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Abstract

A total of 200 finishing pigs (average initial BW of 132.3 lb) were used in a 58-d growth assay to determine the effects of an abrupt change from mash to pellets and pellets to mash on growth performance and carcass measurements. The experiment was designed as a randomized complete block with 5 pigs per pen and 10 pens per treatment. There were 4 treatments with 2 phases of diets utilized. Treatments were mash to mash, mash to pellets, pellets to mash, and pellets to pellets for Phases 1 and 2 of the experiment. For Phase 1 (d 0 to 36), pigs fed the pelleted diet had 4% greater ($P < 0.06$) ADG and F/G was improved ($P < 0.03$) by 8% compared to pigs fed mash. For Phase 2 (d 36 to 58) and overall (d 0 to 58), pigs fed the mash diet had poorer ($P < 0.01$) F/G than pigs fed the pelleted treatments. Indeed, pigs fed pellets the entire experiment had ADG and F/G 5 and 8% better ($P < 0.01$), respectively, than pigs fed mash the entire experiment. Pigs fed mash during Phase 1 then pellets during Phase 2 had improved ($P < 0.01$) ADG and F/G for Phase 2 compared with pigs fed pellets then mash. Overall pigs fed pellets for either Phase 1 or 2, but not both, tended to have poorer ($P < 0.10$) ADG and F/G compared with pigs fed pellets for the entire experiment. With HCW used as a covariate, no differences ($P > 0.15$) were observed in dressing percentage, fat thickness, loin depth, or percentage fat-free lean index (FFLI). Pigs fed pellets tended to have the greatest growth performance, pigs fed mash the worst, with pigs fed pellets for only part of the grow-finish phase rating intermediate.; Swine Day, Manhattan, KS, November 17, 2011

Keywords

Swine Day, 2011; Kansas Agricultural Experiment Station contribution; no. 12-064-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1056; Swine; Meal; Pelleting; Finishing pig

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Effects of Abrupt Changes between Mash and Pellet Diets on Growth Performance in Finishing Pigs

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Summary
A total of 200 finishing pigs (average initial BW of 132.3 lb) were used in a 58-d growth assay to determine the effects of an abrupt change from mash to pellets and pellets to mash on growth performance and carcass measurements. The experiment was designed as a randomized complete block with 5 pigs per pen and 10 pens per treatment. There were 4 treatments with 2 phases of diets utilized. Treatments were mash to mash, mash to pellets, pellets to mash, and pellets to pellets for Phases 1 and 2 of the experiment. For Phase 1 (d 0 to 36), pigs fed the pelleted diet had 4% greater ($P < 0.06$) ADG and F/G was improved ($P < 0.03$) by 8% compared to pigs fed mash. For Phase 2 (d 36 to 58) and overall (d 0 to 58), pigs fed the mash diet had poorer ($P < 0.01$) F/G than pigs fed the pelleted treatments. Indeed, pigs fed pellets the entire experiment had ADG and F/G 5 and 8% better ($P < 0.01$), respectively, than pigs fed mash the entire experiment. Pigs fed mash during Phase 1 then pellets during Phase 2 had improved ($P < 0.01$) ADG and F/G for Phase 2 compared with pigs fed pellets then mash. Overall pigs fed pellets for either Phase 1 or 2, but not both, tended to have poorer ($P < 0.10$) ADG and F/G compared with pigs fed pellets for the entire experiment. With HCW used as a covariate, no differences ($P > 0.15$) were observed in dressing percentage, fat thickness, loin depth, or percentage fat-free lean index (FFLI). Pigs fed pellets tended to have the greatest growth performance, pigs fed mash the worst, with pigs fed pellets for only part of the grow-finish phase rating intermediate.

Key words: meal, pelleting, finishing pig

Introduction
Corn is a major cereal grain fed to swine in the United States. The recent price of corn has reached record highs and pushed swine producers to try to maximize efficiency of gain. Moreover, producers are turning to feed processing technologies to maximize feed utilization. Adding the necessary infrastructure to allow for pelleting entails a high initial cost along with decreasing production rates and increasing energy usage, which leads to higher feed cost for the producer; however, this extra cost for pelleting may provide more economic return.

Inability to achieve adequate production rates could be a problem for some feed manufactures and swine producers who are looking for ways to cut costs while still achieving optimum efficiencies of gain. Also, feeding pelleted diets can lead to an increase in stomach ulcers, leading producers to switch to mash diets to reduce ulcers; however, little data have been produced on the effects of switching from mash to pelleted diets and vice versa and if feeding pellets throughout the entire grower and finisher stage is necessary to achieve benefits from pelleting. Therefore, our objective was to determine

[1] Key Feeds, Clay Center, Kansas.

the effects of abrupt changes between mash and pellet diets on growth performance in finishing pigs.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved this experimental protocol.

All feed processing was completed at Key Feeds (Clay Center, KS). For all diets, corn was milled through a hammer mill (Jacobson P24209 Series 2) with a screen size of 1/8 in. (full circle screen). Pelleted treatments were pelleted in a 125 horsepower pellet mill (Century, California Pellet Mill, San Francisco, CA) and the die had 3/16-in. openings. Pellet durability index (PDI) was determined using the standard tumbling-box technique. A modified PDI was also determined by adding 5 hexagonal nuts into the tumbling box.

A total of 200 finishing pigs (PIC TR4 × 1050, initially 132.3 lb) were used in a 58-d growth assay. The pigs were weighed prior to the experiment, blocked by BW, and allotted by sex and ancestry. Pigs were then assigned to pens with concrete slatted flooring that were 5 ft × 8 ft. Each pen consisted of two nipple waterers and single-hole self-feeder allowing ad libitum consumption of feed and water. The experiment used a total of 40 pens with 5 pigs per pen and 10 pens per treatment. All diets (Table 1) were the same formulation fed in either mash or pellet form. Diets were fed in 2 phases and formulated to 0.88% standardized ileal digestible (SID) lysine, 0.55% Ca, and 0.21% available P for d 0 to 36, and 0.76% SID lysine, 0.50% Ca, and 0.17% available P for d 36 to 58. All other nutrients met or exceeded NRC recommendations (NRC, 1998[2]). Treatments were mash to mash, mash to pellets, pellets to mash, and pellets to pellets for Phases 1 and 2 of the experiment. Pigs and feeders were weighed on day 0, 36, and 58 to determine ADG, ADFI, and F/G. On d 58 of the experiment, pigs (average BW of 282.2 lb) were tattooed and shipped to a commercial abattoir (Farmland Foods Inc., Crete, NE) for collection of HCW, percentage yield, backfat, loin depth, and percentage FFLI.

Data were analyzed as a randomized complete block design using the MIXED procedure of SAS (v9.1; SAS Institute Inc., Cary, NC) with initial weight and location as the blocking criteria and pen as the experimental unit. Initial BW was used as a covariate for analyses of growth performance. Orthogonal contrasts were used to separate treatment means with comparisons of: (1) mash for Phase 1 and 2 vs. pellets for Phase 1 and 2, (2) control vs. pelleted treatments, (3) treatments pelleted for the entire experiment vs. treatments pelleted for either Phase 1 or 2 but not both, and (4) treatments fed in pelleted form for Phase 1 and mash form for Phase 2 vs. treatments fed in mash form for Phase 1 and pelleted form for Phase 2. For analyses of backfat thickness, loin depth, and percentage lean, HCW was used as a covariate.

Results and Discussion

For pellet quality, pelleted diets in Phase 1 and Phase 2 had PDI of 86 and 87% and modified PDI of 80 and 77%, respectively. The average mean particle size for corn was 433 µm.

[2] NRC. 1998. Nutrient Requirements of Swine. 10th ed. Natl. Acad. Press, Washington, DC.

For Phase 1 (d 0 to 36), pigs fed the pelleted diet had 4% greater ($P < 0.06$) ADG and 8% improved ($P < 0.03$) F/G compared with pigs fed mash (Table 2). For Phase 2 (d 36 to 58) and overall (d 0 to 58), pigs fed the mash diet had poorer ($P < 0.02$) F/G than pigs fed the pelleted treatments. Pigs fed mash during Phase 1 then pellets during Phase 2 had improved ($P < 0.002$) ADG and F/G for Phase 2 compared with pigs fed pellets then mash. Pigs fed pellets for either Phase 1 or 2, but not both, tended to have poorer ($P < 0.10$) ADG and F/G compared to those fed pellets for the entire experiment. Indeed, pigs fed pellets the entire experiment had a 5% improvement ($P < 0.06$) in ADG and an 8% improvement ($P < 0.001$) in F/G compared with pigs fed mash the entire experiment. Pigs fed the mash diet for the entire experiment had decreased ($P < 0.03$) final BW and HCW compared with those fed treatments that were pelleted for the entire experiment; however, a tendency was observed for pigs fed the pelleted diet for the entire experiment to have an increased ($P < 0.07$) final BW and HCW compared with those fed treatments that were pelleted for only Phase 1 or 2. Pigs fed the diets pelleted for the entire experiment resulted in a numerically heavier ($P < 0.07$) final BW compared with those fed pelleted diets during only Phase 1 or Phase 2. No differences ($P > 0.15$) were observed in percentage carcass yield, fat thickness, loin depth, or percentage FFLI. In conclusion, pigs fed pellets tended to have the greatest growth performance, pigs fed mash the worst, and pigs fed pellets for only part of the growing-finishing phase fell in between.

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

Ingredient, %	Phase 1[1]	Phase 2[2]
Corn	79.25	84.70
Soybean meal (47.5% CP)	17.15	11.90
Choice white grease	1.00	1.00
L-Lysine HCl	0.34	0.35
DL-Methionine	0.07	0.05
L-Threonine	0.12	0.11
L-Tryptophan	0.02	0.04
Monocalcium phosphate (21% P)	0.72	0.54
Limestone	0.91	0.89
Salt	0.25	0.25
Vitamin premix	0.08	0.08
Mineral premix	0.04	0.04
Antibiotic[3]	0.05	0.05
Calculated analysis,%		
Standardized ileal digestible lysine	0.88	0.76
Ca	0.55	0.50
P	0.49	0.43
Available P	0.21	0.17

[1] Diets fed in meal or pelleted form from d 0 to 36.
[2] Diets fed in meal or pelleted form from d 36 to 58.
[3] Provided 44 g/ton tylosin.

Table 2. Effects of abrupt change between mash and pellet diets on growth performance in finishing pigs[1]

Phase 1:	Mash	Mash	Pellet	Pellet		Probability, $P <$[2]			
Phase 2:	Mash	Pellet	Mash	Pellet	SE	1	2	3	4
d 0 to 36									
ADG,lb	2.46	2.49	2.57	2.57	0.06	0.06	N/A[3]	N/A	N/A
ADFI, lb	6.36	6.31	6.07	6.11	0.16	0.10	N/A	N/A	N/A
F/G	2.59	2.52	2.36	2.37	0.03	0.001	N/A	N/A	N/A
d 36 to 58									
ADG, lb	2.56	2.71	2.46	2.73	0.05	0.02	0.21	0.02	0.002
ADFI, lb	7.79	7.61	7.52	7.74	0.18	0.79	0.29	0.30	0.66
F/G	3.04	2.81	3.06	2.83	0.05	0.003	0.01	0.08	0.001
d 0 to 58									
ADG, lb	2.50	2.57	2.53	2.63	0.05	0.01	0.06	0.08	0.39
ADFI, lb	6.89	6.80	6.62	6.73	0.16	0.27	0.16	0.91	0.25
F/G	2.76	2.63	2.62	2.55	0.03	0.001	0.001	0.10	0.72
BW, lb									
D 0 lb	132.1	133.3	133.4	132.0	3.0	0.94	0.60	0.39	0.96
D 36 lb	221.3	222.4	225.4	225.2	2.1	0.06	0.07	0.44	0.15
D 58 lb	278.6	282.0	279.5	285.4	2.7	0.02	0.12	0.07	0.38
Carcass measurements									
HCW, lb	208.0	209.5	208.7	212.2	1.9	0.03	0.15	0.06	0.68
Carcass yield, %	74.6	74.3	74.3	74.4	0.3	0.71	0.41	0.60	0.97
Backfat thickness, in.[4]	0.75	0.78	0.77	0.77	0.03	0.47	0.34	0.91	0.90
Loin depth, in.[4]	2.63	2.65	2.68	2.65	0.03	0.55	0.34	0.74	0.42
FFLI, %[4,5]	52.0	51.7	51.7	51.7	0.5	0.59	0.47	0.93	0.93

[1] A total of 200 pigs (average initial BW of 132.3 lb) were used in a 58-d growth assay.
[2] Contrast statements: (1) mash for Phase 1 and 2 vs. pellets for Phase 1 and 2, (2) mash vs. others, (3) pellets for entire experiment vs. pellets fed for only part of experiment, (4) mash to pellet vs. pellet to mash.
[3] Not applicable.
[4] HCW used as a covariate.
[5] Fat-free lean index.