The Dose Response to Phytase Inclusion in Diets for Growing Swine

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Introduction

Most of the phosphorus (P) in grains and oilseeds used in swine diets is in the form of phytic acid which is unavailable to the pig and thus excreted into the manure. Inorganic P is usually added to swine diets to meet the animals' requirements, thus increasing diet cost. The phytase enzyme releases the P from the phytic acid, allowing the formulation of diets with less total P. Because the enzyme increases the amount of available P, the Ca concentration in the diet may need to be re-examined, since the Ca:P ratio is critical to the utilization of these minerals. Currently, we do not know the optimum Ca:P ratio to use in the presence of phytase.

This experiment was designed to:

1.Define the growth response of growing pigs to 4 levels of a unique, new, phytase enzyme.

2. Determine how critical the Ca: available P ratio is to optimizing the utilization of the phytase enzyme in practical swine diets.

Methods and Materials

Fifty-four barrows (40.3 ± 1.9 kg) were fed one of 18 different diets (5 levels of phytase plus a positive control, at 3 different Ca:P ratios) for a 28-day growth and digestibility experiment. The corn and soybean diets were supplemented with either 0, 250, 500, 1000, or 2000 U/kg of a novel phytase enzyme. The diets contained 0.38% total P, and either 0.50, 0.60, or 0.70% Ca. The estimated available P at the 0 level of phytase inclusion was 0.11%, which is below the requirement for pigs of this age. The positive control diet was formulated to contain sufficient dicalcium phosphate to meet the pigs' P requirement.

Results and Discussion

Neither performance (ADG, ADFI, feed conversion) nor P digestibility was affected by the Ca concentration in the diet (P>0.1; data not shown). This was surprising and will be investigated in future studies.

Although the inclusion of the phytase enzyme in the diet improved ADG, ADFI and feed efficiency (P<0.05); this improvement plateaued at about the 250 U/kg inclusion level (Figure 1A). Conversely P digestibility was improved linearly (P<0.001) with each increment of supplemental phytase (Figure 1B). This implies that each incremental increase in phytase addition improved P availability, however, beyond the 250 U/kg level, the pigs did not require or utilize this additional P.

Conclusions and Implications

The inclusion of 250 U/kg phytase into diets for growing swine allows the formulation of diets containing less total P without sacrificing performance. This results in less total P excreted into the manure. For example increasing the P digestibility of a diet from 18% (without phytase) to 54% (with phytase) would reduce P excretion in the manure from 7.4 g/d to 4 g/d. Moreover, reducing the P content of the manure also im-

Figure 1. The effect of supplementing corn-soybean diets with phytase on growth, feed intake, feed efficiency (A) and P digestibility (B). The positive control was supplemented with dicalcium phosphate.