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Effects of Added Fat on Growth Performance, Carcass Characteristics, and Economics of Growing and Finishing Pigs Under Commercial Conditions

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Effects of Added Fat on Growth Performance, Carcass Characteristics, and Economics of Growing and Finishing Pigs Under Commercial Conditions

Abstract

A total of 1,637 mixed gender pigs (PIC; 359 × Camborough) with an initial pen average body weight (BW) of 87.8 ± 2.39 lb were used in a 110-d growth trial to determine the effects of feeding increasing levels of dietary fat on performance of growing-finishing pigs from 88 to 286 lb. The trial was conducted from late June to early October. Pens of pigs were randomly assigned to 1 of 4 dietary treatments in a randomized complete block design with BW as a blocking factor. There were 16 replicate pens per treatment and 20 to 27 pigs per pen. The experimental diets were corn-soybean meal-based and were fed in 5 phases. The 4 dietary treatments were formulated to contain 0, 1.5, 3.0, and 4.5% added fat. During the grower and finisher periods, results of this study demonstrated no evidence of difference ($P > 0.05$) in average daily gain (ADG) but a linear decrease ($P < 0.05$) in average daily feed intake (ADFI) with increasing dietary fat level. During the grower period, there was a quadratic change ($P < 0.05$) in feed-to-gain ratio (F/G). The greatest improvement in feed efficiency occurred as the dietary fat increased from 0 to 3%, with no improvements thereafter. During the finisher period, adding up to 4.5% fat to the diet resulted in a linear improvement ($P < 0.05$) in F/G. Overall, there was no evidence of differences ($P > 0.05$) in ADG and final BW as dietary fat level increased. Even though not statistically significant, changes in ADG were close to prior expectation and averaged 0.7% for every percent of added fat. Average daily feed intake decreased linearly ($P < 0.05$) as the level of added dietary fat increased up to 4.5%. Increasing dietary fat level resulted in a quadratic improvement ($P < 0.05$) in F/G. In addition, for every 1% fat increment, F/G improved on average 2.2%. For carcass characteristics, there was no evidence of differences ($P > 0.05$) in hot carcass weight (HCW), percentage carcass yield, loin depth, and fat-free lean measurements due to increasing the level of added fat in the diet. Carcass backfat, however, increased linearly ($P < 0.05$) with increased inclusion of fat in the diet from 0 to 4.5%. Feed cost per pig increased linearly ($P < 0.05$) with increased dietary fat level. Feed cost per pound of gain increased quadratically ($P < 0.05$) as the level of fat in the diet increased, with the highest cost per pound of gain observed at 4.5% fat inclusion. No evidence for differences ($P > 0.05$) was observed for revenue per pig due to added fat in the diet. The increased feed cost in combination with lack of evidence of differences in revenue per pig resulted in a linear decrease ($P < 0.05$) in income over feed cost (IOFC), with the highest income observed when pigs were fed diets with no added fat. The results of this experiment demonstrate that adding dietary fat mainly improved feed efficiency as expected. Also, economic decisions to use added fat depend on ingredient and pig market price, as well as potential of moving a larger proportion of lighter weight pigs into a higher value grid price.

Keywords

fat inclusion, finishing pigs, growth performance, economic analysis

Cover Page Footnote

Appreciation is expressed to Pipestone System for funding, use of the feed mill and animal facilities, and for technical assistance. In addition, appreciation is expressed to Spronk Feed Mill (Pipestone, MN) for diet manufacturing.

Authors

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Effects of Added Fat on Growth Performance, Carcass Characteristics, and Economics of Growing and Finishing Pigs Under Commercial Conditions[1]

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Summary

A total of 1,637 mixed gender pigs (PIC; 359 × Camborough) with an initial pen average body weight (BW) of 87.8 ± 2.39 lb were used in a 110-d growth trial to determine the effects of feeding increasing levels of dietary fat on performance of growing-finishing pigs from 88 to 286 lb. The trial was conducted from late June to early October. Pens of pigs were randomly assigned to 1 of 4 dietary treatments in a randomized complete block design with BW as a blocking factor. There were 16 replicate pens per treatment and 20 to 27 pigs per pen. The experimental diets were corn-soybean meal-based and were fed in 5 phases. The 4 dietary treatments were formulated to contain 0, 1.5, 3.0, and 4.5% added fat. During the grower and finisher periods, results of this study demonstrated no evidence of difference ($P > 0.05$) in average daily gain (ADG) but a linear decrease ($P < 0.05$) in average daily feed intake (ADFI) with increasing dietary fat level. During the grower period, there was a quadratic change ($P < 0.05$) in feed-to-gain ratio (F/G). The greatest improvement in feed efficiency occurred as the dietary fat increased from 0 to 3%, with no improvements thereafter. During the finisher period, adding up to 4.5% fat to the diet resulted in a linear improvement ($P < 0.05$) in F/G. Overall, there was no evidence of differences ($P > 0.05$) in ADG and final BW as dietary fat level increased. Even though not statistically significant, changes in ADG were close to prior expectation and averaged 0.7% for every percent of added fat. Average daily feed intake decreased linearly ($P < 0.05$) as the level of added dietary fat increased up to 4.5%. Increasing dietary fat level resulted in a quadratic improvement ($P < 0.05$) in F/G. In addition, for every 1% fat increment, F/G improved on average 2.2%. For carcass characteristics, there was no evidence of differences ($P > 0.05$) in hot carcass weight (HCW), percentage carcass yield, loin depth, and fat-free lean measurements due to increasing the level of added fat in the diet. Carcass

[1]Appreciation is expressed to Pipestone System for funding, use of the feed mill and animal facilities, and for technical assistance. In addition, appreciation is expressed to Spronk Feed Mill (Pipestone, MN) for diet manufacturing.
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backfat, however, increased linearly ($P < 0.05$) with increased inclusion of fat in the diet from 0 to 4.5%. Feed cost per pig increased linearly ($P < 0.05$) with increased dietary fat level. Feed cost per pound of gain increased quadratically ($P < 0.05$) as the level of fat in the diet increased, with the highest cost per pound of gain observed at 4.5% fat inclusion. No evidence for differences ($P > 0.05$) was observed for revenue per pig due to added fat in the diet. The increased feed cost in combination with lack of evidence of differences in revenue per pig resulted in a linear decrease ($P < 0.05$) in income over feed cost (IOFC), with the highest income observed when pigs were fed diets with no added fat. The results of this experiment demonstrate that adding dietary fat mainly improved feed efficiency as expected. Also, economic decisions to use added fat depend on ingredient and pig market price, as well as potential of moving a larger proportion of lighter weight pigs into a higher value grid price.

Introduction

Fat supplementation to swine diets typically aims to increase dietary energy density, but may also result in a low heat increment, which consists of the heat produced by the digestion and metabolism of nutrients and by fermentation in the intestinal tract.[4] Fat supplementation may also result in the provision of essential fatty acids, and a reduction of feed dust associated with feed manufacturing and handling.[5] Considerable research has been conducted to determine the effects of fat inclusion on growing-finishing pig growth performance and carcass composition. As a general rule of thumb, for every percent of added fat, ADG and feed efficiency are expected to improve 1 and 2%, respectively. Carcass composition, however, can be altered when fat is included in diets, which may result in detrimental effects on carcass leanness.[6]

Although adding fat to increase the energy content of the diet improves growth performance, feed cost increases when fat is added. Thus, the assessment of the economic value should dictate whether fat is added or removed from practical diets for growing-finishing pigs in a commercial production system. In addition, the slowest growth rate of pigs during the summer results in the lowest market weight during this season. Thus, one strategy to increase the market weight during summer months is through added dietary fat to increase diet energy. Thus, the objective of the present study was to evaluate the effects of increasing levels of added fat on growth performance, carcass characteristics, and economics of growing and finishing pigs reared under commercial conditions.

Procedures

The Kansas State University Institutional Animal Care and Use Committee approved the protocol used in this experiment. This study was conducted at a commercial research wean-to-finish site in southwestern Minnesota. Two tunnel ventilated rooms were used. Pens had completely slatted flooring and deep pits. Each pen was equipped with a 5-hole stainless steel feeder and cup waterer to allow *ad libitum* access to feed and water. The facility was equipped with a computerized feeding system (FeedPro; Feed-

[4]Lewis, A.J. and Southern, L.L., 2000. Swine nutrition. CRC press.
[5]Azain MJ. 2001. Fat in swine nutrition. In: Lewis AJ, Southern LL, editors. Swine Nutrition. Boca Raton: CRC Press; p. 95–106.
[6]Pettigrew, J. E., and R. L. Moser. 1991. Fat in swine nutrition. In: E.R. Miller, D. E. Ullrey, and A. J. Lewis (ed.) Swine Nutrition. Butterworth-Heinemann, Stoneham, MA.

logic Corp., Willmar, MN) capable of measuring and recording daily feed additions to individual pens.

A total of 1,637 mixed gender pigs (PIC; 359 × Camborough, initial pen average BW of 87.8 ± 2.39 lb) were used in a 110-d growth trial. The trial was conducted from late June to early October. On d 0 of the trial, pigs were weighed in pens and pens were ranked by average pig BW. Pens were then randomly allotted to 1 of 4 dietary treatments in a randomized complete block design, with BW as a blocking factor. The experimental diets were corn-soybean meal-DDGS–based, and corn oil was used to achieve the treatments. The 4 dietary treatments were formulated to contain 0, 1.5, 3.0, and 4.5% added fat. There were 16 replicate pens per treatment and 20 to 27 pigs per pen.

The experimental diets were fed in 5 different phases (Tables 1, 2, 3, 4, and 5). Phase 1 diets were fed from d 0 to 21 (88 to 122 lb); phase 2 diets were fed from d 22 to 41 (122 to 164 lb); phase 3 diets were fed from d 42 to 59 (164 to 204 lb); phase 4 diets were fed from d 60 to 71 (204 to 229 lb); and phase 5 diets were fed from d 72 to 110 (229 to 286 lb). All experimental diets were fed in meal form.

Pens of pigs were weighed and feed disappearance was recorded approximately every 14 d to determine ADG, ADFI, and F/G. On d 92 and 106, the 8 heaviest pigs in each pen were selected, weighed, and sold according to standard farm procedures. On d 110, final pen weights were taken and RFID tags were used to allow for carcass measurements to be recorded on a pen basis. These pigs were transported to a commercial packing plant in southwestern Minnesota (JBS Swift and Company, Worthington, MN) for processing and carcass data collection. Carcass measurements included HCW, loin depth, backfat depth, and percentage lean. Percentage carcass yield was calculated by dividing the average pen HCW by the average final live weight at the farm.

For the economic analysis, total feed cost per pig, cost per lb of gain, revenue per pig, and income over feed cost (IOFC) were calculated. The total feed cost per pig was calculated by multiplying ADFI by feed cost per pound and number of days the diet was fed in each respective period, then taking the sum of these values for each period. Cost per lb of gain was calculated by dividing total feed cost per pig by total gain per pig. Gain value per pig was calculated by multiplying carcass gain by an assumed carcass value of $75 per cwt. To calculate IOFC, total feed cost was subtracted from gain value. For all economic evaluations, diet costs per treatment within phases were used (Tables 1, 2, 3, 4, and 5).

Performance data were analyzed as a randomized complete block design, with pen considered as the experimental unit and BW the blocking factor. Growth performance, carcass characteristics, and economics were analyzed using a normal distribution, while total removals were analyzed using a binomial distribution. Polynomial contrasts were implemented to evaluate the functional form of the dose response to increasing dietary fat level on growth performance, carcass characteristics, and economics. Statistical models were fitted using GLIMMIX procedure of SAS (Version 9.3, SAS Institute Inc., Cary, NC). Results were considered significant at $P \leq 0.05$.

Results and Discussion

During the grower period, which corresponds to phases 1 and 2 (d 0 to 41), there was no evidence of differences ($P > 0.05$) in ADG as added fat increased (Table 6). On the other hand, increasing the dietary fat level resulted in a linear decrease ($P < 0.05$) in ADFI, and in a quadratic improvement ($P < 0.05$) in F/G with the greatest change in feed efficiency occurring as the dietary fat increased from 0 to 3%, with no improvements thereafter. During this period, ADG increased 1.1% and F/G improved 2.2% for every percent of added fat.

During the finisher period, which corresponds to phases 3 to 5 (d 42 to 110), there was no evidence of differences ($P > 0.05$) in ADG as added fat increased. Similar to the grower period, increasing the dietary fat level resulted in a linear decrease ($P < 0.05$) in ADFI. Adding up to 4.5% fat to the diet also resulted in a linear improvement ($P < 0.05$) in F/G. During the finisher period, the percentage responses to each 1% fat addition in the diet were 0.5% and 2.1% for ADG and F/G, respectively.

Overall, no evidence of differences ($P > 0.05$) were observed in ADG and final BW as dietary fat level increased. Average daily feed intake decreased linearly ($P < 0.05$) as the level of fat in the diet increased up to 4.5%. Increasing dietary fat level resulted in a quadratic improvement ($P < 0.05$) in F/G. Even though we were not able to observe significant differences in ADG, ADG improved 0.7% for every percent of added fat. In addition, feed efficiency improved 2.2% for every 1% increment of added fat. There was no evidence for differences ($P > 0.05$) in percentage of total removals with added fat.

For carcass characteristics, there was no evidence of differences ($P > 0.05$) in HCW, percentage carcass yield, loin depth, and fat-free lean measurements due to increasing the level of fat in the diet. Carcass backfat, however, increased linearly ($P < 0.05$) with increasing the inclusion of fat in the diet from 0 to 4.5%.

Feed cost per pig increased linearly ($P < 0.05$) as the level of fat in the diet increased. Feed cost per pound of gain increased quadratically ($P < 0.05$) with increasing dietary fat level, with the highest cost per pound of gain observed at 4.5% fat inclusion. No evidence for differences ($P > 0.05$) was observed for revenue per pig due to added fat in the diet, with the highest numerical revenue observed at 3.5% added fat. The increased feed cost in combination with lack of evidence of differences in revenue per pig resulted in a marginal linear decrease ($P < 0.05$) in IOFC, with the highest income observed when pigs were fed diets with no added fat.

Increasing the dietary fat level throughout the finisher period did not result in significant improvements in growth rate, final BW, and HCW. However, ADG was improved by 0.7% for every 1% added fat. Also, the improvement in F/G averaged 2.2% for every 1% added fat, which is consistent with other commercial data as well. Economic decisions of using added fat depend on ingredient and pig market price, as well as potential of moving a larger proportion of lighter weight pigs into a higher value grid price.

Table 1. Diet formulation, Phase 1 (as fed basis)[1]

	Added fat, %			
Item	0	1.5	3.0	4.5
Ingredient, %				
Corn	53.74	51.28	48.82	46.38
Soybean meal, 46.5% crude protein	13.50	14.45	15.40	16.35
DDGS[2]	30.00	30.00	30.00	30.00
Corn oil	---	1.50	3.00	4.50
Limestone	1.30	1.30	1.30	1.27
Sodium chloride	0.50	0.50	0.50	0.50
L-lysine HCl	0.55	0.55	0.55	0.55
DL-methionine	0.04	0.05	0.06	0.07
L-threonine	0.14	0.14	0.14	0.14
L-tryptophan	0.05	0.05	0.05	0.05
Phytase	0.04	0.04	0.04	0.04
Copper chloride	0.02	0.02	0.02	0.02
Vitamin and trace mineral premix	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	1.03	1.05	1.07	1.09
Isoleucine:lysine	58	58	58	58
Methionine and cysteine:lysine	58	58	58	58
Threonine:lysine	63	63	63	63
Tryptophan:lysine	19	19	19	19
Valine:lysine	70	70	70	70
Metabolizable energy, kcal/lb	1,450	1,479	1,508	1,537
SID lysine:ME,[3] g/Mcal	3.23	3.23	3.23	3.23
Calcium, %	0.58	0.58	0.58	0.58
Phosphorus, %	0.41	0.41	0.41	0.42
Available phosphorus, %	0.31	0.31	0.31	0.31
Diet cost, $/ton	156.91	166.12	175.55	184.92

[1]Phase 1 diets were fed from d 0 to 21 (88 to 122 lb).
[2]DDGS = dried distillers grains with solubles.
[3]ME = metabolizable energy.

Table 2. Diet formulation, Phase 2 (as fed basis)[1]

	Added fat, %			
Item	0	1.5	3.0	4.5
Ingredient, %				
Corn	58.84	56.51	54.14	51.78
Soybean meal, 46.5% crude protein	8.45	9.30	10.15	11.00
DDGS[2]	30.00	30.00	30.00	30.00
Corn oil	---	1.50	3.00	4.50
Limestone	1.27	1.25	1.25	1.25
Sodium chloride	0.50	0.50	0.50	0.50
L-lysine HCl	0.55	0.55	0.55	0.55
DL-methionine	0.01	0.02	0.03	0.04
L-threonine	0.14	0.14	0.14	0.14
L-tryptophan	0.05	0.05	0.05	0.05
Phytase	0.04	0.04	0.04	0.04
Copper chloride	0.02	0.02	0.02	0.02
Vitamin and trace mineral premix	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	0.91	0.93	0.95	0.96
Isoleucine:lysine	56	56	56	56
Methionine and cysteine:lysine	58	58	58	58
Threonine:lysine	64	64	64	64
Tryptophan:lysine	19	19	19	19
Valine:lysine	70	70	70	70
Metabolizable energy, kcal/lb	1,462	1,491	1,520	1,549
SID lysine:ME,[3] g/Mcal	2.82	2.82	2.82	2.82
Calcium, %	0.55	0.55	0.55	0.55
Phosphorus, %	0.39	0.39	0.39	0.39
Available phosphorus, %	0.31	0.31	0.31	0.31
Diet cost, $/ton	148.28	157.35	166.62	175.80

[1]Phase 2 diets were fed from d 22 to 41 (122 to 164 lb).
[2]DDGS = dried distillers grains with solubles.
[3]ME = metabolizable energy.

Table 3. Diet formulation, Phase 3 (as fed basis)[1]

	Added fat, %			
Item	0	1.5	3.0	4.5
Ingredient, %				
Corn	61.72	59.47	57.22	54.96
Soybean meal, 46.5% crude protein	5.70	6.50	7.25	8.00
DDGS[2]	30.00	30.00	30.00	30.00
Corn oil	---	1.50	3.00	4.50
Limestone	1.25	1.20	1.20	1.20
Sodium chloride	0.50	0.50	0.50	0.50
L-lysine HCl	0.50	0.50	0.50	0.50
L-threonine	0.11	0.11	0.11	0.12
L-tryptophan	0.05	0.05	0.05	0.05
Phytase	0.04	0.04	0.04	0.04
Copper chloride	0.03	0.03	0.03	0.03
Vitamin and trace mineral premix	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	0.80	0.82	0.84	0.85
Isoleucine:lysine	58	58	58	58
Methionine and cysteine:lysine	61	60	59	59
Threonine:lysine	64	64	64	64
Tryptophan:lysine	19	19	19	19
Valine:lysine	73	73	73	73
Metabolizable energy, kcal/lb	1,468	1,498	1,527	1,557
SID lysine:ME,[3] g/Mcal	2.48	2.48	2.48	2.48
Calcium, %	0.54	0.52	0.52	0.52
Phosphorus, %	0.38	0.38	0.38	0.38
Available phosphorus, %	0.30	0.30	0.30	0.30
Diet cost, $/ton	141.74	150.70	159.46	168.31

[1]Phase 3 diets were fed from d 42 to 59 (164 to 204 lb).
[2]DDGS = dried distillers grains with solubles.
[3]ME = metabolizable energy.

Table 4. Diet formulation, Phase 4 (as fed basis)[1]

	Added fat, %			
Item	0	1.5	3.0	4.5
Ingredient, %				
Corn	69.55	67.35	65.17	62.92
Soybean meal, 46.5% crude protein	8.15	8.85	9.55	10.30
DDGS[2]	20.00	20.00	20.00	20.00
Corn oil	---	1.50	3.00	4.50
Limestone	1.10	1.10	1.08	1.08
Sodium chloride	0.50	0.50	0.50	0.50
L-lysine HCl	0.40	0.40	0.40	0.40
L-threonine	0.09	0.09	0.10	0.10
L-tryptophan	0.04	0.04	0.04	0.03
Phytase	0.04	0.04	0.04	0.04
Copper chloride	0.03	0.03	0.03	0.03
Vitamin and trace mineral premix	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	0.75	0.77	0.78	0.80
Isoleucine:lysine	60	60	60	60
Methionine and cysteine:lysine	62	61	60	59
Threonine:lysine	65	65	65	65
Tryptophan:lysine	19	19	19	19
Valine:lysine	75	75	74	74
Metabolizable energy, kcal/lb	1,475	1,504	1,534	1,563
SID lysine:ME,[3] g/Mcal	2.31	2.31	2.31	2.31
Calcium, %	0.48	0.48	0.48	0.48
Phosphorus, %	0.36	0.36	0.36	0.36
Available phosphorus, %	0.26	0.26	0.26	0.26
Diet cost, $/ton	144.87	153.55	162.33	170.74

[1]Phase 4 diets were fed from d 60 to 71 (204 to 229 lb).
[2]DDGS = dried distillers grains with solubles.
[3]ME = metabolizable energy.

Table 5. Diet formulation, Phase 5 (as fed basis)[1]

	Added fat, %			
Item	0	1.5	3.0	4.5
Ingredient, %				
Corn	78.53	76.47	74.26	72.00
Soybean meal, 46.5% crude protein	8.90	9.65	10.35	11.10
DDGS[2]	10.00	10.00	10.00	10.00
Corn oil	---	1.50	3.00	4.50
Monocalcium phosphate, 21% P	0.10	0.10	0.09	0.09
Limestone	1.25	1.05	1.05	1.05
Sodium chloride	0.50	0.50	0.50	0.50
L-lysine HCl	0.40	0.40	0.40	0.40
DL-methionine	--	0.01	0.02	0.02
L-threonine	0.12	0.13	0.13	0.13
L-tryptophan	0.04	0.04	0.04	0.04
Phytase	0.04	0.04	0.04	0.04
Copper chloride	0.03	0.03	0.03	0.03
Vitamin and trace mineral premix	0.10	0.10	0.10	0.10
Total	100.00	100.00	100.00	100.00
Calculated analysis				
Standardized ileal digestible (SID) amino acids, %				
Lysine	0.74	0.75	0.77	0.78
Isoleucine:lysine	56	56	56	56
Methionine and cysteine:lysine	58	58	58	58
Threonine:lysine	66	66	66	66
Tryptophan:lysine	19	19	19	19
Valine:lysine	69	69	69	69
Metabolizable energy, kcal/lb	1,480	1,512	1,542	1,571
SID lysine:ME,[3] g/Mcal	2.26	2.26	2.26	2.26
Calcium, %	0.55	0.48	0.48	0.48
Phosphorus, %	0.35	0.35	0.34	0.34
Available phosphorus, %	0.24	0.24	0.24	0.24
Diet cost, $/ton	148.68	157.78	166.70	175.67

[1]Phase 5 diets were fed from d 72 to 110 (229 to 286 lb).
[2]DDGS = dried distillers grains with solubles.
[3]ME = metabolizable energy.

Table 6. Effects of added fat on growth performance, carcass characteristics, and economics of growing and finishing pigs[1]

	Added fat, %					Probability, P =	
Item[2]	0	1.5	3.0	4.5	SEM	Linear	Quadratic
Grower period (d 0 to 41)							
ADG, lb	1.79	1.84	1.85	1.83	0.024	0.200	0.171
ADFI, lb	4.05	3.95	3.93	3.88	0.064	0.018	0.612
F/G	2.26	2.15	2.12	2.12	0.019	<0.001	<0.001
Finisher period (d 41 to 114)							
ADG, lb	2.08	2.10	2.12	2.10	0.030	0.466	0.559
ADFI, lb	6.36	6.14	6.12	5.91	0.092	0.002	0.939
F/G	3.05	2.94	2.86	2.82	0.045	<0.001	0.445
Overall							
ADG, lb	1.96	1.99	2.01	1.99	0.024	0.299	0.320
ADFI, lb	5.42	5.26	5.23	5.08	0.078	0.002	0.872
F/G	2.76	2.64	2.60	2.55	0.021	<0.001	0.012
BW, lb							
d 0	87.8	87.8	87.9	87.9	2.39	0.897	0.954
d 41	162.0	163.5	165.2	164.4	3.01	0.047	0.248
d 110	282.0	284.1	289.4	286.4	4.06	0.136	0.361
Total removals, %							
Morbidity + mortality	3.97	3.18	5.10	5.09	0.011	0.246	0.647
Carcass characteristics							
HCW, lb	213.2	213.6	217.6	215.6	2.62	0.164	0.509
Yield, %	73.1	72.8	73.2	73.2	0.24	0.410	0.620
Backfat, mm[3]	16.7	16.6	17.1	17.5	0.20	0.001	0.102
Fat-free lean, %[3]	56.4	56.4	56.6	56.2	0.21	0.591	0.404
Loin depth, mm[3]	67.8	67.8	67.6	68.3	0.51	0.569	0.434
Economics, $/pig marketed							
Feed cost	44.33	45.59	47.91	49.11	0.689	<0.001	0.971
Feed cost/lb gain[4]	0.205	0.208	0.217	0.224	0.0017	<0.001	0.049
Revenue[5]	110.53	110.85	113.75	112.29	1.228	0.141	0.473
IOFC[6]	66.19	65.26	65.84	63.18	0.753	0.016	0.258

[1]A total of 1,637 pigs (PIC; 359 × Camborough, initial pen average BW of 87.8 lb) were used in a 110-d growth trial with 20 to 27 pigs per pen and 16 pens per treatment.
[2]ADG = average daily gain. ADFI = average daily feed intake. F/G = feed-to-gain ratio. BW = body weight. HCW = hot carcass weight.
[3]Adjusted for HCW.
[4]Feed cost/lb gain = total feed cost per pig divided by total gain per pig.
[5]Revenue = (HCW × $0.75) – (d 0 BW × 0.75 × $0.75).
[6]Income over feed cost = revenue – feed cost.