

Swine Day 1993

## PELLET QUALITY AFFECTS GROWTH PERFORMANCE OF NURSERY AND FINISHING PIGS

*C. R. Stark<sup>1</sup>, K. C. Behnke<sup>1</sup>,  
J. D. Hancock, and R. H. Hines*

### Summary

Two experiments were conducted to determine the effects of diet form (meal vs pellet) and amount of fines in pelleted feed on growth performance of nursery and finishing pigs. One hundred twenty-six weanling pigs, with an average initial body wt of 12.5 lb, were used in the 35-d nursery experiment. The same phase I diet (pelleted) was fed to all pigs for 7 d, then the pigs were switched to phase II diet treatments (d 7 to 35 postweaning). Treatments were the same phase II diet fed as: 1) meal; 2) screened pellets (fines removed); and 3) the screened pellets with 25% added fines. From d 7 to 21, average daily gain (ADG) tended to be greater for pigs fed pellets, and feed/gain (F/G) was improved by 14% when pigs were fed pelleted diets compared with those fed the meal diet. Also, pigs fed the screened pellets had a 7% improvement in F/G compared to pigs fed the pelleted diet with 25% fines. From d 7 to 35, pigs fed pelleted diets were 9% more efficient than pigs fed the meal diet. Also, pigs fed the pelleted diet with 25% added fines had 2.6% poorer F/G than pigs fed the diet with screened pellets. In the finishing experiment, 80 gilts (average initial body wt of 118 lb) were used to evaluate the effects of diet form and pellet fines on growth performance. Treatments were a common finishing diet fed as: 1) meal; 2) screened pellets; 3) pellets with 20% fines; 4) pellets with 40% fines; and 5) pellets with 60% fines. Pigs fed the meal diet or the diet

with 60% fines tended to have decreased ADG compared to pigs fed the other pelleted diets. Pigs fed screened pellets had a 4.7% improvement in F/G compared with those fed the meal diet. However, increasing the amount of fines in the screened pellets diet resulted in a linear trend for poorer F/G. These results suggest that pelleting diets improved growth performance in nursery and finishing pigs; however, increasing amounts of pellet fines reduced the advantage of feeding a pelleted diet.

(Key Words: Nursery, Finishing, Pellets, Process.)

### Introduction

In the 1992 KSU Swine Day Report (page 122), Wondra et al. reported that pelleting diets for finishing pigs improved nutrient digestibility and growth performance. However, our experience indicates that improperly pelleted feed, with a significant amount of fines, results in greater feed wastage, increased requirements for feeder management, reduced palatability, and decreased feed intake. Interestingly, controlled research projects have not been reported that determine if, or how much, the presence of fines in pelleted diets affects growth performance of pigs. Reported herein are experiments conducted to determine the effects of pellet fines on growth performance of nursery and finishing pigs.

### Procedures

---

<sup>1</sup>Department of Grain Science and Industry.

**Nursery Experiment.** One hundred twenty six weanling pigs, with an initial body wt of 12.5 lb, were used in a 35-d growth assay to evaluate the effects of pellet fines on growth performance. The pigs were blocked by weight and randomly allotted to pens based on sex and ancestry. There were six pigs per pen (three barrows and three gilts) and seven pens per treatment. The pigs were fed the same pelleted phase I diet (Table 1) from d 0 to 7 post-weaning and then switched to the phase II dietary treatments. The phase I diet was formulated to contain 1.5% lysine, .9% Ca, and .8% P. The phase II diet was formulated to contain 1.25% lysine, .9% Ca, and .8% P, and fed from d 7 to 35 postweaning. Treatments were the phase II diet fed as: 1) meal; 2) screened pellets (fines removed); and 3) the screened pellets with 25% added fines. Pelleted feed was processed with a California Pellet Mill 1000 Series Master H.D. Model® equipped with a 5/32 in × 1 1/2 in (hole diameter vs die thickness) die for the phase I diet and a 5/32 in × 2 in die for the phase II diet. Conditioning temperatures were 145°F for the phase I diet and 150°F for the phase II diet. Fines were made by passing the screened pellets through crumblizing rolls. Fines were characterized as material that would pass through a Tyler #6 sieve (3,360 µm openings).

The pigs were housed in 4 ft × 5 ft pens with wire-mesh flooring. Each pen had a self-feeder and nipple waterer to allow ad libitum consumption of feed and water. Fines were removed from the feeders on a weekly basis and weighed to allow calculation of daily fines accumulation. Pigs and feeders were weighed on d 7, 21, and 35 for calculation of ADG, ADFI, and F/G. Data were analyzed as a randomized complete block design with pen as the experimental unit. Contrasts used to separate means were: 1) meal vs pelleted diets and 2) screened pellets vs 25% added fines.

**Finishing Experiment.** Eighty gilts, with an average initial body wt of 118 lb, were used to compare the response to a

meal diet vs pelleted diets with different amounts of fines. The pigs were blocked by weight and allotted to pens based on ancestry. There were two pigs per pen and eight pens per treatment. Treatments were a common finishing diet fed as: 1) meal; 2) screened pellets; 3) pellets with 20% fines; 4) pellets with 40% fines; and 5) pellets with 60% fines.

The diet contained corn and soybean meal with 3% added soybean oil and was formulated to .70% lysine, .65% Ca, and .55% P (Table 1). Pellets were processed with the pellet mill used in the nursery trial, but equipped with a 3/16 in × 1 1/2 in die. The conditioning temperature was 170°F. Fines were made by mechanically handling the pellets in a Forberg® mixer until the proper amount of fines was achieved. Fines were characterized as material that would pass through a Tyler #5 sieve (4,000 µm openings).

The pigs were housed in 5 ft × 5 ft pens with slatted concrete flooring. Each pen had a single-hole self-feeder and nipple waterer to allow ad libitum consumption of feed and water. The pigs were weighed at initiation and termination of the growth assay to allow calculation of ADG, ADFI, and F/G. Data were analyzed as a randomized complete block design with pen as the experimental unit. Contrast used to separate means were: 1) meal vs pellets, 2, 3, and 4) linear, quadratic, and cubic response to the amount of fines.

## Results and Discussion

**Nursery Experiment.** The pelleted diet had a 97% pellet durability index (PDI) in phase I and a 94% PDI in phase II; therefore, the nursery pigs were fed high quality pellets that were above industry standards. The pigs fed the common phase I diet had similar growth performance (ADG, ADFI, and F/G were .62 lb, .64 lb, and 1.03, respectively). However, during the transition to the phase II diet (d 7 to 21), pigs fed the pelleted diets had numerically greater ADG (10% improvement) and

significantly greater ( $P<.01$ ) F/G (14% improvement) compared to pigs fed the meal diet (Table 2). Improved F/G was also observed for the overall experiment when pigs were fed pellets vs the meal diet ( $P<.01$ ) and screened pellets vs pellets with 25% added fines ( $P<.07$ ). Also 2.5 times more fines ( $P<.01$ ) were removed weekly from the feeders of pigs fed the diet with 25% fines compared to the feeders of pigs fed the screened pellets.

**Finishing Experiment.** The pelleted diet had an average PDI of 71% before mechanical handling. A pellet durability index of 70% for simple corn-soybean meal-based formulas with 3% added fat would be considered acceptable by industry standards. Pigs fed the screened pellets

had 3% greater ADG and a 5% improvement in F/G compared with pigs fed the meal diet (Table 3). The addition of fines did not affect ADG, but F/G became poorer ( $P<.10$ ) as the amount of fines in the diet increased. Therefore, the improvement in F/G for pigs fed pelleted feed was lost as the amount of fines increased.

These experiments demonstrate that growth performance of nursery and finishing pigs is improved by pelleting. However, poor quality pellets, as indicated by accumulation of fines, can negate any benefits in rate and/or efficiency of gain. Further research is needed to define the amount of fines that is tolerated by pigs, but at present, our data indicate that as little as 20 to 25% fines significantly reduces the benefits of pelleted starter and finishing diets for pigs.

**Table 1. Diet Composition, %**

Ingredient	Nursery Experiment		Finishing Experiment <sup>c</sup>
	Phase I <sup>a</sup>	Phase II <sup>b</sup>	
Corn	37.07	53.35	79.64
Soybean meal (48% CP)	16.00	25.00	14.45
Spray-dried porcine plasma	7.50	—	—
Spray-dried blood meal	2.50	2.50	—
Dried whey	20.00	10.00	—
Lactose	10.00	—	—
Soybean oil	3.00	5.00	3.00
Monocalcium phosphate	2.00	1.94	1.12
Limestone	.74	.96	1.05
Lysine-HCl	.10	.07	.06
DL-methionine	.11	—	—
Salt	—	.20	.30
Vitamin premix	.25	.25	.17
Trace mineral premix	.15	.15	.11
Copper sulfate	.08	.08	—
Antibiotic	.50 <sup>d</sup>	.50 <sup>d</sup>	.10 <sup>e</sup>

<sup>a</sup>Phase I diets were formulated to 1.5% lysine, .40% methionine, .90% Ca, and .80% P.

<sup>b</sup>Phase II diets were formulated to 1.25% lysine, .32% methionine, .90% Ca, and .80% P.

<sup>c</sup>Diets were formulated to .7% lysine, .65% Ca, and .55% P.

<sup>d</sup>Provided 100 g/ton chlortetracycline, 100 g/ton sulfathiazole, and 50 g/ton penicillin.

<sup>e</sup>Provided 100 g/ton chlortetracycline.

**Table 2. Effects of Pellet Fines on Growth Performance of Nursery Pigs<sup>a</sup>**

Item	Meal	Screened Pellets	Screened Pellets & 25% Fines	SE
<u>d 7 to 21</u>				
ADG, lb	.71	.80	.76	.04
ADFI, lb	1.23	1.15	1.18	.05
F/G <sup>b</sup>	1.73	1.44	1.55	.03
<u>d 7 to 35</u>				
ADG, lb	1.03	1.07	1.08	.03
ADFI, lb	1.72	1.61	1.67	.05
F/G <sup>c</sup>	1.67	1.50	1.54	.02
Daily fines accumulation, lb/d <sup>d</sup>	—	.13	.32	.02

<sup>a</sup>A total of 126 weanling pigs with an average initial body wt of 12.5 lb (6 pigs/pen and 7 pens/treatment).

<sup>b</sup>Meal vs pelleted (P<.01); screened pellets vs 25% added fines (P<.05).

<sup>c</sup>Meal vs pelleted (P<.01); screened pellets vs 25% added fines (P<.07).

<sup>d</sup>Screened pellets vs 25% added fines (P<.01).

**Table 3. Effects of Pellet Fines on Growth Performance of Finishing Pigs<sup>a</sup>**

Item	Meal	Screened Pellets	Percentage Fines			SE
			20	40	60	
ADG, lb	2.05	2.11	2.11	2.12	2.07	.05
ADFI, lb	5.69	5.59	5.86	5.87	5.84	.19
F/G <sup>b</sup>	2.78	2.65	2.78	2.77	2.82	.07

<sup>a</sup>A total of 80 pigs with an average initial body wt of 118 lb (2 pigs/pen and 8 pens/treatment).

<sup>b</sup>Linear effect of fines (P<.10).