Kansas Agricultural Experiment Station Research Reports

Volume 0
Issue 10 *Swine Day (1968-2014)*

Article 812

1999

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Recommended Citation

Steidinger, M U.; Tokach, Michael D.; O'Quinn, P R.; Woodworth, J C.; McKinney, Leland J.; Borg, B S.; Campbell, J M.; Goodband, Robert D.; Nelssen, Jim L.; and Dritz, Steven S. (1999) "Effects of pelleting and pellet conditioning temperatures on weanling pig performance," *Kansas Agricultural Experiment Station Research Reports*: Vol. 0: Iss. 10. https://doi.org/10.4148/2378-5977.6652

Effects of pelleting and pellet conditioning temperatures on weanling pig performance

Abstract

Two studies were conducted to evaluate" the effects of pelleting and pellet conditioning temperature of diets containing 5% spray-dried animal plasma (SDAP) on weanling pig growth performance. In Exp. 1, conditioning temperatures evaluated were 140, 150, 160, and 170Â°F. In Exp. 2, pellet conditioning temperatures were 140, 155, 170, 185, and 200Â°F. The results suggest that pellet conditioning temperatures above 170Â°F decrease weanling pig performance from d 0 to 7 after weaning. Pellet conditioning temperature should not exceed 170OF (exit temperature of 180Â°F) for nursery diets containing 5% SDAP.; Swine Day, Manhattan, KS, November 18, 1999

Keywords

Swine day, 1999; Kansas Agricultural Experiment Station contribution; no. 00-103-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 841; Swine; Weanling pigs; Spray-dried animal plasma; Pellet conditioning termperature

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EFFECTS OF PELLETING AND PELLET CONDITIONING TEMPERATURES ON WEANLING PIG PERFORMANCE[1]

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Summary

Two studies were conducted to evaluate the effects of pelleting and pellet conditioning temperature of diets containing 5% spray-dried animal plasma (SDAP) on weanling pig growth performance. In Exp. 1, conditioning temperatures evaluated were 140, 150, 160, and 170°F. In Exp. 2, pellet conditioning temperatures were 140, 155, 170, 185, and 200°F. The results suggest that pellet conditioning temperatures above 170°F decrease weanling pig performance from d 0 to 7 after weaning. Pellet conditioning temperature should not exceed 170°F (exit temperature of 180°F) for nursery diets containing 5% SDAP.

(Key Words: Weanling Pigs, Spray-Dried Animals Plasma, Pellet Conditioning Temperature.)

Introduction

Numerous trials have demonstrated improved ADG and F/G in pigs fed pelleted diets versus meal diets. Because starter diets typically contain specialty ingredients, such as dried whey and spray-dried animal plasma (SDAP), making a high quality pellet can be challenging. Some heat and steam are required in the pelleting process, but too much heat could potentially burn or scorch some of the specialty ingredients and reduce their nutritional value. Therefore, the objective of this experiment was to determine the effects of pellet conditioning temperature of a starter diet containing SDAP and spray-dried whey.

Procedures

General. Two 28 d growth assays were used to determine the effects of pelleting and pellet conditioning temperatures of starter diets fed to weanling pigs. Pigs (PIC L326 × C22) were housed in an environmentally regulated nursery at the Kansas State University Swine Teaching and Research Center in 5 ft × 5 ft pens and were provided ad libitum access to feed and water. Both experiments used seven pens (replications) per treatment, and each pen contained six pigs. The trials were divided into two phases, with the experimental diets fed from d 0 to 14 after weaning (Table 1). From d 14 to 28, a common corn-soybean meal-based diet containing 10 % dried whey and 2.5 % dried blood cells was fed in a meal form (Table 1).

The pelleted diets were conditioned with a 10-second retention time and then pelleted (5/32 in. diameter) using a Master Model HD 1000 series California Pellet Mill equipped with a die of 1.25 in. effective thickness. Samples of the pelleted diets were collected to determine pellet exit temperatures and pellet durability index (PDI).

Pigs were weighed and feed disappearance was determined on d 0, 7, 14, 21, and

[1]The authors thank American Protein Corp. for providing the spray-dried animal plasma and partial financial support.

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28 after weaning to calculate ADG, ADFI, and F/G. Data were analyzed in a randomized complete block design with pen as the experimental unit.

Experiment 1. Two hundred fifty-two weanling pigs (13.2 lb and 21 d of age) were used. Experimental treatments consisted of a corn-soybean meal control diet (1.4% lysine and 15% dried whey) with no spray-dried animal plasma (SDAP) fed in a meal form or the control diet with 5% SDAP replacing soybean meal on a equal lysine basis also fed in a meal form. Additional treatments were the 5% SDAP diet pelleted at conditioning temperatures of 140, 150, 160, or 170°F. Corresponding exit temperatures were 155, 166, 171, and 176°F, and corresponding PDI's were 95.7, 92.7, 92.9, and 92.6, respectively.

Experiment 2. Two hundred fifty-two weanling pigs (13.8 lb and 22 d of age) were used in the 28 d growth assay. Experimental treatments were the control diet (containing no SDAP) from Exp. 1 pelleted at a conditioning temperature of 140°F or one of five diets containing 5 % SDAP pelleted at conditioning temperatures of 140, 155, 170, 185, or 200°F. Corresponding exit temperatures were 158, 158, 169, 180, 185, and 200°F with PDI's of 94.9, 96.7, 95.2, 93.7, 94.9, and 96.1.

Results and Discussion

Experiment 1. From d 0 to 7 and d 0 to 14, pigs fed the control diet had decreased (P<.08) ADG, ADFI, and F/G compared to the mean of pigs fed diets containing 5% SDAP. Although not significant, among pigs fed diets containing SDAP from d 0 to 7, those fed the pelleted diets had an 8% increase in ADG and 12% better feed efficiency than pigs fed the diet in meal form. From day 0 to 14, pellet conditioning temperature had no effect on pig performance.

From d 14 to 28, pigs previously fed the control diet had increased (P<.02) ADG and better F/G than animals previously containing 5% SDAP. From d 14 to 28, feed efficiency improved as pellet conditioning temperature was increased in the diet previously fed from d 0 to 14 (linear, P<.08). Overall (d 0 to 28), no effects of feeding SDAP or pellet conditioning temperature used from d 0 to 14 were observed (Table 2).

Experiment 2. From d 0 to 7, pigs fed the 5% SDAP diet conditioned at 140°F tended (P<.12) to have greater ADG and greater (P<.05) ADFI compared to pigs fed the control diet without SDAP. From d 0 to 7, ADG was similar as pellet conditioning temperature increased to 170°F, but then decreased with conditioning temperatures above 170°F (quadratic, P<.03). From d 0 to 7, increasing conditioning temperature also decreased feed intake (linear, P<.002), with the most pronounced decrease observed after 170°F. From d 0 to 14, increasing pellet conditioning temperature had no effect on ADG or ADFI, but F/G improved with increasing conditioning temperature (linear, P<.02), with pigs fed diets conditioned at 170°F having the best F/G.

From d 14 to 28, pigs previously fed the control diet had improved (P<.08) feed efficiency compared to pigs fed the diet containing 5% SDAP conditioned at 140°F. Pellet conditioning temperature of the diet fed from d 0 to 14 had no effect on performance from d 14 to 28 (Table 3).

In conclusion, the results of these experiments suggest that diet preparation and formulation are critical for optimal performance in early-weaned pigs. Results also suggest that adding SDAP to weanling pig starter diets, whether pelleted or prepared in meal form, improves growth performance from d 0 to 7. Although no statistical differences in growth performance occurred between pigs fed meal diets and those fed pelleted diets, pigs fed pelleted diets demonstrated a 12% improvement in feed efficiency from d 0 to 7. Results also indicated that conditioning diets containing SDAP at temperatures above 170°F decreases growth performance of weanling pigs.

Table 1. Compositions of Experimental Diets

Ingredient, %	Day 0 to 14[a]		d 14 to 28[b]
	Control	5% SDAP	
Corn	44.64	51.47	53.79
Soybean meal (46.5% C.P.)	34.04	22.18	25.86
Spray-dried animal plasma	--	5.00	--
Dried whey	15.00	15.00	10.00
Soy oil	3.00	3.00	3.0
Monocalcium P (21% P)	1.40	1.32	1.89
Limestone	.95	1.00	0.81
Salt	.30	.30	0.25
Vitamin premix	.25	.25	0.25
L-lysine HCl	.15	.15	0.15
Trace mineral	.15	.15	0.15
DL-methionine	.10	.13	0.10
Zinc oxide	--	--	0.25
Medication[c]	--	--	1.00
Spray-dried blood cells	--	--	2.50

[a]Formulated to contain 1.4% lysine, 0.9% Ca, and 0.8% P.

[b]Fed in meal form to all pigs and formulated to contain 1.35% lysine, .85% Ca, and .75% P.

[c]Provided 50 g/ton carbodox.

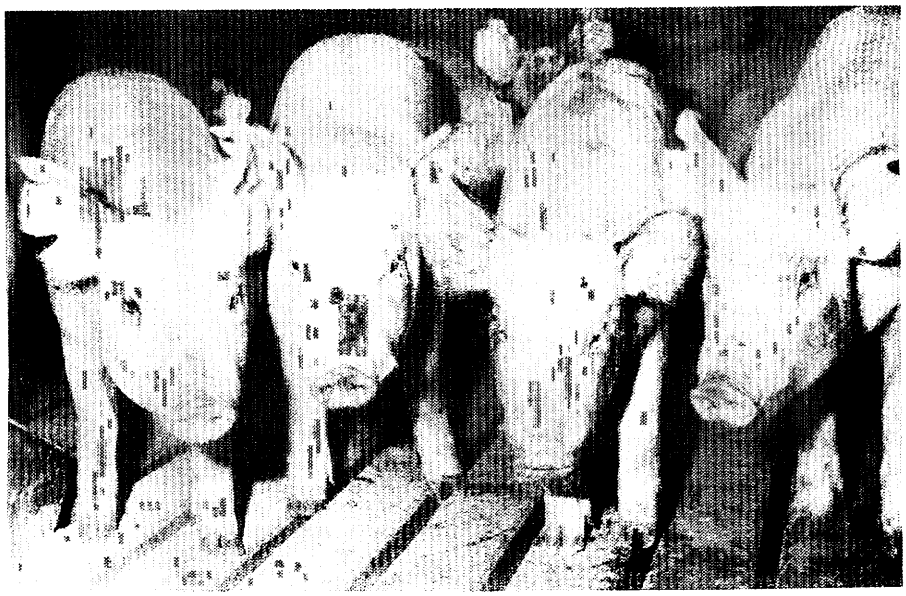

Table 2. Effects of Pelleting and Increasing Pelleting Temperature on Weanling Pig Performance (Exp. 1)[a]

	Meal Diets		Pellet Conditioning Temperature (°F)					Contrast (P<)[c]			
Item	Control	5% SDAP	140	150	160	170	SEM	1	2	3	4
Treatment[b]	1	2	3	4	5	6					
PDI[d]	-	-	95.7	92.7	92.9	92.6					
Day 0 to 7											
ADG, lb	.31	.43	.48	.47	.48	.45	.028	.001	.21	.53	.65
ADFI, lb	.52	.59	.59	.58	.55	.56	.023	.05	.37	.25	.56
F/G	1.86	1.42	1.28	1.24	1.17	1.27	.12	.001	.19	.87	.55
Day 0 to 14											
ADG, lb	.42	.56	.55	.60	.55	.53	.026	.001	.94	.39	.24
ADFI, lb	.73	.82	.78	.80	.76	.77	.027	.08	.15	.55	.80
F/G	1.75	1.49	1.44	1.34	1.39	1.45	.053	.001	.15	.67	.16
Day 14 to 28											
ADG, lb	1.42	1.36	1.36	1.32	1.33	1.37	.025	.02	.56	.62	.13
ADFI, lb	1.81	1.82	1.84	1.81	1.79	1.80	.041	.98	.82	.41	.69
F/G	1.28	1.34	1.36	1.38	1.35	1.31	.021	.01	.71	.08	.21
Day 0 to 28											
ADG, lb	.92	.96	.95	.96	.94	.95	.022	.42	.38	.31	.97
ADFI, lb	1.27	1.32	1.31	1.30	1.28	1.27	.029	.42	.38	.31	.96
F/G	1.39	1.38	1.38	1.36	1.36	1.35	.020	.34	.44	.30	.95

[a]Two hundred fifty-two weanling pigs were used (initially 13.2 lb) with six pigs per pen and seven pens per treatment.

[b]Treatment 1 contained no spray-dried animal plasma (SDAP). Treatments 2, 3, 4, 5, and 6 contained 5% SDAP.

[c]Contrasts: 1=Control (1) vs Plasma (Mean of 2, 3, 4, 5, and 6). 2=Meal (2) vs Pellet (Mean of 3, 4, 5, and 6).
3=Linear effect of conditioning temperature (3, 4, 5, and 6). 4=Quadratic effect of conditioning temperature (3, 4, 5, and 6).

[d]Pellet Durability Index (Standard: ASAE S269.3).

Table 3. Effects of Increasing Pellet Conditioning Temperature on Weanling Pig Performance (Exp. 2)[a]

		Pellet Conditioning Temperature (°F)						Contrast (P<)[c]		
Item	Control[b]	140	155	170	185	200	SEM	1	2	3
PDI[d]	94.9	96.7	95.2	93.7	94.9	96.1				
Day 0 to 7										
ADG, lb	.51	.57	.57	.60	.52	.47	.025	.12	.004	.03
ADFI, lb	.53	.59	.58	.59	.55	.49	.021	.05	.002	.12
F/G	1.05	1.05	1.01	.99	1.05	1.08	.040	.99	.41	.21
Day 0 to 14										
ADG, lb	.52	.52	.51	.57	.55	.54	.021	.88	.20	.29
ADFI, lb	.65	.69	.68	.69	.69	.67	.023	.23	.64	.60
F/G	1.25	1.35	1.35	1.22	1.24	1.24	.042	.23	.02	.36
Day 14 to 28										
ADG, lb	1.38	1.38	1.33	1.37	1.38	1.38	.038	.86	.58	.63
ADFI, lb	1.82	1.88	1.80	1.87	1.87	1.94	.058	.39	.34	.31
F/G	1.32	1.37	1.36	1.36	1.35	1.40	.026	.08	.44	.30
Day 0 to 28										
ADG, lb	.95	.95	.92	.97	.97	.96	.025	.88	.32	.92
ADFI, lb	1.23	1.28	1.24	1.28	1.28	1.30	.038	.28	.54	.53
F/G	1.30	1.36	1.35	1.32	1.32	1.36	.023	.10	.64	.19

[a]Two hundred fifty weanling pigs were used (initially 13.8 lb) with six pigs per pen and seven pens per treatment.

[b]Control contained no spray-dried animal plasma and was pelleted at 140°F. All other diets contained 5% SDAP and were pelleted at their respective temperatures.

[c]Contrasts: 1=Control vs 140°F. 2=Linear effect of conditioning temperature. 3=Quadratic effect of conditioning temperature.

[d]Pellet Durability Index (Standard:ASAE S269.3).