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An evaluation of several diet acidifiers commonly utilized in pig starter diets to improve growth performance (1996)

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AN EVALUATION OF SEVERAL DIET ACIDIFIERS COMMONLY UTILIZED IN PIG STARTER DIETS TO IMPROVE GROWTH PERFORMANCE[1]

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Summary

Early-weaned pigs (weaned at 14 d of age) that are managed in a conventional one-site production system and fed a complex segregated early-weaning diet will benefit from the inclusion of a diet acidifier during the first week. However, the data indicate no benefit from including a diet acidifier in semicomplex diets fed during subsequent growth phases.

(Key Words: Weanling Pigs, Growth Performance, Diet Acidifiers.)

Introduction

The supplementation of diets for weanling pigs with organic acids (citric, formic, fumaric, and propionic acid) has been shown to improve ADG and F/G in many, but not all, studies. The inconsistent results observed may have been due to a number of factors, such as weaning age, health status, diet complexity, degree of stress at weaning, and inclusion rate of the organic acid. Generally, the inclusion of organic acids in starter diets has not been as beneficial when the diets contained high levels of milk products. However, the increased use of spray-dried blood meal and plasma protein to replace a portion of the milk products in nutrient-dense starter diets has renewed the interest in organic acids and their impact on starter pig performance.

Recently, interest has increased in the use of diet acidifiers that contain mixtures of organic and inorganic acids. Such mixtures may enhance the effectiveness of acidification. Thus, acidification of the diet can be accomplished at a lower dietary inclusion level. The purpose of this trial was to evaluate the effectiveness of several of these acidifiers when included in a typical early-weaning feeding regime. The diet acidifiers used in this trial were: Syneracid, Lupro-mix, Digest Acid, and Kemgest.

Procedures

A total of 270 pigs (initially 14 ± 2 d of age and 9.8 ± 1.0 lb) was used in a 28 d growth trial. The pigs were blocked by weight and allotted to one of five acidification treatments, with a total of nine pigs/pen and six pens/treatment. The trial was divided into three phases, an SEW phase (d 0 to 7 postweaning), Transition phase (d 7 to 14 postweaning), and Phase II (d 14 to 28 postweaning). The five treatments were: 1) control (without acid), 2) Syneracid (.35% in the SEW and Transition phases, .225% in phase II), 3) Lupro-mix (.4% in all phases), 4) Digest Acid (.2% in all phases), and 5) Kemgest (.2% in all phases). The inclusion levels used in this trial were based on the suppliers' recommendations.

The SEW basal diet was a corn-soybean meal diet containing 25% dried whey, 7.5%

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spray-dried plasma protein, 6% select menhaden fish meal, 5% lactose, and 1.75% spray-dried blood meal and was formulated to contain 1.7% lysine .47% methionine, .9% Ca, and .8% P (Table 1). The Transition basal diet contained 20% dried whey, 2.5% spray-dried plasma protein, 2.5% select menhaden fish meal, 5% lactose, and 2.5% spray-dried blood meal and was formulated to contain 1.5% lysine, .41% methionine, .9% Ca, and .8% P. The Phase II basal diet contained 10% dried whey and 2.5% spray-dried blood meal and was formulated to contain 1.35% lysine, .37% methionine, .9% Ca, and .8% P. Syneracid, Lupro-mix, Digest Acid, and Kemgest each replaced corn starch in the basal diet to provide the four additional treatments.

Pigs were housed in an environmentally controlled nursery in 5 × 5 ft pens. Pens were equipped with one self-feeder and two nipple waterers to provide ad libitum access to feed and water.

The pigs were weighed and feed disappearance was determined on d 7, 14, 21, and 28 postweaning. Average daily gain, ADFI, and F/G were calculated from this information.

The data were analyzed as a randomized complete block design, with pen as the experimental unit. The pigs were blocked on the basis of initial weight. Analysis of variance was performed using the GLM procedure of SAS. All possible individual contrasts were performed using three separate SAS outputs, because no more than four individual contrasts could be run at one time when only four degrees of freedom existed for diet in the model.

Results

From d 0 to 7 postweaning, when pigs were fed an SEW diet, no differences occurred in ADG or ADFI; however, F/G was improved ($P<.05$) by including an acidifier in the diet (Table 2). Although not significant, numeric improvements occurred in ADG when pigs were fed acidified diets, with improvements in ADG ranging from 5% to 16%. Improvements in F/G ranged from 3% to 19% with acid inclusion.

During the Transition (d 7 to 14 postweaning) and Phase II (d 14 to 28 postweaning) periods, no differences in growth performance were observed. Also, for the entire trial period (d 0 to 28 postweaning), growth performance was similar among all of the treatments.

Discussion

The results of this trial are in agreement with much of the data already published concerning the inclusion of acidifiers in starter diets. The improvements in growth performance that resulted from diet acidification during the first week are indicative of the benefits often observed when young pigs are subjected to the stresses of weaning. Weaning often occurs when pigs are 3 to 4 weeks of age, a time when secretion of gastric HCl, as well as pancreatic lipase, amylase, and trypsin, is relatively low. Supplementing starter diets with acidifiers may improve growth performance by increasing digestibility and nutrient and energy retention when pigs are weaned at 3 to 4 weeks of age.

Previous research at Kansas State University demonstrated that adding fumaric acid to a Phase I starter diet (containing 20% dried whey and 10% plasma protein) resulted in tendencies for improved ADG and F/G. In another study, weanling pigs fed a nutrient-dense Phase I diet containing either 1.5% fumaric acid or .4% buffered propionic acid (Luprosil NC or Luprosil salt) had improved ADG and F/G. These two studies demonstrated that the inclusion of an organic acid in a nutrient-dense diet containing 20% dried whey will improve the growth performance of early-weaned pigs.

In this study, the lack of a significant improvement in growth performance after the first week may have been due to the high health status of the pigs. The growth performance obtained in this trial is indicative of the high health status. The benefits of using a diet acidifier often are more evident when pigs are subjected to a disease challenge, and the incidence of diarrhea may be reduced by including an acidifier in the diet.

Also, the complex nutrient-dense diets used in this trial may have reduced the potential for an improved growth response with acidification. Past research at the University of Illinois has demonstrated that diet acidifiers are not as effective when included in complex diets containing high levels of milk products. Recent research at Oklahoma State University indicates that feeding an acidified diet (Syneracid) will improve growth performance during the first 3 weeks post-weaning. However, the basal diets used were less complex than those in this trial and may have been responsible for the lower growth performance observed by all pigs in that research.

In conclusion, including an acidifier in a complex SEW diet will improve growth performance of the conventionally reared, early-weaned pig. However, when the stresses associated with weaning have been overcome, acidification is not necessary if semicomplex diets are fed during subsequent growth phases.

Table 1. Composition of Diets[a]

Ingredient, %	SEW	Transition	Phase II
Corn	32.18	35.92	55.50
Soybean meal (46.5% CP)	11.76	20.93	25.72
Dried whey	25.00	20.00	10.00
Spray-dried plasma protein	7.50	2.50	-
Spray-dried blood meal	1.75	2.50	2.50
Soybean oil	6.00	5.00	-
Select menhaden fish meal	6.00	2.50	-
Lactose	5.00	5.00	-
Corn starch[b]	1.50	1.50	1.50
Antibiotic[c]	1.00	1.00	1.00
Monocalcium phosphate	.75	1.41	1.88
Limestone	.46	.67	.97
Zinc oxide (72% Zn)	.38	.38	-
Copper sulfate	-	-	.08
Vitamin premix	.25	.25	.25
Trace mineral premix	.15	.15	.15
DL-methionine	.13	.10	.07
L-lysine HCl	.10	.10	.15
Salt	.10	.10	.25
TOTAL	100.00	100.00	100.00
Calculated Analysis, %			
CP	22.85	21.39	20.48
Lysine	1.70	1.50	1.35
Methionine	.47	.41	.37
Ca	.90	.90	.90
P	.80	.80	.80

[a]Pigs were fed the SEW, Transition, and Phase II diets from d 0 to 7, d 7 to 14, and d 14 to 28, respectively.
[b]Syneracid (.35% in the SEW and Transition phases, .225% in phase II), Lupro-mix (.4% in all phases), Digest Acid (.2% in all phases), and Kemgest (.2% in all phases) each replaced corn starch to form the four additional experimental treatments.
[c]Provided 50 g/ton of carbadox.

Table 2. Comparison of Various Acidifiers Commonly Utilized in Pig Starter Diets to Improve Growth Performance[a]

		Dietary Acidifier				
Item	Control	Syneracid	Lupro-Mix	Digest Acid	Kemgest	CV
d 0 to 7						
ADG, lb	.37	.41	.39	.43	.43	16.4
ADFI, lb	.42	.40	.37	.40	.40	9.8
F/G[b]	1.14	.99	.97	.93	.92	16.6
d 7 to 14						
ADG, lb	.64	.57	.64	.66	.62	13.2
ADFI, lb	.79	.79	.82	.86	.82	8.0
F/G	1.25	1.39	1.28	1.32	1.33	10.4
d 14 to 28						
ADG, lb	1.02	1.00	1.00	.99	.99	6.1
ADFI, lb	1.44	1.42	1.41	1.46	1.48	3.9
F/G	1.41	1.43	1.41	1.47	1.49	4.8
d 0 to 28						
ADG, lb	.76	.74	.76	.77	.76	5.1
ADFI, lb	1.02	1.01	1.00	1.04	1.05	4.1
F/G	1.33	1.35	1.33	1.37	1.37	3.4

[a]Two hundred and seventy pigs were used (initially 9.8 lb and 14 d of age), nine pigs/pen, six pens/treatment.
[b]Control vs acidified diets ($P < .05$).