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Abstract

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Keywords

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EFFECTS OF INCREASING ZINC OXIDE ON STARTER PIG GROWTH PERFORMANCE[1]

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Summary

Four hundred and twenty pigs (initially 9.8 lb and 13 d of age) were used to evaluate the effects of increasing zinc oxide in starter diets. Results that suggest 3,000 ppm and 2,000 ppm zinc, from zinc oxide, improve growth performance in phase I and II diets, respectively.

(Key Words: Starter, Zinc Oxide, Performance.)

Introduction

Recently, researchers at Kansas State University, University of Illinois, and other institutions have investigated the use of supplemental Zn in starter pig diets. The research at Kansas State University showed an advantage to feeding 3,000 ppm Zn. Researchers at the University of Illinois also demonstrated improvements in growth performance from feeding Zn from zinc oxide through 5,000 ppm Zn. At Michigan State University, investigators fed up to 5,000 ppm Zn from zinc oxide before negatively affecting growth. Therefore, the objective of this experiment was to evaluate the effect of increasing Zn (from zinc oxide) in starter pig diets on pig performance and to determine whether high levels of Zn negatively impact growth.

Procedures

A total of 420 weanling pigs (initially 9.8 lb and 13 d of age) were used in a 28-d growth assay to compare the effects of increasing Zn from zinc oxide in diets on the growth of starter pigs. There were eight replicate pens per treatment with 10 or 12 pigs per pen. The pigs were blocked by weight and assigned to one of the five dietary treatments: control (165 ppm Zn and 16.5 ppm copper), 1,000, 2,000, 3,000, or 4,000 ppm Zn. Pigs were maintained on the assigned mineral level throughout the entire 28 d. Diets were formulated to contain 1.6 and 1.25% dietary lysine and .44 and .35% dietary methionine from d 0 to 14 postweaning (phase I) and d 14 to 28 postweaning (phase II), respectively. Both the phase I and II diets were corn-soybean meal based. The phase I diets were pelleted and contained 25% dried whey, 7.5% spray dried plasma protein, 1.75% spray dried blood meal, and 5% soy oil (Table 1). The phase II diets were fed in a meal form and contained 10% dried whey, 2.5% spray dried blood meal, and 3% soy oil. Zinc oxide (72% Zn) was added at the expense of corn starch to achieve the experimental mineral levels.

The pigs were housed in an environmentally controlled nursery in 5 ft × 5 ft pens

[1]The authors with to thank Ellen Johncock and Eichman Brothers, St. George, KS for use of facilities and animals in this experiment.

[2]Northeast Area Extension Office.

with a self-feeder and two nipple waterers to allow ad libitum access to feed and water. The pigs were weighed and feed disappearance was measured weekly to calculate ADG, ADFI, and F/G. Feed samples were collected and analyzed for total mineral profile and crude protein content.

Results and Discussion

During phase I of this trial, increasing dietary Zn resulted in a linear improvement in ADG (Table 2; $P<.01$), ADFI ($P<.01$), and F/G ($P = .01$). Pigs fed the 4,000 ppm zinc diet had the greatest ADG and ADFI and lowest F/G. This indicates the importance of including Zn in the diets of newly weaned pigs.

In phase II, increasing dietary Zn content increased ADG (linear, $P<.02$; quadratic, $P<.01$) and ADFI (linear, $P<.05$). Feed utilization, though not significant, showed a quadratic response, with the best F/G achieved by pigs fed the diet with 2,000 ppm Zn. The lower performance of the pigs fed the 4,000 ppm Zn diet may have been the result of long-term feeding of this high a level of Zn.

For the entire 28-d trial, a curvilinear response was detected for ADG (linear, $P<.01$; quadratic, $P<.11$), with the maximum ADG observed at 2,000 ppm Zn. A linear response for ADFI was detected ($P<.04$), with pigs fed 3,000 ppm Zn consuming the greatest amount of feed over the entire trial. Feed utilization was not significantly affected by dietary Zn in the diet; however, pigs fed the 2,000 ppm Zn diet had the lowest F/G.

In conclusion, this research indicates that diets fed to weanling pigs should contain Zn to achieve optimum growth performance. Current recommendations at Kansas State University are to include 3,000 ppm Zn from zinc oxide in the phase I diet (10 to 15 lb) and 2,000 ppm Zn from zinc oxide in phase II diets (15 to 25 lb).

Table 1. Composition of Diets[a]

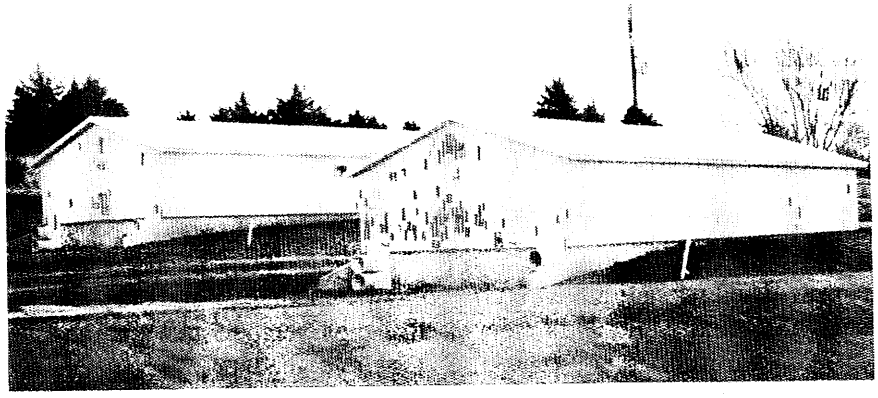
Ingredient, %	Phase I	Phase II
Corn	36.93	55.42
Soybean meal (48% CP)	19.30	22.25
Dried whey	25.00	10.00
Spray-dried plasma protein	7.50	--
Spray-dried blood meal	1.75	2.50
Soybean oil	5.00	3.00
Monocalcium phosphate	1.74	1.92
Limestone	.62	.82
Antibiotic[b]	1.00	1.00
Corn starch[c]	.53	.53
DL-methionine	.13	.05
L-Lysine·HCl	.10	.15
Vitamin premix	.25	.25
Trace mineral premix	.15	.15
Total	100.00	100.00

[a]Pigs were fed the phase I and phase II diets from d 0 to 14 and d 14 to 28, respectively.
[b]Provided 150 g/ton apramycin in phase I diets and 50 g/ton carbadox in phase II diets.
[c]Zinc oxide replaced corn starch in experimental diets.

Table 2. The Effects of Increasing Levels of Zinc in Starter Pig Diets on Growth Performance[a]

	Zinc level						Zinc effect (P <)	
Item	165	1,000	2,000	3,000	4,000	CV	Linear	Quadratic
d 0 to 14								
ADG, lb	.36	.38	.40	.41	.47	10.2	.0001	.35
ADFI, lb	.48	.49	.50	.52	.54	7.4	.004	.59
F/G	1.39	1.29	1.26	1.30	1.15	11.9	.01	.98
d 14 to 28								
ADG, lb	.73	.78	.85	.82	.80	7.7	.02	.006
ADFI, lb	1.33	1.37	1.44	1.58	1.53	17.7	.05	.81
F/G	1.84	1.76	1.72	1.90	1.97	13.3	.17	.14
d 0 to 28								
ADG, lb	.54	.58	.62	.61	.63	7.4	.0004	.11
ADFI, lb	.91	.93	.97	1.04	1.02	13.3	.03	.79
F/G	1.69	1.6	1.57	1.70	1.66	11.0	.83	.31

[a]Four hundred twenty weanling pigs (initially 9.2 lb and 12 d of age) were used with 10 or 12 pigs/pen with 8 replicate pens/treatment. Zinc oxide replaced corn starch (165 ppm zinc) in the experimental diets.



KSU Segregated Early Weaning Facilities