

## **Effect of non-phytate phosphorus levels and phytase sources on performance in broiler chicks**

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### **Abstract**

This study was carried out to investigate the effects of formulating diets varying in non-phytate phosphorus levels (0.45, 0.38 and 0.31 % during the starter and 0.43, 0.36 and 0.29 % during the grower and finisher periods, respectively) with 500 F.T.U of either Natuphos or Ronozyme-P phytase on performance in broiler chicks. Ross straight-run broiler chicks (n=576) were allocated to six dietary treatments, each replicated three times (32 chicks per pen) in a completely randomized design in a 3×2 factorial arrangements. The results indicated that the chicks fed diet containing lower NPP levels had significantly lower body weight at 40 and 50 d; lower daily gain during 21-40d; and higher feed conversion ratio during 21-40d period. The broiler performance was not affected by either source of phytase or the interaction between phytase source and NPP levels.

### **Introduction**

It is well established that the majority of plant phosphorus is in the form of phytate, which has a low availability to monogastric animals, such as poultry and pigs (Simons et al., 1990; NRC, 1994). Phytic acid not only reduces phosphorus availability for poultry, but also reduces the availability of other nutrients in poultry diets (Ravindran et al., 2001; Shirley and Edwards, 2003). Supplementation of poultry diets with phytase is an effective method to enhancing the digestibility of phytic acid in monogastric animals. Microbial phytase supplementation of diets, not only enhances broiler performance on low P rations, but also increases the availability of phytate P, Zn, Ca, Mg, Cu, AME of the diets and a number of amino acids (Simons et al., 1990; Ravindran et al., 2001; Punna and Roland, 2001; Yan et al., 2001).

The objectives of the present experiment were to investigate the influence of lowering NPP levels with two different source of phytase on performance of broiler chicks.

### *Material and Methods*

*576 day-old, mixed-sex, Ross broiler chicks, were randomly allocated to six dietary treatments, each replicated three times (32 chicks per pen) in a completely randomized design in a 3×2 factorial arrangements .Birds were maintained on a 2300h light:0100h dark lighting program and allowed ad libitum access to feed and water. The corn-soybean meal-based starter, grower and finisher diets were formulated to meet or exceeded the requirements (NRC, 1994) for all nutrients, with the exception of NPP (table 1).*

### **Results and Discussion**

During the experiment, mortality was within acceptable levels (less than 2 %) and was not related to dietary treatments. The result of this experiment is summarized in table 2.

During the starter period, average BW, DG, FI and FCR were not significantly influenced by different dietary NPP levels (P<0.05). Through grower period, the average body weight (40d) , daily gain, and FCR of broiler chicks (21-40d) were significantly affected by NPP level(P<0.05) ,in which that chicks fed with diet containing 0.36 % NPP had higher BW and

average daily gain, and lower FCR values compared with chicks fed diets containing 0.43 % or 0.29% NPP levels. The results of this experiment also indicated that the average body weight (50d) of broiler chicks fed marginally deficient NPP diets (0.29%) was significantly ( $P<0.05$ ) lower than BW of chicks fed diets containing adequate NPP levels (0.43-0.36%). Other performance criteria were not affected by NPP levels during this period.

Over the whole experimental period(0-50d), the average chicks daily gain, feed intake and feed conversion ratio were not either significantly influenced by dietary NPP level or phytase sources. According to the results, phytase sources had not significant effect on broiler performance ( $P<0.05$ ). There was no significant interaction ( $P>0.05$ ) between dietary NPP levels and phytase source.

The fact that reduced NPP levels did not adversely affect gain during the starter period suggests that even the 0.31% NPP diet was not severely deficient in phosphorus during this phase. This is in agreement with the findings of Waldroup et al. (1999). Very low NPP diets typically result in reduced gain and intake and perhaps a mildly adverse effect on FCR, and performance being restored with addition of phytase (Simons et al., 1990; Sohail and Roland, 1999; Yan et al., 2001 Ravindran et al., 2001). Liveweight at 40 and 50dd of ages were influenced by dietary NPP level, indicating that the low NPP diets fed during these periods were in fact deficient. Data from the literature is equivocal during this phase of growth, with some papers suggesting lower levels of NPP are required to constrain growth (Sohail and Roland, 1999; Waldroup, 1999) and others suggesting these levels are already deficient (NRC, 1994). Lack of significant difference between two source of phytase during this experiment, could be partially explained by the fact that the NPP levels of the diets in this experiment were marginally deficient, not severely (Simons et al., 1990; Waldroup et al., 1999).

## **Conclusion**

The results of this experiment demonstrate that the effect of feeding the marginally NPP deficient diets becomes most evident after 21d of age, and under the circumstances presented here, the broiler performance was not affected by phytase source or the interaction between phytase source and dietary NPP levels.

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## **References**

- National Research Council (1994). Nutrient Requirements of Poultry. 9th. rev. ed. National Academy Press, Washington, DC.*
- Ravindran, V., Sell, P. H., Ravindran, G., Morel, P. C. H., Kies, A. K. and Bryden, W. L. (2001). Microbial phytase improves performance, apparent metabolizable energy and ileal amino acid digestibility of broilers fed a lysine –deficient diet. Poultry Science. Vol:80: 338-344.*
- SAS Institute, 1991. SAS® User's Guide: Statistics. Version 6.03 Edition. SAS Institute, Inc., Cary, NC.*
- Simons, P. C. M., Versteegh, H. A. J., Jongbloed, A. W., Kemme, P. A., Slump, P., Bos, K. D., Wolters, M. G. E., Beudeker, R. F. , and Verschoor, G. J. (1990) Improvement of phosphorus availability by microbial phytase in broiler and pigs. British Journal of Nutrition: Vol:64:525-541.*
- Sohail, S. S., and Roland, D. A. Sr. (1999) Influence of supplemental phytase on performance of broilers four to six weeks of age. Poultry Science. Vol:78: 550-555.*

Waldroup, P. W.(1999).Nutritional approaches to reducing phosphorus excretion by poultry. Poultry Science.Vol:78:683-691.

Yan, F., Kersey, J. H. and Waldroup, P. W. (2001) Phosphorus requirements of broiler chicks three to six weeks of age as influenced by phytase supplementation. Poultry Science.Vol: 80: 455-459.

Yan, F., Kersey, J. H., Fritts, C. A. and Waldroup,P. W. (2003) Phosphorus requirements of broiler chicks six to nine weeks of age as influenced by phytase supplementation. Poultry Science.Vol: 82: 294-300.

**TABLE 1.Composition (%) and calculated analysis of basal diets**

Phytase <sup>1</sup> (FTU/kg diet)	Starter			Grower			Finisher		
	500	500	500	500	500	500	500	500	500
<b>Ingredients</b>	(%)								
Corn grain	57.83	58.17	58.50	61.70	62.04	62.34	66.97	67.41	67.85
SBM (44 % Cp)	34.91	34.85	34.78	31.25	31.19	31.12	26.58	26.38	26.18
Fish meal (63 % Cp)	2.50	2.50	2.50	2.00	2.00	2.00	1.17	1.23	1.31
Corn oil	1.27	1.16	1.05	1.53	1.42	1.31	1.59	1.44	1.29
CaCo3	1.13	1.35	1.57	1.08	1.30	1.51	1.05	1.27	1.48
D.C.P	1.33	0.96	0.58	1.32	0.95	0.58	1.48	1.10	0.71
Oyster shell	0	0	0	0.00	0.00	0.00	0.00	0.00	0.00
Common Salt	0.30	0.30	0.30	0.28	0.28	0.28	0.30	0.30	0.29
Mineral premix <sup>2</sup>	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin Premix <sup>3</sup>	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DL. Methionine	0.17	0.17	0.17	0.17	0.17	0.17	0.20	0.20	0.20
L-Lysine –HCL	0.05	0.06	0.06	0.15	0.15	0.15	0.18	0.18	0.18
<b>Calculated dietary nutrient content</b>									
ME(Kcal/kg)	2900	2900	2900	2962	2962	2962	3010	3010	3010
CP (%)	22	22	22	20.5	20.5	20.5	18.4	18.4	18.4
Ca (%)	0.95	0.95	0.95	0.9	0.9	0.9	0.88	0.88	0.88
T.P (%)	0.7	0.63	0.56	0.67	0.60	0.53	0.67	0.60	0.60
NPP (%)	0.45	0.38	0.31	0.43	0.36	0.29	0.43	0.36	0.36

<sup>1</sup> From either sources: Natuphos(10000 F.T.U. phytase activity/gr.) or Ronozyme P( 2500 F.T.U. phytase activity/gr .)

<sup>2</sup> Supplied per Kg: Vit. A , 7200 mg; Vit. D3, 1600mg; Vit. E, 14400mg; Menadion, 800 mg; Thiamine, 720 mg; Riboflavin, 2640 mg; Niacin, 12000 mg; Pyridoxin, 1200 mg; Vit B12, 6 mg; D-Pantothenic acid ,4000 mg; Folic acid, 400 mg; Biotin ,40 mg; Choline chloride, 100000mg; Antioxidant, 40000 mg.

<sup>3</sup> Supplied per Kg: Manganese, 40000 mg; Zinc ,33880 mg; Iron, 20000 mg; Copper , 4000 mg; Iodine , 400 mg; Choline chloride, 100000 mg.

**Table 2. The effect of non-phytate phosphorus levels and phytase source on broiler performance**

		NPP level <sup>1</sup>			Phytase Source	
		Low	Medium	High	Natuphos	Ronozyme P
<b>Body weight(gr.)</b>	<b>20d</b>	500.2	524.7	511.6	511.4	513.0
	<b>40d</b>	1624.8 <sup>b</sup>	1749.3 <sup>a</sup>	1614.5 <sup>b</sup>	1674.6	1651.1
	<b>50d</b>	2192.5 <sup>ab</sup>	2287.1 <sup>a</sup>	2149.0 <sup>b</sup>	2221.4	2197.6
<b>Daily gain(gr.)</b>	<b>0-20d</b>	22.9	24.1	23.4	23.4	23.5
	<b>21-40d</b>	53.6 <sup>b</sup>	58.3 <sup>a</sup>	52.5 <sup>b</sup>	55.4	54.2
	<b>41-50d</b>	71.0	67.2	66.8	68.4	68.3
	<b>0-50d</b>	43.8	45.7	42.9	44.4	43.9
<b>Feed intake(gr.d<sup>-1</sup>)</b>	<b>0-20d</b>	37.4	38.6	36.6	38.5	36.5
	<b>21-40d</b>	111.6	113.1	114.4	113.2	112.8
	<b>41-50d</b>	174.5	169.7	163.6	167.6	170.9
	<b>0-50d</b>	91.38	91.7	90.4	91.4	90.9

<b>FCR(gr.gr<sup>-1</sup>)</b>	<b>0-20d</b>	1.65	1.61	1.57		1.65	1.56
	<b>21-40d</b>	2.09 <sup>ab</sup>	1.94 <sup>b</sup>	2.18 <sup>a</sup>		2.05	2.10
	<b>41-50d</b>	2.47	2.54	2.46		2.47	2.51
	<b>0-50d</b>	2.09 <sup>ab</sup>	2.01 <sup>b</sup>	2.11 <sup>a</sup>		2.06	2.07

a-b: Mean values within a row and under each main effects with no common superscripts differ significantly (P<0.05).

1: Low, Medium, high: 0.45, 0.38 and 0.31% in starter, and 0.43, 0.36 and 0.29% in grower and finisher periods.