Is the Phosphorus in Rye More Digestible for Pigs?

by:- University Of Illinois

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In cereal grains, most of the phosphorus (P) is bound to phytic acid and not available to pigs unless phytase is present. As a consequence, feed phosphates such as monocalcium phosphate and dicalcium phosphate are usually added to the diets to provide enough digestible P to pigs. Not only is this an added expense in diet formulation, but the undigested P that is bound to phytate is excreted in the manure, which could cause manure handling challenges because a greater area is needed for manure spreading.

To mitigate this problem, the swine industry often adds a microbial phytase to the diets, which makes some of the phytate-bound P digestible and reduces the amount of added feed phosphate needed.

However, in addition to microbial phytase, some plants contain intrinsic phytase that also will result in increased digestibility of phytate bound P. As an example, new varieties of hybrid rye contain considerable quantities of intrinsic phytase (2,000 to 3,500 FTU/kg). That means the P in rye might be more digestible, and a microbial phytase might have less of an effect on P digestibility. It is also possible the intrinsic phytase in hybrid rye increases P digestibility in other plant feed ingredients by releasing P from the phytate.

To our knowledge, no information about the ability of the intrinsic phytase in hybrid rye to impact the digestibility of P in other feed ingredients has been published. Therefore, the objective of a recent experiment was to test the hypothesis that including rye in diets containing corn and soybean meal (SBM) without or with microbial phytase improves the apparent total tract digestibility (ATTD) of P and calcium (Ca).

Six-Diet Trial
Three diets were formulated: a corn and SBM-based basal diet, a hybrid rye-based diet and a mixed diet containing corn, SBM and hybrid rye. Each diet was formulated without and with microbial phytase (500 unit/kg; Quantum Blue, AB Vista, Marlborough, UK). Vitamins and minerals, except Ca and P, were included in all diets to meet or exceed current requirements for growing pigs. Fecal samples were collected to calculate the ATTD of P and Ca in each diet.

After calculating the ATTD of P in each diet, the ability of the intrinsic phytase in hybrid rye to increase the digestibility of P in corn and SBM was determined by calculating the additivity of ATTD values in the diets containing corn, SBM and hybrid rye without or with microbial phytase. It was assumed that if the ATTD of P in the mixed diet was similar to what could be calculated from the corn-SBM diet and the hybrid rye diet then there was no effect of the intrinsic phytase in hybrid rye on the ATTD of P in corn and SBM. However, if the ATTD values in the diet containing corn, SBM and hybrid rye was greater than what was predicted from the other diets, the intrinsic phytase in hybrid rye had increased the ATTD in corn and SBM.

Results
The rye used in this experiment had an intrinsic phytase activity of 2,300 FTU/kg, but corn and SBM had phytase activity less than 70 FTU/kg. Results indicated that addition of microbial phytase to the diets improved the ATTD of P and Ca regardless of feed ingredients.

Calculated values for the ATTD of P in the mixed diet containing corn, SBM and hybrid rye with no phytase tended to be greater compared with the ATTD predicted from the corn and SBM diet and the hybrid rye diet. The calculated ATTD of P in the mixed diet supplemented with phytase was greater compared with the predicted value. These results demonstrate that both microbial phytase and the intrinsic phytase in hybrid rye act on the phytate in other feed ingredients in the diet, and therefore increases digestibility of P in a mixed diet. The implication of these results is that less microbial phytase is needed in diets containing hybrid rye compared with diets without hybrid rye to provide a given release of P.

Conclusion

Supplementing microbial phytase improved the ATTD of P and Ca regardless of the feed ingredients used in the diets. The intrinsic phytase in hybrid rye also increased P digestibility in corn and SBM, which resulted in a greater digestibility of P in the diet containing corn, SBM and hybrid rye, than what was predicted from the separate diets. As a consequence, the inclusion of microbial phytase may be reduced in diets containing hybrid rye, which represents a saving in diet costs.

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