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Effects of feeder design (conventional dry feeder, dry shelf-feeder, and wet/dry shelf-feeder) on finishing pigs

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EFFECTS OF FEEDER DESIGN (CONVENTIONAL DRY FEEDER, DRY SHELF-FEEDER, AND WET/DRY SHELF-FEEDER) ON FINISHING PIGS [1]

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Summary

Pigs fed from wet/dry shelf-feeders had 6.8% greater ADG compared to those fed from dry shelf-feeders and used 18.3% less water than those fed from conventional feeders.

(Key Words: Feeder Design, Wet/Dry Feeder, Finishing Pigs.)

Introduction

In previous reports from KSU, we demonstrated that wet/dry shelf-feeders supported greater rates and(or) efficiencies of gain compared to conventional dry feeders. However, it has not been demonstrated whether the benefits observed with the wet/dry feeders resulted from the deep-bowl design that might prevent feed wastage or from the wet/dry concept. Thus, we designed an experiment to compare growth performance of finishing pigs when fed from conventional dry feeders and shelf-feeders used to deliver feed in dry or wet/dry form.

Procedures

A total of 180 finishing pigs with an average initial wt of 118 lb was used in the experiment. The pigs were blocked by weight and allotted to the treatments based on sex and ancestry. The pigs were housed in a modified open-front building (16-ft × 6-ft pen) with 50% solid concrete and 50% concrete slat flooring. There were 12 pigs (six barrows and six gilts) per pen and five pens per treatment. Treatments were: 1) a conventional dry feeder (two-hole stainless steel, Model 1/2 no. 2, style B, Smidley Mfg. Co., Dritt, IA); 2) a single-hole shelf-feeder (Model F-5000, Crystal Spring®, Omaha, NE) used dry; and 3) a single-hole shelf-feeder used wet/dry with a water nipple located inside the bowl. In the wet/dry feeders, pigs had the choices of eating either dry feed from the shelf or wet feed from the deep bowl. The pens with conventional dry feeders had one nipple waterer mounted against the wall. Each pen was equipped with a water meter (Neptune, Trident™, 5/8 in. × 3/4 in. , North Kansas City, MO) to determine water disappearance. All pigs were fed the same corn-soybean meal-based diets (Table 1) formulated to .95% lysine, .6% Ca, and .5% P from 119 to 181 lb and .8% lysine, .5% Ca, and .45% P from 181 to 253 lb body weight. The corn was ground with a roller mill (Roskamp Manufacturing, Model D, Ceder Falls, IA), and the diets were fed in meal form (geometric mean particle size of 626 µm).

Pigs and feeders were weighed on d 0, 31, and before slaughter (d 66) to allow calculation of ADG, ADFI, and F/G. From d 55 to 60 of the experiment, the pigs were fed their diet with .25% chromic oxide added as an indigestible marker. On d 60, samples of feces were collected by rectal massage from four pigs per pen. Concentrations of Cr, DM, and N in the feces and diets were determined to allow calculation of apparent

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

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digestibilities of DM and N using the indirect ratio method. On d 66, 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 at the midline of the split carcass on both sides, and hot carcass weight and last rib backfat thickness were used to calculate fat-free lean index (NPPC, 1994). Finally, the esophageal region of the pigs'stomachs were collected and scored for severity of keratinization and ulceration. The scoring system for keratinization was:.5 = normal, 1 = mild, 2 = moderate, and 3 = severe. The scoring system for ulcers was: .5 = normal, 1 = slight erosion, 2 = ulcer, and 3 = severe ulcer.

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; thus, 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 conventional feeders had ADG, ADFI, and F/G similar to pigs fed from he shelf-feeders (P>.12). However, overall ADG (P<.09) and ADFI (P<.06) tended to be greater when the shelf-feeder was used wet/dry than when it was used dry. Nonetheless, no difference in feed conversion occurred for the overall growth performance.

Pigs fed from the shelf-feeders used 18.3% less water for the overall trial compared to pigs fed from the conventional feeders (P<.08). Also pigs fed from wet/dry feeders used less water than pigs fed from the dry shelf-feeders.

Digestibilities of DM and N, dressing percentage, last rib back fat thickness, and fat-free lean index were not affected by feeder design (P>.57). Finally, scores of stomach lesion (Table 3) were not affected by feeder design.

In conclusion, pigs fed from wet/dry shelf-feeders had the greater ADG and consumed less water compared to pigs fed from dry shelf-feeders. Therefore, the wet/dry-feeding concept, rather than the deep-bowl feeder design, seemed to be of benefit.

Table 1. Compositions of the Basal Diets (As-Fed Basis), %[a]

Ingredient	For 119 to 181 lb	For 181 to 253 lb
Corn	75.61	80.78
Soybean meal (46.5% CP)	20.71	15.87
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 119 to 181 lb and .8% lysine, .5% Ca, and .45% P for 181 to 253 lb.
[b]Provided 100g/ton tylosin.

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

	Feeder Design				Contrasts[c]	
Item	Conventional Dry	Shelf Dry	Shelf Wet/Dry	SE	1	2
For 119 to 181 lb						
ADG, lb	1.99	1.95	2.19	.05	–[d]	.09
ADFI, lb	5.19	4.89	5.50	.15	–	.02
F/G	2.61	2.51	.10	.12	–	–
Water usage, gal/pig/day	1.43	1.28	1.13	.08	.05	–
For 181 to 253 lb						
ADG, lb	2.14	2.12	2.19	.07	–	–
ADFI, lb	6.58	6.41	6.82	.18	–	.13
F/G	3.07	3.02	3.11	.05	–	–
Water usage, gal/pig/day	1.46	1.42	1.18	.08	.12	.06
Overall						
ADG, lb	2.07	2.05	2.19	.05	–	.09
ADFI, lb	5.93	5.74	6.20	.15	–	.06
F/G	2.86	2.80	2.83	.04	–	–
Water usage, gal/pig/day	1.43	1.35	1.15	.07	.08	.08
Apparent digestibility (d 65), %						
DM	89.9	89.6	90.2	.5	–	–
N	87.9	87.7	88.5	.7	–	–
Carcass Characteristics						
Dressing percentage	73.3	73.9	74.7	.3	–	–
Backfat thickness, in	1.03	.96	1.00	.08	–	–
Fat free lean index[b], %	48.2	48.3	48.6	.9	–	–

[a]A total of 180 pigs (12 pigs per pen and five pens per treatment) with an average initial wt of 118 lb and average final wt of 252 lb.

[b]Fat free lean index (NPPC, 1994).was calculated as FFLI = 50.767 + (.035 × hot carcass weight, lb) – (8.979 × backfat thickness, in).

[c]Contrasts were: 1) conventional vs shelf-feeders and 2) dry shelf-feeder vs wet/dry shelf-feeders.

[d]Dashes indicated P>.15.

Table 3. Effects of Feeder Design on Stomach Morphology in Finishing Pigs[a]

Item	Feeder Design				Contrasts[d]	
	Conventional Dry	Shelf Dry	Shelf Wet/Dry	SE	1	2
Stomach Keratinization[b]						
No. observation	60	60	60			
Normal	45	44	47			
Mild	8	11	5			
Moderate	5	5	5			
Severe	2	0	3			
Mean score	.50	.43	.48	.10	–[e]	–
Stomach Ulceration[c]						
No. observation	60	60	60			
Normal	58	59	58			
Mild	1	0	0			
Moderate	0	1	2			
Severe	1	0	0			
Mean score	.08	.04	.08	.05	–	–

[a]A total of 180 pigs (12 pigs per pen and five pens per treatment) with an average initial wt of 118 lb and average final wt of 252 lb was used in the 66 d experiment.

[b]Scoring system was: 0 to .5 = normal; 1 to 1.5 = mild keratosis; 2 to 2.5 = moderate keratosis; and 3 = severe keratosis.

[c]Scoring system was: 0 to .5 = normal; 1 to 1.5 = slight erosions; 2 to 2.5 = ulcers; and 3 = severe ulcers.

[d]Contrasts were: 1) conventional vs shelf-feeders; and 2) dry shelf-feeders vs wet/dry shelf-feeders.

[e]Dashes indicated P>15.