INFLUENCE OF MICROBIAL PHYTASE ON APPARENT METABolisABLE ENERGY AND AMINO ACID DIGESTIBILITY IN BROILERS

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The use of microbial phytase to release phytate-bound phosphorus (P) in plant feed ingredients has attracted considerable attention in recent years. The effectiveness of microbial phytase in improving overall P availability for growth and bone mineralisation in broilers is now well documented. However, published data on the influence of added phytase on energy utilisation and amino acid digestibility are limited. The influence of microbial phytase (Natuphos®, BASF AG, Germany) on apparent metabolisable energy (AME) and apparent ileal amino acid digestibility (AIAD) are reported in this paper.

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 phytic acid (PA; 10.4, 13.2 and 15.7 g/kg) and two levels of non-phytate P (nP; 2.3 and 4.5 g/kg). Details of the study have been previously reported (Cabahug et al., 1997). The diets were fed from day 7 to 25. The classical total collection method was employed during the last 3 days to determine the AME values of the diets. On day 25, digesta contents from the terminal ileum were collected and processed. Samples of diets and digesta were analysed for acid-insoluble ash and amino acids, and the AIAD values were calculated.

Increasing levels of PA had no influence, but main effects (P < 0.001) of nP and phytase were observed for AME values. An nP x phytase interaction (P < 0.001) was also observed for AME, indicating that the effects of phytase on AME was dependent on dietary nP levels. The AME of diets containing low levels of nP were largely unaffected by added phytase, whereas consistent improvements of 5-6% were seen in diets with adequate levels of nP. The AME of low and adequate nP diets with 0, 400 or 800 FTU phytase/kg were 13.36, 13.58 and 13.49, and 12.66, 13.31 and 13.45 MJ/kg dry matter, respectively. Main effects of PA (P < 0.03 to 0.001) and phytase (P < 0.01) and an interaction of nP x phytase (P < 0.01 to 0.08) were observed for the digestibility of most essential amino acids. Addition of phytase improved amino acid digestibilities at both nP levels, but the responses were greater in diets containing low level of nP. The mean percentage increases in digestibility in diets containing low nP diets plus phytase were as follows: lysine, 3.0; arginine, 3.7; threonine, 6.9; isoleucine, 4.6; leucine, 6.4; valine, 5.4; phenylalanine, 5.1; and histidine, 4.6. The corresponding increases in diets containing adequate nP diets plus phytase were 1.4, 1.8, 3.0, 2.4, 2.9, 2.4, 2.7 and 1.8, respectively. These findings emphasise the relevance of phytate(P)-protein complexes and the anti-nutritional effects of PA on amino acid availability in practical broiler diets. The mechanism underlying the energy effect of added phytase in adequate nP diets is unclear, but it appears to be independent of the protein effect of the enzyme. The present results demonstrate the beneficial effects of microbial phytase on energy metabolism and protein digestion in chickens.


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