Super-dosed Phytase Improves Rate and Efficiency of Gain in Nursery Pigs

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Summary

The performance and growth of four hundred forty newly weaned nursery pigs were observed over a 35-day trial at the Iowa State University Swine Nutrition Farm. Pigs were allotted to one of four treatments: an NRC derived positive control [PC], a negative control with 10% lower SID lysine with relative lowering of all other essential amino acids and 1% reduced fat [NC], and two phytase levels: 0 vs 2,500 FTU Quantum Blue, with the 2,500 FTU being considered 'super-dosed'. Pigs started with an average initial body weight of 6.27 ± 0.01 kg., and received feed and water *ad libitum*. For the overall experiment, both diet and phytase improved ADG and G:F. However, ADFI was unaffected, and there were no interactions. In conclusion, including phytase at super-dosed levels in the nursery pig diet improves growth performance, regardless of diet adequacy.

Introduction

Phytate is a compound that plants use to store phosphorous. The phosphorous that is bound by phytate is not accessible to the pig, as pigs do not synthesize phytase, which is the enzyme that breaks down phytate. Producers add exogenous phytate to pig diets to help utilize this bound phosphorus. This allows producers to reduce the level of inorganic phosphorus that must be added to pig diets, thereby reduce feed costs. In addition, pigs will excrete less phosphorus in the manure, so the use of phytase also has environmental benefits as well.

In addition to including phytase to access the phytate-bound phosphorous in plant ingredients, previous studies have shown that phytase fed at super-dosing levels, or levels much higher than what is needed to release the bound phosphorus, may improve pig performance. The expectation is that high levels of phytase release other nutrients in the diet, thus enhancing pig performance. However, the results have been inconsistent.

The objective of this experiment was to further evaluate the concept of using phytase at super-dosed levels. Super-dosed level of phytase were added to diets that were fully adequate in terms of nutrient content, versus a diet that was deficient in amino acids as well as lower in energy. Our hypothesis was that super-dosed phytase would improve pig performance, especially in the deficient diet.

Materials and Methods

Four hundred forty newly weaned pigs (PIC 337 x Temple sows) were received at Iowa State University Swine Nutrition Farm with an average initial body weight of 6.27 ± 0.01 kg. Pigs were weighed, ear tagged, and randomly allotted within weight block to four dietary treatments. The assignment of pens to treatment was random within the nursery room. Sexes were not separated, but were equal amongst treatments. Feed and water were provided ad libitum.

Pigs were weighed on days 0, 7, 14, 21, 28, and 35 to allow for calculation of average daily gain (ADG). Feed utilization was also recorded to determine average daily feed intake (ADFI). The dietary treatments were applied across 4 dietary phases, with the first three phases lasting one week, and the fourth phase lasting two weeks. Phase changes occurred on days 7, 14, and 21, respectively.

Data were analyzed using the PROC MIXED procedure of SAS version 9.2 (SAS Inst. Inc., Cary, NC). The experiment was set up as a randomized complete block design with pigs being blocked by initial weight. Treatment and block were fixed effects.

Results and Discussion

For the overall experiment, diet nutrient level and phytase improved ADG (P <0.001, and P = 0.043, respectively) and G:F (P <0.001, and P = 0.006, respectively). However, ADFI was unaffected by dietary treatment or phytase level (P =0.186, and P = 1.00, respectively). There were no interactions between diet and phytase level. Our hypothesis was not supported, because the use of phytase improved pig growth performance, irrespective of which diet was fed. Interestingly, the pigs on the low nutrient diet with phytase added performed equally to pigs fed the fully balanced diet without phytase. This would represent a substantial opportunity to reduce feed cost while maintaining performance.

In conclusion, under the conditions of this study, the addition of phytase at super-dosing levels to a typical nursery diet improved growth rate and feed efficiency. Decreasing the SID lysine and energy level along with the addition of phytase at super-dosing levels resulted in performance similar to the positive control diet, which was fully balanced for amino acids. This indicates that including

phytase at super-dosing levels in nursery diets will allow producers to improve pig performance without increasing feed intake, as indicated by the improved feed efficiency, both for the diets that meet NRC requirements, as well as in diets limiting in amino acid levels and available energy.

Table 1. Least squares means for the effects of diet and phytase super-dosing on overall growth performance and feed efficiency.

	Main effect of diet[1]		Main effect of phytase		*P*-values		
	PC	NC	0	2,500FTU	Diet	Phytase	DXP
BW, kg							
d0	6.28	6.26	6.27	6.27	0.01	0.72	0.72
d35	22.45	21.68	21.89	22.23	<0.01	0.14	0.34
Daily gain, kg/d	0.477	0.456	0.461	0.472	<0.001	0.043	0.520
Daily feed, kg/d	0.676	0.685	0.681	0.681	0.186	1.000	0.893
Gain:feed	0.706	0.667	0.678	0.695	<0.001	0.006	0.239

[1] PC = Positive control; NC = negative control