTU phytase/ Kg of feed. These results were in agreement with those of Zyla *et al.* (2000), Bozkurt *et al.* (2006) and Jadhav *et al.* (2011) who reported that feed conversion ratio of broiler fed the low phosphorus diet containing microbial phytase are comparable with or even better than those obtained for broiler fed the standard phosphorus diets. These result supported the concept that phytase was improving phosphorus availability and phosphorus levels can be lowered in soybean meal based broiler starter and finisher diets added phytase. These result also suggest that phytate phosphorus released by phytase was supplemented to meet starter and finisher broiler growth requirement. The non significant influence of super dosing on cumulative feed conversion ratio are contradicted to the finding of Scheideler and Ferket (2000), Panda *et al.* (2007), Aureli *et al.* (2011) and Santos *et al*. (2013).

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Serum Calcium and Phosphorus (%)

The highest mean value for serum calcium (Table 8) was observed in group E, followed by group A, group B, group C and group D.

Table 8: Serum calcium and phosphorus levels in broilers supplemented with super dosing of phytase

Traits / Treatments	Serum calcium (%)	Serum phosphorus (%)
A	10.367^{ab}	5.453
B	10.167^{ab}	6.006
C	9.266 ^{a}	5.926
D	9.266^{a}	5.720
E	11.500^{b}	5.570
SE $\pm$	0.4825	0.2191
CD	1.5182	0.6894
CV %	8.2649	6.6182

The means bearing similar superscript do not differ significantly from each other.

The highest serum phosphorus values were observed for treatment group B (6.006 %) followed by experiment group C, group D, group E, group A. The mean of serum phosphorus levels at 42 days of experiment showed non-significant difference (Table 9).

Table 9: Analysis of variance for serum calcium and phosphorus of broilers with super dosing of phytase

Source	Df	Serum Calcium (%)		Serum Phosphorus (%)	
		MSS	'F' value	MSS	'F'value
Treatment	4	2.5677	3.6758*	0.16299	1.1313
Error	10	0.6986		0.144	

$^*P < 0.05$

The results in the present study indicated significantly improved serum calcium for phytase supplemented group of 2000 FTU/kg diet, however, the value of serum calcium for treatment group C and D were significantly lower. The increase in serum calcium was expected because the diet with low phosphorus result in elevated ionized calcium in the serum which depresses release of parathyroid hormone, thus reabsorption of phosphate and permitting the urinary excretion of additional calcium observed from the gut. The lower values for treatment group C and D for serum calcium was observed, which is not well explanatory. The results in the present study were in accordance with the findings of Edward (1993), Roberton, Edward (1994) and Jadhav *et al.* (2011). The numerically higher serum phosphorus values revealed better nutrient utilization by broiler chicken fed on corn soya diet. It also indicated that there was improvement in the serum phosphorus at 42 days as compared with control group diet. Similar observations of improved serum phosphorus serum phosphorus with phytase supplementation had been reported by Augspurger *et al*. (2004), Bhanja *et al*. (2005), Arabi *et al*. (2010), Kozlowski and Jeroch (2011), Farzinpour *et al*. (2011), Jalani *et al.* (2012), Kuhn *et al.* (2012), Rutherford *et al.* (2012), Wang *et al*. (2013), Beiki *et al.* (2013) and Arabi *et al.* (2013). The improvement in serum phosphorus observed in

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the phytase supplemented group may be due to release of phosphorus from the phytate mineral complex (Saimans *et al.* 1990) or increase availability of protein as suggested by Sebstian *et al.* (1996)

Mortality

The mortality in control group A was higher compared to rest of the treatment groups (Table 10). The higher mortality in treatment group was due to heat stress. Significantly lower mortality in phytase supplemented group indicated that there was no detrimental effect on survivability by supplementation of phytase enzyme. On the other hand, the supplementation of phytase protected the birds from heat stress. These results are in agreement with walk *et al.* (2012), who concluded that experimental mortality was low (3.41 percent). In contrast to these broiler fed with 5000 FTU/kg phytase had an increased ($p \leq 0.05$) mortality compared to other experimental groups (Walk *et al.*, 2012).

Table 10: Mortality (%) in broilers supplemented with super dosing of phytase

Treatment groups	Mortality per treatment	Mortality (%)
A	8/75	10.66
B	2/75	2.66
C	3/75	4.00
D	2/75	2.66
E	2/75	2.66

Economics of Broiler Production

The economics of broiler (Table 11) inferred that supplementation of super dosing of phytase enzyme significantly enhanced the net income per bird.

Table 11: Economics of broiler production supplemented with super dosing of phytase

S. No.	Economics					
	Particulars	A	B	C	D	E
1	Cost of day old chick (Rs)	17	17	17	17	17
2	Feed consumption (g)					
i)	Prestarter	90.77	101.83	90.627	89.72	90.12
ii)	Starter	602.16	644.29	621.35	625.38	602.59
ii)	Finisher	2369.97	2355.6	2449.85	2546.56	2402.78
	Total	3062.9	3101.72	3161.82	3261.66	3095.5
3	Rate of feed (Rs/kg)					
i)	Prestarter	32.44	30.98	31.04	31.1	31.16
ii)	Starter	32.5	29.07	29.13	29.19	29.25
iii)	Finisher	31.14	27.22	27.28	27.34	27.4
4	Cost of feed consumed (per bird Rs.)					
i)	Prestarter	2.94	3.15	2.81	2.79	2.8
ii)	Starter	19.57	18.72	18.09	18.25	17.62
iii)	Finisher	73.8	64.11	66.83	69.62	65.83
	Total cost of feed consumed per bird (Rs.)	96.31	85.98	87.73	90.66	86.25
5	Miscellaneous cost* (Rs)	5	5	5	5	5
6	Total cost of production (1+4+5)	118.31	107.98	109.73	112.66	108.25
7	Average live weight (g)	1794.8	1758.4	1824.8	1929.4	1839.1
8	Return obtained @ Rs. 68 per kg live weight	122.04	119.57	124.08	131.19	125.05
9	Net profit/ bird (Rs)	3.73	11.59	14.35	18.53	16.8
10	Net profit/ kg (Rs)	2.07	6.59	7.86	9.6	9.13

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It was observed that as the levels of phytase enzyme increased, the net profit increased due to decreased cost of production. Cost of day old broiler chicks and feed cost were the major inputs considered. The super dosing of phytase could make a reasonable profit. As the feed constitute more than 70 percent of the ration cost for broiler feeding. Further benefits lie within the improvement of digestibility and better utilization of nutrient the net profit/ kg was significantly better in broiler group fed diet supplemented with 1500 FTU/ Kg of feed. The present findings are in close agreement with that reported by Khose *et al.* (2003), Dhore *et al*. (2012), Jadhav *et al.* (2011), Narshima *et al*. (2013) and Ponnuvel *et al*. (2013).

Conclusion

The overall results obtained from the present study leads to conclusion that the birds with super dosing of phytase and consideration of nutritional matrix during feed formulation improved the performance and profitability in linear way. It supports the concept that hydrolyzing phytate and consequently reduced the antinutritional effect of phytate and thereby improved bird's performance. By consideration of nutritional matrix at 500 FTU of feed significantly reduced cost of production, thereby increase profitability. The study concluded importance of proper selection of dose and proper nutritional Matrix to get best result in terms of profitability. However, liner improvement was not noticed beyond 1500 FTU super dosing. Further research will be required to study effect of super dosing with use of respective dose matrix.

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References

1. Ahmed F., M.S. Rahman, S.U. Ahmed and M.Y Miah (2004). Performance of broiler on phytase supplementation soybean meal based diet, international journal of poultry science 3 (4): 266-271.
2. Akyurek Hasan, Nizamettin Senkoylu and Mehmet Levent Ozduven (2005). Effect of microbial phytase on growth performance and nutrients digestibility in broilers. Pakistan Journal of Nutrition 4(10: 22-26
3. Amin MD Ruhul and Elliyana Nadia BT Hamidi (2013). Effect of phytase supplementation on the performance of babcock-308 layer hens. Journal of tropical resources and sustainable science 1(1): 36-41
4. Arabi Sami Ahemed, Ahemed. Elamin Mohanmmed, Kamal Abdalbaqi Mohammed (2010). Effect of dietary phytase at different phosphorus, high nitrogen on broiler chick's production. ISSN: 1858-571X
5. Augspurger N.R. and Baker D. H. (2004). High dietary phytase levels maximize phytase phosphorus utilization but do not affect protein utilization in chicks fed phosphorus or amino acid deficient diets, journal of animal science, 82:1100-1107.
6. Augspurger N. R D. M. Webel and D. H. Baker (2007). An Escherichia coli phytase expressed in yeast effectively replaces inorganic phosphorus for finishing pigs and laying hens. J. Anim. Sci.85: 1192-1198

 DOI 10.5455/ijlr.20170921044550

7. Aureli R., M. Umar Faruk, I. cechova, P.B. Pedersen, S.G. Elvig –Joergensen, F. Fru and J. Broz (2011). International journal of poultry science10 (2): 160- 168
8. Baker N.J, A. S. Parson and J. S. Mortiz (2007). Effect of various phytase concentrations in diet with low- phytase corn on broiler chicks performance and performance and nutrient use, international journal of poultry science 6 (2):77-84.
9. Beiki M., S.M. Hashemi and A. Yaghoobfar (2013). The use of phytase and low phosphorus levels in broiler diets with different metabolizable energy levels. Journal of Animal and Poultry Science 2 (2): 48-54.
10. Berthelot E.S. (1973). Clin. Chem. Acta 446, 46.
11. Bhanja S. K., V.R. Reddy, A.K. Panda, S.V. Rama Rao and R.P. Sharma (2005). Effect of supplementing microbial phytase on performance of broiler breeders fed low non-phytate phosphorus diet. Asian-Aust.J.Anim. Sci. 18 (9): 1299-1304.
12. Bohn Lisbeth, Anne S. Meyer and Soren K. Rasmussen (2008) Phytase act on environment and human nutrition a challenge for molecular breeding. National Research 26: 503-508.
13. Bozkurt M., M. Cabuk and A. Alcicek (2006). The effect of microbial phytase in broiler grower diets containing low phosphorus, energy and protein. J. Poult. Sci., 43: 29-34.
14. Bureau of Indian standards (2007). Indian standards. Poultry Feed Specification (fifth revision) page 3-5.
15. Cabahug S.R., Windran V., Selle P.H. and Bryden, W.L. (1999). Responses of broiler chickens to microbial phytase supplementation as influenced by dietary phytic acid and non phytate phosphorus levels. British Poultry Journal 40: 660-666.
16. Dhore R.N., R.L. Wasnik., A. P Dhok (2012). Effect of different sources of calcium and phosphorus with or without phytase on performance of Satpuda Desi birds. Indian Journal of Poultry Science 47(2): 199-203 .
17. Edward H.M. Jr. (1993) Dietary 1,25 Dihydroxycholecalciferol supplementation increases natural phytase phosphorus utilization in chicken. J. Nutr. 123: 567-577.
18. Farzinpour amjad, Ahmad Karimi and Ardaashir Sheikh Ahmadi (2011). Effects of dietary phytase and different levels of non phytase phosphorus on some serum mineral and biochemical parameter in \broiler chicken. Journal of animal and Veterinary Advances 10(10): 1317-1321.
19. Jadhav N V, M D Suranagi and S N Anjaneya (2011). Effect of replacing soyabean meal and dicalcium phosphate in the diets with alternative indredients and phytase supplementation as growth and nutrient balance in broiler chicken. Animal Nutrition and food Techanology. 11: 203-210.
20. Jalani M. A and babaei (2012). effect of supplementation dietary phytase on performance and blood biochemical parameter of broiler chicks, international journal of bioscience, biochemistry and bioinformatics.2: 1.
21. Johnson Lisa A., Aman Deep, Hank Classen (2014). digestability and performance responses of broiler chickens fed a pea- based diet with different levels of dietary microbial Phytase university of Saskatchewan undergraduate research journal 1 (1): 39-44.
22. Junqueira Mack Otto, Karina Ferreira Duarte, Vinicius Assuena, Rosemeire da Silva Filardi, Antonio Carlos de kamiri a. (2005). Effect of different non- phytase phosphorus level and phytase sources on performance in broiler chicks, International Journal of Poultry Science 4 (12): 1001- 1005.
23. Khose K. K.; Ranade A. S., Kadam M. M., Jagatap S. K., Gole M.A. (2003). Effect of phytase supplementation on performance of broiler fed low phosphorus diet. International Journal of Poultry Science.38 (30): 288-290.
24. Kozlowski Krzysztof and Heinz Jeroch (2011). The effect of *Escherichia coli* phytase on nutrient metabolizability and ileal digestability in laying hens. ISSN 55(77): 1392-2130.
25. Kuhn Imke, Ralf Greiner, Janos Tossenberger (2012). The effect of phytase on ilealphosphorus digestibility and ip6 degradation in broiler, wpc2012- salvador- bahia- Brazil 5-9.
26. Kumar v.,Sinha A. K.,Harinder P.S. Markkar, Klaus Becker(2010). Dietary roles of phytate and phytase in human nutrition. Food Chemistry 120: 945-959.

  DOI 10.5455/ijlr.20170921044550

27. Lee Sung-Hyen, Hong Ju-Park, Hye-Kyung Chun, So- young Cho, Soo- Muk Cho, Hyun soon Lillehoj (2006). Dietary phytic acid lowers the blood glucose levels in diabetic KK mice. Nutrition Research 26: 474-479.
28. Manangi M.K. and C.N. Coon (2008). Phytase phosphorus hydrolysis in broiler in response to dietary phytase, calcium and phosphorus concentration. Poultry Science 87: 1577-1586.
29. Narasimha J., Nagalakshmi D., S. T. Viroji Rao M. Venkateswerlu. Y. Ramana Reddy (2013). Associative effect of non- starch polysaccharide enzymes and phytase on performance, nutrient utilization and gut health of broiler fed sub optimal energy diets. Research journal of Poultry Sciences 6(1): 23-28.
30. Panda Arun K., Savaram V. Rama Rao, Mantena V.L.N. Raju, Shyma S., Shishir K. Bhanja (2007). Performance of broiler chickens fed low non phytase phosphorus diet supplemented with microbial phytase. The Journal Poultry Science 44: 258-264.
31. Ponnuvel P., K. Narayanankutty, A. Jalaludeen and P. Anitha (2013). Economics of phytase enzyme supplementation in low energy- protein layer chicken diet. Academic Journal 5(7): 113-116.
32. Roberson K.D. And H.M. Edwards (1994). Effect of 1,25 dihydroxycholecalciferol and phytase on zinc utilizationin broiler chicks. Poult. Sci. 73: 1312-1326.
33. Saima M.Z. U. Khan, M. A. jabbar, M. Ijaz and M.A. Qudeer (2009). Efficacy of microbial phytase at different levela on growth performance and mineral availability in broiler chicken. The journal of animal and plant science 19(2): 58-62.
34. Santos F.R. M. Hurby, E. M. Pierson, J. C. Remus and N.K. sakomura (2008). Effect of phytase supplementation in diet on nutrient digestibility and performance in broiler chicks. J.Appl.Poult. Res.17:191-201.
35. Scheideler S.E. and P. R. Ferket (2000). Phytase in broiler ration Effects on carcass yield and incidence of tibial dyschondroplasia. J. Appl. Poultry Res.9:468-475
36. Sebastian S., S.P. Touchburn, E.R. Chavez and P.C. Lague (1996). Efficacy of supplemental microbial phytase at different dietary calcium levels on growth performance and mineral utilization of broiler chicken. Poult. Sci. 75: 1516-1523.
37. Shirley R.B. and H.M. Edwards (2003). Graded levels of phytase past industry standards improves broiler performance. Poultry Science 82:671-680
38. Simons, P.C.M., H.A.J. Versteegh, A.W. Jongbloed P.A. Kemme and P. Slump (1990). Improvement of phosphorus availability by microbial phytase in broiler and pigs. Br. J. Nutr. 64: 525-540
39. Snedecor, G.W. and Cochran, W.G. (1968). Statistical Methods. 6th Ed., Oxford and IBH Publishing Co., Calcutta, Bombay and New Delhi, pp 168-181.
40. Viverous A, Berenes, Arijaand C. Centeno (2002). Effect of microbial phytase supplementation on mineral utilization and serum enzyme activities in broiler chick fed different levels of phosphorus. Poultry science 81: 1172-1183
41. Walk C.L., Bedford M.R. and McElroy (2012). Influence of limestone and phytase on broiler performance, gastrointestinal ph, and apparent ileal nutrient digestibility.
42. Wang Wei, Zhiyue Wang, Haiming Yang, Yujuan Cao, Xiaochun Zhu, Yang Zhao (2013). Effect of phytase supplementation on growth performance, slaughter performance, growth of intestinal organ and small intestine, and serum biochemical parameter of broiler. Open Journal of Animal Science 3: 236-241.
43. Wilson, J.H., E.T. Kornegay, B.L. Frazer, L. Barrions, A.N. Miller and S. Pettit (1999). The influence of supplemented phytase on broiler bone strength. ASAE-CSAE-SCGR. 996072: 8
44. Zyla, K., J. Koreleski, A. Swiatkeiewick Wikiera, M, Kujawski, J. Piironen and Ledovx (2000). Effects of phosphorolytic and cell wall degrading enzymes on the performance of growing broilers fed wheat based diets containing different calcium levels. Poult. Sci. 79: 66-67.

  DOI 10.5455/ijlr.20170921044550