EFFECTS OF DIETARY PHYTATE AND AVAILABLE PHOSPHORUS LEVELS ON THE RESPONSES OF BROILERS TO SUPPLEMENTAL PHYTASE

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Phytic acid (PA) is the primary storage form of phosphorus (P) in plant seeds, accounting for 60-80% of total P in these materials. The ability of poultry to utilise phytate P from plant-derived ingredients is generally assumed to be poor. In addition, the ability of PA to complex with several biologically important minerals and proteins is well known (Ravindran et al., 1995) and is another nutritional concern associated with phytate. The adverse effects on nutrient utilisation and bird performance will be greater at higher dietary levels of PA. The availability of commercial phytase, an enzyme that hydrolyses PA, offers a practical means of improving the utilisation of phytate P in poultry diets. The present study was conducted to evaluate the response of broilers to microbial phytase (Natuphos®, BASF Corp., Ludwigshafen, Germany) added to wheat-sorghum-soyabean meal diets containing three levels of PA and two levels of non-phytate P (nP).

Nine hundred 7-day old male broiler chicks were used in a 3 x 3 x 2 factorial arrangement of treatments with five replicates (10 chicks/pen) to study the response to three levels of phytase (0, 400 and 800 FTU/kg diet) when given in combination with three levels of PA (10.4, 13.2 and 15.7 g/kg) and two levels of nP (2.3 and 4.5 g/kg). The 'low' PA diet was based on wheat (steam pelleted to destroy intrinsic phytase activity), sorghum and soyabean meal, and the 'medium' and 'high' PA diets were formulated by the inclusion of rice pollard. All diets contained similar levels of metabolisable energy, crude protein, lysine and sulphur-containing amino acids, and the calcium: total P ratio was maintained at 1.4:1. The diets were fed from day 7 to 25. Criteria evaluated included weight gain, feed intake, feed/gain and toe ash content.

Weight gains were lowered (P < 0.001) by increasing dietary PA levels and increased by dietary phytase (P < 0.001) and nP (P < 0.05) additions. However, a nP x phytase interaction (P < 0.001) was observed in which the magnitude of response to added phytase was greater at the lower dietary nP level. Feed intake followed a similar pattern to that of weight gains. Feed/gain was increased (P < 0.001) by increasing PA levels but these adverse effects were overcome (P < 0.05) by supplemental phytase. Dietary nP level had no influence on feed/gain of broilers. Toe ash contents were lowered (P < 0.05) by dietary PA and increased (P < 0.001) by dietary additions of phytase and nP. These results suggest that the anti-nutritive effects of PA on broiler performance and bone mineralisation can be effectively overcome by the provision of supplemental phytase.


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