A Leader in Nutrition Solutions

SWINE NEWSLETTER

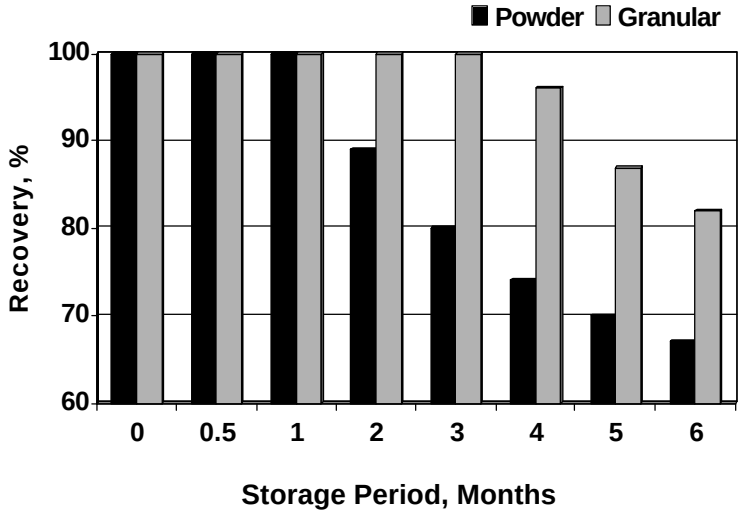
JANUARY 2001

PHYTASE UPDATE

Phytase was introduced to the US swine industry in 1996 and was positioned for grow-finish pig diets. The platform for the phytase launch was based on strong research and field trial data demonstrating decreased phosphorus (P) excretion via 1) increased endogenous phytate P availability, and 2) decreased use of inorganic P sources in the diet. Adaptation of this technology in grow-finish diets occurred quickly for the majority of Akey customers, as phytase is both environmentally friendly and cost effective.

Initial success with phytase did not come without concerns about enzyme stability, especially when phytase-containing products were kept in customer inventory for too long a period of time. Stability concerns were largely resolved in 1999 with the introduction of granular (rather than powder) product (Figure 1). Even with the change in form, products containing granular Natuphos must be handled with care, especially during hot, humid weather. Granular phytase is also destroyed by moisture and heat during the pelleting process, so it is used only in meal feeds or applied post-pelleting as a liquid to the outer surface of cooled pellets.

Figure 1. Stability of Phytase at 86°F



BASF, 1999

In 1996, lack of research data resulted in recommended levels of phytase for sow diets that were not cost effective. By 1999, Akey's practical experience with phytase as well as additional research and field data resulted in lower recommended levels of phytase for sows. Our current

recommendation is 1 lb of Phytase 600 per ton of complete sow feed. At this rate, phytase is cost effective and has resulted in increased use in sow diets by customers. Advantages of using phytase in sow feeds include 1) reduced P excretion, 2) reduced lactation diet cost, and 3) enhanced lactation intake due to lower levels of added inorganic mineral sources. We also increased the energy density of sow diets with phytase, as 10 lb/ton of mineral is replaced with 10 lb/ton of corn. This helps maximize energy intake of lactating sows, which can be a challenge. Akey products including Sow HP 90 Phytase and Sow Booster 55 Phytase, as well as complete sow feeds with phytase, have been updated to reflect our current recommendations.

Phytase likely affects release of nutrients (i.e., amino acids, trace minerals and energy) other than P, but to what extent is unclear. Research in this area has yielded variable results. In Akey's initial studies with GF pigs, we saw an improvement in performance beyond what was expected with phytase (Table 1). Other studies have given similar results, indicating potential release of multiple nutrients. Unfortunately, nutrient release is not constant across all cereal grain sources, nor are all amino acids released at the same rate (Table 2).

Table 1. Effect of Dietary Phytase Addition on GF Pig Performance

	Phytase, FTU/kg		
Item	0	300	Difference Due to Phytase
Initial Wt, lb	55.1	55.6	---
Final Wt, lb	248.4	248.2	---
Days on Feed	101.8	97.2	-4.6 days
ADG, lb	1.89	1.98	+4.8%
F/G Ratio	2.88	2.84	-1.4%
Fecal P, %	1.43	1.06	-26%

Akey Field Trial, 1996

Table 2. Apparent Amino Acid Ileal Digestibility in Relation to Phytase in GF Pigs

	Exp. 1[a]		Exp. 2[b]	
Phytase, FTU/kg	0	800	0	900
Lysine, %	81.0	81.9	77.5	79.9
Methionine, %	76.7	80.6	80.6	81.7
Cystine, %	70.5	74.1	73.4	73.0
Tryptophan, %	72.4	73.6	68.3	72.7
Threonine, %	73.8	72.0	68.3	71.2

[a] Mroz et al., 1994; [b] Kemme, 1995

Energy release by phytase is particularly variable, ranging from 0.4 to 81.3 Kcal/kg (broiler study; Table 3). BASF (2000) published matrix values for nutrient release by Natuphos, and reduced the energy release value by a 70% margin of safety because of inconsistency of responses.

Table 3. Dietary Energy Released by Phytase in Broiler Chick Diets

Item	Additional ME Released, Kcal/kg
Exp. 1	
ADG	81.3
G/F Ratio	68.9
Avg. Release	75.1
Exp. 2	
ADG	0.4
G/F Ratio	32.2
Avg. Release	16.3

Johnston and Southern, 2000

The optimal level of phytase for additional nutrient release beyond P is questionable. In several poultry experiments, lower levels of phytase released as much lysine as higher levels (Table 4). Based on all available data, Akey's current recommendation for GF diets is 1 lb/ton of Phytase 600. Because of the variability in the published data, Akey is not currently formulating phytase-supplemented diets based on release of nutrients other than P.

Table 4. Effect of Phytase Addition on Digestible Lysine (%) for Poultry

	Phytase, FTU/kg					
Item	0	150	300	400	450	800
Exp. 1 (Turkeys)	80.7	82.2	82.8	---	82.8	---
Exp. 2 (Broilers)	84.1	---	---	86.8	---	86.3
Exp. 3 (Broilers)	84.0	---	---	85.2	---	85.1

BASF Symposium, 2000

In summary, Akey has an excellent understanding of, and tremendous success in feeding phytase to grow-finish pigs. BASF improved the stability of Natuphos by granulating the product. Akey has been feeding phytase to sows for more than two years with excellent results, and we updated our usage recommendations for sow diets (Spring 2000). We are actively monitoring phytase research in the area of nutrient release. As more and better information becomes available, we will continue to update our products and programs, keeping our customers at the forefront of this technology.