Feeding Trials Involving Transgenic Alfalfa Phytase

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Introduction

Phosphorus is abundant in the grain-based rations typically fed to poultry and swine. Because much of this phosphorus is contained in insoluble phytates, however, monogastric animals normally can utilize only about one-third of it. As a consequence, rations must be supplemented with inorganic phosphorus for optimum animal performance. This practice involves cost for the supplement and results in excessive phosphorus, contained in the feces, being added to the environment.

Researchers have shown that the addition of the enzyme phytase (from *Aspergillus niger*) to monogastric rations can approximately double the amount of phosphorus derived from the grain by the animals. This can reduce or eliminate the need for inorganic phosphorus supplementation and reduce the phosphorus content of the feces to as low as 50% of typical levels.

Phytase has been produced, at economically significant levels in alfalfa, by researchers in Madison, Wisconsin. Research was needed, however, to verify that the efficacy of alfalfa-produced phytase is equivalent to phytase produced by *Aspergillus niger* in fermentation vats.

Groups of chicks and weanling pigs were fed at different levels of inorganic phosphorus supplementation (0-max.). Gains of these animals were compared with those of animals with no phosphorus supplementation and phytase from either transgenic alfalfa (juice or leaf meal) or from a commercial source.

Results

Figure 1 shows 3-week gains of chicks at different levels of inorganic phosphorus supplementation. Phytase was fed in the form of alfalfa juice dried on ground corn (1:1 w.b.) at a rate of 800 phytase units per kilogram of ration. The gain from the alfalfa-produced phytase was as great or greater than that of the optimum level of inorganic phosphorus supplementation. While it appeared to be greater than that produced by the commercial phytase product, no valid comparison could be made due to discrepancies in assays for phytase activities and losses in phytase activity during storage.

In the case of weanling pigs (Fig. 2), phytase was added to rations in the form of (1) alfalfa juice, (2) alfalfa leaf meal, and (3) a commercial phytase product. While the gains from the "optimum" level of inorganic P appear slightly higher than those from the various forms of phytase, there was no statistical difference. Additional feeding trials with larger numbers of animals will be carried out to enable valid statistical comparisons to be made.

Conclusions

Research, to date, indicates that phytase from transgenic alfalfa, in various forms, can totally replace inorganic phosphorus supplementation in poultry and swine while maintaining growth rates.

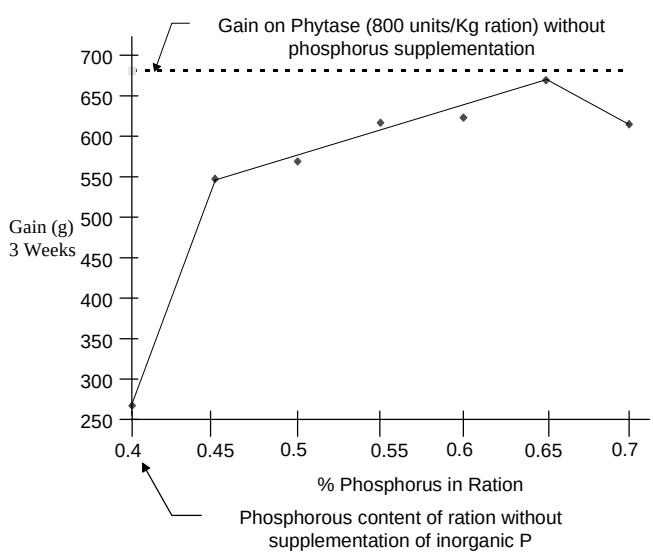

Figure. 1. 3 week gain of chicks vs. phosphorus content of ration compared to phytase with no phosphorus supplementation.

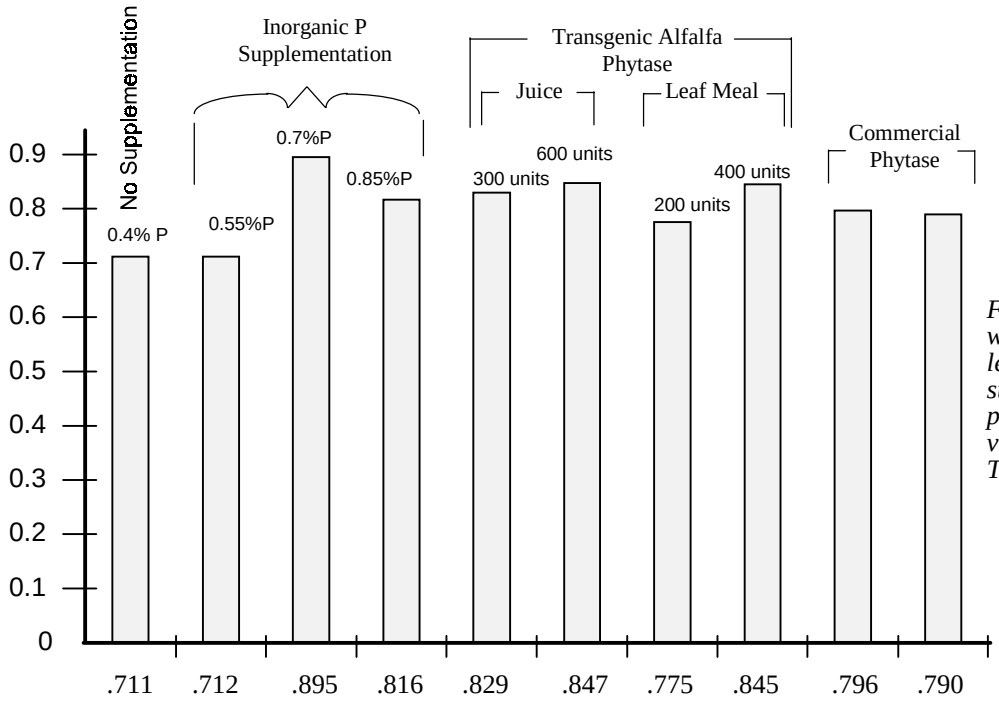

Figure 2. Daily gains of weanling pigs fed at various levels of inorganic phosphorus supplementation or with phytase supplementation from various sources.
Trial Durations: 18-21 days