Plasma 1,25 dihydroxy cholecalciferol levels in broiler chickens as influenced by dietary levels of phytic acid, available phosphorus and phytase

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Microbial phytase has received considerable attention in recent years as a tool in releasing the phosphorus (P) bound in phytic acid in plant feed ingredients. It has been shown that microbial phytase and cholecalciferol act additively in improving phytate-P utilisation and growth performance in broiler chickens fed on phosphorus-deficient diets (1). The exact mechanism of this synergetic effect is unclear. To understand the mechanism of action, the influence of three levels of phytic acid (10.4, 13.2 and 15.7 g/kg), two levels of available P (2.3 and 4.5 g/kg) and three levels of phytase (Natuphos®, BASF, Sydney; 0, 400 and 800 FTU/kg) on plasma 1,25 dihydroxy cholecalciferol [1,25$(OH)_2$ D] concentrations in broiler chickens was investigated. Each dietary combination was fed to five pens (10 chicks/pen) from day 7 to 25. On the last day of the trial, two birds were randomly selected from each pen and blood samples were taken. Plasma 1,25$(OH)_2$ D levels were determined by competitive binding assay. The relationship between phytic acid, available phosphorus, supplemental phytase and plasma 1,25$(OH)_2$ D levels (pg/ml)in broiler chickens is shown below.

Phytic acid (g/kg)	Available-P (g/kg)	Phytase added (FTU/kg diet)		
		0	400	800
10.4	2.3	235	77	75
	4.5	83	78	77
13.2	2.3	267	109	83
	4.5	136	80	64
15.7	2.3	228	68	66
	4.5	141	75	84

The root mean square error (MSE) was 33.6. The pooled SEM for a single treatment mean is MSE/ $\sqrt{n}$; Available P effect ($P < 0.001$); Phytase effect ($P < 0.001$); Available P x phytase interaction ($P < 0.001$).

Plasma 1,25$(OH)_2$ D levels were not influenced ($P > 0.05$) by dietary phytic acid, but decreased ($P < 0.001$) as the dietary available P level and the added phytase increased. An available P x phytase interaction was also observed. The decrease in plasma 1,25$(OH)_2$ D levels with added phytase was greater in low available P diets compared to those in adequate available P diets. The reductions in plasma 1,25$(OH)_2$ D levels with increased dietary available P was to be expected. The degree of improvement in P availability to added phytase is generally higher in low P diets compared to that in adequate P diets (1). This may explain the interaction observed between available P and phytase.

1. Qian H, Konegay ET, Denbow DM. Utilization of phytate phosphorus and calcium as influenced by microbial phytase, cholecalciferol, and the calcium: total phosphorus ratio in broiler diets. Poult Sci 1997; 76: 37-46.