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The effects of feeder design (conventional dry vs. wet-dry) in the nursery and in the finisher on growth performance of finishing pigs

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The Effects of Feeder Design (Conventional Dry vs. Wet-Dry) in the Nursery and in the Finisher on Growth Performance of Finishing Pigs[1]

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Summary

A total of 1,296 pigs (PIC 1050 × 337; initially 36 lb) were used in a 102-d study to determine the effects of feeder type (conventional dry vs. wet-dry) on nursery and finishing pig growth performance for pigs reared under commercial conditions. In the nursery, pigs were housed in rooms with either conventional dry or wet-dry feeders. At movement to the finisher, 312 barrows and 336 gilts from a room with conventional dry feeders and an equal number of pigs from a room with wet-dry feeders were randomly selected and distributed to have a similar number of barrows and gilts in each finisher pen. At the start of the trial, pens of pigs were weighed and randomly allotted to the 2 feeder types in finishing barn to arrange the treatments as a 2 × 2 factorial with main effects of feeder type in nursery and feeder type in finisher.

All pigs were fed the same corn-soybean meal diets containing 20 to 40% dried distillers grains with solubles (DDGS) during 6 dietary phases. For the finisher period (d 0 to 102), pigs fed with the conventional dry feeder during the nursery phase and wet-dry feeder during the finisher phase tended to have greater ADG ($P < 0.01$) compared with pigs fed with the other feeder regimens. An interaction ($P = 0.03$) occurred between nursery and finisher feeder type for F/G. Within pigs provided feed with the conventional dry feeder in the nursery phase, pigs provided feed with the conventional dry feeder in the finisher phase had poorer ($P < 0.01$) F/G compared with those fed with the wet-dry feeder. In contrast, for pigs provided feed with the wet-dry feeder in the nursery phase, F/G during the finisher phase was the same regardless of feeder type in the finisher phase. Pigs previously fed using a conventional dry feeder in the nursery had greater ADG and ADFI ($P = 0.03$, $P = 0.02$) compared with those on wet-dry feeder in the nursery phase regardless of the effect of feeder types in finishing period. Pigs fed with wet-dry feeders in the finisher phase had greater ($P < 0.01$) finisher ADG and improved ($P = 0.02$) F/G compared with those fed with conventional dry feeders in the finishing period. Also, the final BW of finishing pigs previously fed using conventional dry feeders in the nursery was greater ($P < 0.01$) than those previously fed on wet-dry feeders; however, pigs fed using wet-dry feeders in finisher phase had greater ($P < 0.01$) final BW compared with those fed with conventional dry feeders. These results indicated that using dry feeder in nursery and wet-dry feeder in finisher gave the most benefit in terms of growth performance.

Key words: conventional dry feeder, wet-dry feeder, finishing pig

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Introduction

Recent studies have demonstrated that finishing pigs fed using wet-dry feeders had improved weight gain, feed intake, and final BW (Bergstrom et al., 2010[3]), but little research is available comparing conventional dry feeders and wet-dry feeders in the nursery phase. Also, very little data is available to analyze the influence of feeder type used in the nursery on subsequent finishing pig performance.

Thus, the objective of this study was to evaluate the effects of feeder type (conventional dry vs. wet-dry) in the nursery and the potential interaction with feeder type (conventional dry vs. wet-dry) in the finisher on the growth performance of growing-finishing pigs.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. The study was conducted at a commercial research-finishing barn in southwestern Minnesota. The barns were naturally ventilated and double-curtain-sided. Pens had completely slatted flooring and deep pits for manure storage. Twenty-four pens were equipped with conventional dry stainless steel feeders (STACO, Inc., Schaefferstown, PA) with 5 holes and a cup waterer in each pen for ad libitum access to feed and water. The remaining 24 pens were equipped with a double-sided wet-dry feeder (Crystal Springs, GroMaster, Inc., Omaha, NE) where the feeder was the only source of water. Daily feed additions to each pen were accomplished through a robotic feeding system (FeedPro; Feedlogic Corp., Willmar, MN) capable of providing and measuring feed amounts for individual pens.

A total of 1,296 pigs (PIC 1050 × 337) with an initial BW of 36 lb were used in this study. During the nursery phase, pigs were housed in a room with either conventional dry feeders or in a room with wet-dry feeders. When moved to the finisher, 312 barrows and 336 gilts from the conventional dry feeder room and an equal number from the wet-dry feeder room in nursery phase were randomly selected to distribute a similar number of barrows and gilts (13 barrows and 14 gilts) to each finisher pen. Thus, 24 pens contained pigs previously fed using a conventional dry feeder in nursery and the remaining 24 pens contained those previously fed using a wet-dry feeder. At start of the trial, pens of pigs were weighed and randomly allotted to the 2 feeder types in finishing barn treatments, which were arranged as a 2 × 2 factorial with main effects of feeder type in nursery and feeder type in finisher. All pigs were fed the same corn-soybean meal-based diets containing 20 to 40% DDGS during 6 dietary phases from 36 to 75 lb, 75 to 120 lb, 120 to 170 lb, 170 to 205 lb, 205 to 240 lb, and 240 lb to market (Table 1). The last phase diet contained 4.5 g/ton of Ractopamine HCl (Paylean; Elanco Animal Health, Greenfield, IN). Pens of pigs were weighed and feed disappearance was recorded at d 13, 27, 49, 69, 88, and 102 to determine ADG, ADFI, and F/G.

The experimental data were analyzed using the MIXED procedure of SAS (SAS institute, Inc., Cary, NC). Pen was the experimental unit for all data and significance and tendencies were set at $P < 0.05$ and $P < 0.12$, respectively. Data were analyzed for the main effects of nursery feeder type on finisher performance, finisher feeder type, and interaction between nursery and finisher feeder types.

[3] Bergstrom et al., Swine Day 2010, Report of Progress 1038, pp. 178-189.

Results and Discussion

For the overall period (d 0 to 102), pigs fed with the conventional dry feeder during the nursery phase and wet-dry feeder during the finisher phase tended to have greater ADG ($P < 0.01$; Table 2) compared with pigs fed with the other feeder regimens. An interaction ($P = 0.03$) was observed between nursery and finisher feeder type for F/G. Within pigs provided feed with the conventional dry feeder in the nursery phase, pigs provided feed with the conventional dry feeder in the finisher phase had poorer ($P < 0.01$) F/G compared with those fed with the wet-dry feeder. In contrast, for pigs provided feed with the wet-dry feeder in the nursery phase, F/G during the finisher phase was the same regardless of feeder type in the finisher phase and was similar to pigs provided feed with a dry feeder during the nursery and wet-dry feeder during the finisher phase. As a result of the tendency for increased finisher growth rate, pigs fed with the conventional dry feeder in the nursery phase and wet-dry feeder in the finisher phase had the heaviest final BW compared with those fed with the other 3 regimens.

Pigs previously fed using a conventional dry feeder in the nursery had greater ADG and ADFI ($P = 0.03$, $P = 0.02$; Table 3) compared with those on wet-dry feeder in the nursery phase regardless of the effect of feeder types in finishing period. Pigs fed with wet-dry feeders in the finisher phase had higher finisher ADG and better F/G ($P < 0.01$, $P = 0.02$) compared with those fed with conventional dry feeders in finishing period. Also, the final BW of finishing pigs previously fed using conventional dry feeder in nursery was greater ($P < 0.01$) than those previously fed on wet-dry feeder, but pigs fed using wet-dry feeder in the finisher phase had greater ($P < 0.01$; Table 3) final BW compared with those fed on conventional dry feeder. Pigs fed with dry feeders in the nursery also had greater ($P < 0.01$) BW at the beginning of the finisher phase (d 0); however, more research needs to be done to determine if this difference was caused by nursery feeder or a random effect due to the random sample of pigs chosen from the two nursery rooms.

In this experiment, pigs fed using a wet-dry feeder during the finisher phase had a greater growth rate, which agrees with data reported by Bergstorm et al. (2010[4]), where pigs fed with a wet-dry feeder had increased ADG and final BW compared with those fed with a conventional dry feeder. In that trial, feed efficiency was not affected regardless the adjustment strategies; however, in this experiment we found an improvement in F/G for pigs fed with wet-dry feeders in the finisher when they had been previously fed with conventional dry feeders in the nursery.

In conclusion, pigs fed using conventional dry feeders in the nursery period had advantages in ADG and ADFI in the finishing period, and pigs fed using wet-dry feeders in the finishing period had the greatest growth rate and best feed efficiency. Therefore, these results indicate that using conventional dry feeders in nursery and wet-dry feeders in finisher gave the most benefit in terms of growth performance.

[4] Bergstrom et al., Swine Day 2010, Report of Progress 1038, pp. 178-189.

Table 1. Composition of diets (as-fed basis)[1]

Item	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6
Ingredient, %						
Corn	47.40	41.75	44.95	50.50	68.10	58.80
Soybean meal (46.5% CP) CP) CP	18.30	14.55	11.35	7.40	10.10	19.35
DDGS[2]	30.00	40.00	40.00	40.00	20.00	20.00
Choice white grease	2.00	1.50	1.50	---	---	---
Limestone	1.15	1.15	1.15	1.15	1.00	1.00
Salt	0.35	0.35	0.35	0.35	0.35	0.35
Vitamin premix	0.10	0.10	0.10	0.09	0.09	0.09
L-Threonine	0.025	---	---	---	---	---
L-Lysine sulfate	0.65	0.60	0.55	0.53	0.35	0.35
Phytase[3]	0.01	0.01	0.01	0.01	0.01	0.01
Ractopamine HCl, 9 g/lb[4]	---	---	---	---	---	0.025
Total	100	100	100	100	100	100
Calculated analysis						
Standadized ileal digestible (SID) amino acids, %						
Lysine	0.79	0.79	0.79	0.79	0.79	0.79
Isoleucine:lysine	62	68	73	73	79	84
Leucine:lysine	158	191	224	174	207	240
Methionine:lysine	28	33	39	31	36	42
Met & Cys:lysine	57	68	79	63	74	85
Threonine:lysine	65	65	69	65	71	78
Tryptophan:lysine	16.5	16.5	16.5	20.0	20.0	20.0
Valine:lysine	74	83	93	85	94	103
Phenylalanine:lysine	77	88	98	89	100	110
Tyrosine:lysine	55	63	72	64	72	81
Total lysine, %	0.88	0.92	0.96	0.90	0.93	0.97
ME, kcal/lb	1,523	1,526	1,527	1,522	1,525	1,526
SID lysine:ME, g/Mcal	2.35	2.35	2.35	2.35	2.35	2.35
CP, %	14.4	16.8	19.2	16.2	18.6	21.0
Ca, %	0.50	0.50	0.50	0.50	0.50	0.50
P, %	0.41	0.41	0.48	0.43	0.43	0.50
Available P, %	0.23	0.26	0.35	0.23	0.26	0.36

[1] The 6 diets were fed from 36 to 75 lb, 75 to 120 lb, 120 to 170 lb, 170 to 205 lb, 205 to 240 lb, and 240 lb to market.
[2] Dried distillers grains with solubles from Vera-Sun (Aurora, SD).
[3] OptiPhos 2000 (Enzyvia LLC, Sheridan, IN).
[4] Ractopamine HCl (Paylean; Elanco Animal Health, Greenfield, IN) at 4.5 g/ton was added.

Table 2. Effects of feeder design (conventional dry vs. wet-dry) in the nursery and feeder design (conventional dry vs. wet-dry) in the finisher[1]

	Nursery feeder					
	Dry[2]		Wet-dry[3]			Probability, P <
Finisher feeder	Dry[4]	Wet-dry[5]	Dry	Wet-dry	SEM	Nursery × finisher
d 0 to 102						
ADG, lb	1.94[a]	2.03[b]	1.93[a]	1.97[a]	0.015	0.12
ADFI, lb	4.75	4.78	4.60	4.68	0.050	0.58
F/G	2.44[a]	2.35[b]	2.37[b]	2.37[b]	0.019	0.03
Avg. weight, lb						
d 0	37.5	36.5	35.5	34.4	0.325	0.81
d 102	236.1[a]	244.3[b]	233.4[a]	236.0[a]	1.615	0.09

[a,b] Means lacking a common superscript within a row differ ($P < 0.05$).
[1] A total of 1,296 pigs (PIC 1050 × 337, initially 36 lb) were used in a 102-d growing-finishing trial with 27 pigs per pen and 12 pens per treatment.
[2] Conventional dry feeders (STACO, Inc., Schaefferstown, PA) were 6-hole stainless steel and 36 in. wide.
[3] A double-sided wet-dry feeder (The Crystal Springs N_2 Series Nursery Wet-Dry Feeder, GroMaster, Inc., Omaha, NE).
[4] Conventional dry feeders (STACO, Inc., Schaefferstown, PA) were 5-hole stainless steel with a cup waterer in each pen.
[5] A double-sided wet-dry feeder (Crystal Springs, GroMaster, Inc., Omaha, NE).

Table 3. Effects of feeder design (conventional dry vs. wet-dry) in the nursery and feeder design (conventional dry vs. wet-dry) in the finisher (main effect)[1]

	Nursery feeder		Finisher feeder			Probability, P <	
	Dry[2]	Wet-dry[3]	Dry[4]	Wet-dry[5]	SEM	Nursery	Finisher
d 0 to 102							
ADG, lb	1.99	1.95	1.94	2.00	0.010	0.03	<0.01
ADFI, lb	4.76	4.64	4.67	4.73	0.035	0.02	0.26
F/G	2.40	2.38	2.41	2.36	0.013	0.21	0.02
Avg. weight, lb							
d 0	37.0	34.9	36.5	35.5	0.230	<0.01	<0.01
d 102	240.2	234.7	234.8	240.2	1.142	<0.01	<0.01

[1] A total of 1,296 pigs (PIC 1050 × 337, initially 36 lb) were used in a 102-d growing-finishing trial with 27 pigs per pen and 12 pens per treatment.
[2] Conventional dry feeders (STACO, Inc., Schaefferstown, PA) were 6-hole stainless steel and 36 in. wide.
[3] A double-sided wet-dry feeder (The Crystal Springs N_2 Series Nursery Wet-Dry Feeder, GroMaster, Inc., Omaha, NE).
[4] Conventional dry feeders (STACO, Inc., Schaefferstown, PA) were 5-hole stainless steel with a cup waterer in each pen.
[5] A double-sided wet-dry feeder (Crystal Springs, GroMaster, Inc., Omaha, NE).