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# EFFECTS OF FEEDER DESIGN AND PELLET QUALITY ON FINISHING PIGS [1]

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## Summary

Pigs fed from wet/dry feeders had 2.5% greater ADG and used 26% less water compared to pigs fed from conventional dry feeders. Also, as percentage fines was increased from none to 50%, ADG and digestibilities of DM and N decreased. However, the decreased ADG with increased pellet fines occurred only with the conventional dry feeder.

(Key Words: Pellet Quality, Wet/Dry Feeders, Finishing Pigs.)

## Introduction

We have reported previously that pelleting improves rate and(or) efficiency of gain in finishing pigs. However, we also reported that increased amounts of pellet fines reduced the effects of pelleting diets. Other data from our laboratory indicated that wet/dry feeders improved rate and(or) efficiency of growth in finishing pigs fed a meal diet, and that pellet quality might be of lesser significance when a wet/dry feeder is used. Thus, we designed an experiment to determine the effects of pellet quality in pigs fed from wet/dry feeders.

## Procedures

A total of 384 finishing pigs (initial BW of 92 lb) was used in an 84-d growth assay. The pigs were blocked by initial weight and allotted to pens based on gender and ancestry with 12 pigs per pen and four pens per treatment. Treatments were arranged as a 2 × 4 factorial with main effects of feeder type (conventional dry feeder vs wet/dry feeder) and diet form (meal, 0, 25, and 50% pellet fines).

Diets were formulate to .95% lysine, .6% Ca, and .5% P for 93 to 194 lb and .8% lysine, .5% Ca, and .45% P for 194 to 260 lb body weight (Table 1). Corn was ground through a roller mill (Roskamp Manufacturing, Model D, Ceder Falls, IA) to particle size of an approximately 600 microns; blended with other ingredients; and pelleted through a 30-horsepower pellet mill (30 HD Master Model, California Pellet Mill, San Francisco, CA) equipped with die having 3/16-in. opening. Conditioning temperatures were 180 and 185°F for the diets. To generate the desired amount of fines, the pellets were mechanically challenged by mixing in a Forberg® mixer. Fines were characterized as material that would pass through a Tyler #5 sieve (.16-in. openings).

The pigs were housed in 16-ft × 6-ft pen with 50% solid concrete and 50% slotted flooring. Feeders were a two-hole, dry feeder (model 1/2 no. 2 style B, Smidley Mfg. Co, Dritt, IA) and a single-hole, wet/dry shelf-feeder with a nipple waterer located at the base of the trough (Crystal Spring®, model F-5000, Omaha, NE). The pens with dry feeders had one nipple waterer mounted against the wall. Each pen was equipped with a water meter (Neptune,

[1]Appreciation is extended to Gro Master, Inc., Omaha, NE, for donation of feeders used in this project.

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Trident™, 5/8 in. × 3/4 in., North Kansas City, MO) to determine water disappearance.

From d 75 to 80 of the experiment, pigs were fed their diets with .25% chromic oxide added. On d 80, samples of feces were collected by rectal massage from four pigs in each pen. Concentration of Cr, DM, and N in the feces and diets were determined to allow calculation of apparent digestibilities of DM and N. On d 82, the pigs were slaughtered and hot carcass weights were recorded to allow calculation of dressing percentage. Last rib backfat thickness was measured with a ruler on each side of the split carcass at the midline. Hot carcass weight and last rib backfat thickness were used to calculate fat-free lean index (NPPC, 1994). Finally, stomachs were collected and scored for severity of esophagogastric ulcers and keratinization. The scoring system for keratinization was: 0 = normal, 1 = mild keratosis, 2 = moderate keratosis, and 3 = severe keratosis. The scoring system for ulcers was: 0 = normal, 1 = slight erosion, 2 = ulcers, and 3 = severe ulcers.

All data were analyzed using the GLM procedure of SAS with pen as the experiment unit. Hot carcass weight was used as a covariate for analyses of dressing percentage, last rib backfat thickness, and fat-free lean index. Stomach scores were categorical data; therefore, the Cochran-Mantel-Haenszel procedure of SAS (i.e., row mean scores differ test) was used to detect treatment effects.

## Results and Discussion

Pigs fed from wet/dry feeders had 2.5% greater ADG (P<.01) and used 26% less water (P<.02) vs pigs fed from conventional dry feeders (Table 2). Also, pigs fed pelleted diets had 3% greater ADG (P<.09) than pigs fed meal diets. As the amount of fines was increased from none to 50%, ADG (P<.04) and digestibilities of DM (P<.01) and N (P < .01) decreased. However, at least for ADG, the negative effects of pellet fines occurred primarily in pigs fed from the conventional dry feeders (feeder type × linear effect of fines, P<.03).

Dressing percentage was not affected by feeder type or diet form (P<.07), but pelleting increased last rib backfat thickness when the diet was fed in a conventional dry feeder (conventional vs wet/dry × meal vs pellets, P<.02). As a result of the greater last rib backfat thickness, pigs fed from wet/dry feeders had a slightly lower fat-free lean index than pigs fed from conventional dry feeders (P<.04).

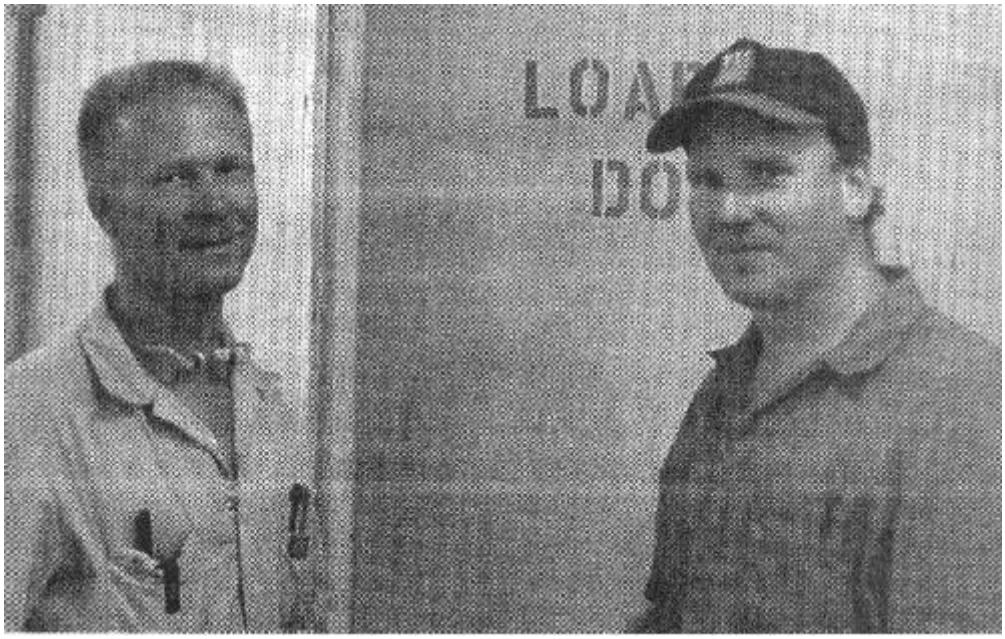
The incidence and severity of stomach ulcers (Table 3) were less when pigs were fed a meal diet compared to pellets (P<.001). Also, stomach ulceration scores decreased as percentage fines was increased (linear effect, P<.04) and the diet became more like the meal control. Feeder design did not affect the incidence or severity of stomach lesions (P>.15).

In conclusion, pelleting tended to improve ADG and F/G when diets were fed from a conventional dry feeder. Also, pellet quality was an issue when conventional feeders were used. Pigs fed from the wet/dry feeders tended to have greater ADG and feed intake and less water usage vs pigs fed from the conventional dry feeders. However, pelleting and pellet quality had minimal effect on growth performance in finishing pigs fed from wet/dry feeders.

**Table 1. Compositions of the Basal Diets[a]**

| Ingredient, % | For 93 to 194 lb | For 194 to 260 lb |
|---|---|---|
| Corn | 75.62 | 80.78 |
| Soybean meal (46.5% CP) | 20.71 | 15.62 |
| Lysine-HCl | .16 | .15 |
| L-threonine | .05 | .03 |
| Soybean oil | 1.00 | 1.00 |
| Monocalcium phosphate | 1.00 | .84 |
| Limestone | .69 | .55 |
| Salt | .35 | .35 |
| KSU vitamin premix | .15 | .15 |
| KSU mineral premix | .15 | .15 |
| Antibitotic[b] | .13 | .13 |

[a]Formulated to .95% lysine, .6% Ca, and .5% P for 93 to 194 lb and .8% lysine, .5% Ca, and .45% P for 194 to 260 lb.
[b]Provided 100g/ton tylosin.



**Mark Nelson, Farm Manager, and Robert Beckley, Farrowing House Manager.**

**Table 2. Effects of Feeder Design and Pellet Quality on Growth Performance, Water Disappearance, Nutrient Digestibility, and Carcass Characteristics in Finishing Pigs[a]**

| | Conventional Dry Feeder | | | | Wet/Dry Feeder | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % Fines | | | | % Fines | | | | Contrasts[b] | | | | | | |
| Item | Meal | 0% | 25% | 50% | Meal | 0% | 25% | 50% | SE | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| For 94 to 194 lb | | | | | | | | | | | | | | | | |
| ADG, lb | 1.94 | 2.00 | 1.95 | 1.90 | 2.12 | 1.98 | 2.00 | 2.02 | .04 | .02 | -[d] | - | - | .08 | .13 | - |
| ADFI, lb | 5.05 | 5.09 | 5.03 | 4.96 | 5.42 | 5.18 | 5.14 | 5.16 | .09 | .01 | .09 | - | - | .13 | - | - |
| F/G | 2.60 | 2.55 | 2.58 | 2.61 | 2.56 | 2.62 | 2.57 | 2.55 | .05 | - | - | - | - | - | - | - |
| Water usage, gal, pig/day | 1.8 | 2.3 | 2.0 | 1.9 | 1.6 | 1.3 | 1.4 | 1.5 | .1 | .01 | - | - | - | .12 | .06 | - |
| For 194 to 260 lb | | | | | | | | | | | | | | | | |
| ADG, lb | 2.11 | 2.36 | 2.34 | 2.20 | 2.10 | 2.23 | 2.45 | 2.24 | .06 | - | .01 | - | .03 | - | - | - |
| ADFI, lb | 6.42 | 6.39 | 6.50 | 6.48 | 6.46 | 6.58 | 6.64 | 6.50 | .21 | - | - | - | - | - | - | - |
| F/G | 3.04 | 2.71 | 2.78 | 2.95 | 3.08 | 2.95 | 2.71 | 2.90 | .12 | - | .03 | - | - | - | - | - |
| Water usage, gal, pig/day | 2.2 | 2.6 | 2.3 | 2.3 | 2.1 | 1.5 | 2.0 | 1.7 | .2 | .01 | - | - | - | .13 | - | - |
| Overall | | | | | | | | | | | | | | | | |
| ADG, lb | 1.96 | 2.10 | 2.04 | 1.98 | 2.07 | 2.05 | 2.12 | 2.05 | .03 | .01 | .09 | .04 | .10 | .12 | .03 | - |
| ADFI, lb | 5.50 | 5.49 | 5.42 | 5.41 | 5.58 | 5.53 | 5.58 | 5.58 | .14 | - | - | - | - | - | - | - |
| F/G | 2.81 | 2.61 | 2.66 | 2.73 | 2.70 | 2.70 | 2.63 | 2.72 | .06 | - | - | - | - | - | - | - |
| Water usage, gal, pig/day | 2.0 | 2.4 | 2.1 | 2.1 | 1.8 | 1.4 | 1.6 | 1.6 | .2 | .02 | - | - | - | .05 | - | - |
| Apparent digestibility, % | | | | | | | | | | | | | | | | |
| DM | 88.6 | 87.8 | 88.8 | 85.7 | 87.3 | 88.5 | 87.2 | 86.5 | .7 | - | - | .01 | .12 | - | - | .05 |
| N | 87.6 | 86.0 | 87.5 | 84.4 | 85.6 | 87.1 | 84.8 | 83.6 | 1.0 | - | - | .01 | - | - | - | .05 |
| Carcass Characteristics | | | | | | | | | | | | | | | | |
| Dressing percentage | 73.9 | 73.5 | 73.4 | 73.7 | 73.7 | 73.9 | 72.6 | 73.3 | .4 | -[h] | - | - | - | - | - | - |
| Backfat thickness, in | .90 | 1.02 | .96 | 1.01 | 1.04 | 1.00 | 1.04 | 1.00 | .1 | .03 | - | - | - | .02 | - | - |
| Fat free lean index, %[c] | 49.4 | 48.2 | 48.8 | 48.3 | 48.3 | 48.4 | 48.0 | 48.3 | .3 | .04 | .03 | - | - | .07 | - | .08 |

[a]A total of 384 pigs (12 pigs/pen and four pens/treatment) with an average initial BW of 93 lb and an average final BW of 260 lb.

[b]Contrasts were: 1) dry vs wet/dry; 2) meal vs pellets; 3) linear effect of fines; 4) quadratic effect of fines; 5) feeder type × meal vs pellets; 6) feeder type × linear effect of fines; and 7) feeder type × quadratic effect of fines.

[c]Fat free lean (NPPC, 1994) was calculated as FFL = 50.767 + (.035 × hot carcass weight, lb) - (8.979 × backfat thickness, in).

[d]Dashes indicated P>.15.

**Table 3. Effects of Feeder Design and Pellet Quality on Stomach Lesions in Finishing Pigs[a]**

| | Conventional Dry Feeder | | | | Wet/Dry Feeder | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % Fines | | | | % Fines | | | | Contrasts[b] | | | | | | |
| Item | Meal | 0% | 25% | 50% | Meal | 0% | 25% | 50% | SE | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Stomach Keratinization[c] | | | | | | | | | | | | | | | | |
| No. of observations | 45 | 42 | 47 | 42 | 43 | 40 | 43 | 46 | | | | | | | | |
| Normal | 30 | 8 | 7 | 9 | 28 | 10 | 19 | 9 | | | | | | | | |
| Mild | 12 | 18 | 24 | 25 | 10 | 18 | 14 | 23 | | | | | | | | |
| Moderate | 2 | 10 | 11 | 7 | 5 | 11 | 10 | 12 | | | | | | | | |
| Sever | 1 | 6 | 5 | 1 | 0 | 1 | 0 | 2 | | | | | | | | |
| Mean scores[d] | .31 | 1.21 | 1.16 | .84 | .37 | 1.00 | .71 | 1.03 | .11 | -[g] | .001 | - | - | - | .08 | .02 |
| Stomach Ulceration[e] | | | | | | | | | | | | | | | | |
| No. of observations | 45 | 42 | 47 | 43 | 43 | 41 | 43 | 46 | | | | | | | | |
| Normal | 44 | 28 | 34 | 38 | 39 | 27 | 35 | 33 | | | | | | | | |
| Erosion | 0 | 4 | 8 | 1 | 3 | 7 | 5 | 4 | | | | | | | | |
| Ulcer | 0 | 7 | 3 | 2 | 1 | 4 | 3 | 3 | | | | | | | | |
| Severe ulcer | 1 | 3 | 2 | 2 | 0 | 3 | 0 | 2 | | | | | | | | |
| Mean scores[f] | .06 | .63 | .40 | .24 | .08 | .56 | .22 | .49 | .10 | - | .001 | .04 | .07 | - | .13 | .14 |

[a]A total of 384 pigs (12 pigs/pen and four pens/treatment) with an average initial BW of 93 lb and an average final BW of 260 lb.
[b]Contrasts were: 1) dry vs wet/dry; 2) meal vs pellets; 3) linear effect of fines; 4) quadratic effect of fines; 5) feeder type × meal vs pellets; 6) feeder type × linear effect of fines; and 7) feeder type × quadratic effect of fines.
[c]Scoring system was 0= normal; 1= mild keratosis; 2 = moderate keratosis; and 3= severe keratosis.
[d]Cochran-Mantel-Haenszel statistic, row mean scores differ test was P<.001.
[e]Scoring system was 0 = normal; 1= slight erosion; 2 = ulcers; and 3= severe ulcers.
[f]Cochran-Mantel-Haenszel statistic, row mean scores differ test was P<.001.
[g]Dashes indicated P>.15.