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Effects of 6% Oil Corn Dried Distillers' Grains with Solubles Withdrawal Strategies on Finishing Pigs Growth Performance, Carcass Characteristics, and Diet Economics

Jamil E. G. Faccin
Kansas State University

Mikayla S. Spinler
Kansas State University, mspinler@k-state.edu

Rachelle M. Lazaga
Kansas State University

See next page for additional authors

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Authors

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K-STATE Research and Extension

SWINE DAY 2024

KANSAS STATE UNIVERSITY SWINE INDUSTRY DAY 2024

Effects of 6% Oil Corn Dried Distillers' Grains with Solubles Withdrawal Strategies on Finishing Pigs Growth Performance, Carcass Characteristics, and Diet Economics

Jamil E. G. Faccin, Mikayla S. Spinler, Rachelle M. Lazaga,[1] Katelyn N. Gaffield, Robert D. Goodband, Jordan T. Gebhardt,[1] Mike D. Tokach, Joel M. DeRouchey, and Jason C. Woodworth

Summary

A total of 1,080 finishing pigs (PIC 337 × 1050; initially 39.2 ± 1.22 lb) were used in a 125-d study to investigate growth performance, carcass characteristics, and economics of pigs fed diets with different DDGS-withdrawal strategies using 6% oil corn DDGS. Pigs were housed in mixed-sex pens, with 27 pigs per pen and 10 pens per treatment. Four dietary treatments were tested, including a control treatment with no DDGS throughout the entire trial, a treatment with 20% DDGS fed for the entire trial, or two treatments evaluating DDGS-withdrawal strategies. The first withdrawal strategy included diets with 20% DDGS for 55 days and then 10% for the rest of the study (20/10%), and the second withdrawal treatment included diets with 20% DDGS until day 105 then 0% until the end (20/0%). The experiment was a randomized complete block design with initial weight as blocking factor. Pens of pigs were weighed every two weeks to determine ADG, ADFI, and F/G. Three weeks prior to the end of the trial, four of the heaviest barrows in each pen were marketed and carcass characteristics and iodine value (IV) were collected. The remaining pigs were marketed at the end of the study and carcass characteristics were also collected. For the first three diet phases (0 to 55 d), pigs fed 20% DDGS had lower ADG ($P = 0.040$) than pigs fed without DDGS but similar ADFI ($P = 0.782$), which resulted in poorer feed efficiency ($P = 0.038$). From 56 to 105 d, no differences ($P > 0.05$) were observed for ADG, ADFI, and F/G. Overall, pigs fed diets without DDGS throughout the whole trial had improved feed efficiency ($P = 0.023$) by approximately 2.4% compared to all other treatments; however, ADG and ADFI were similar between treatments. Pigs fed 20/0% DDGS had greater ($P < 0.005$) removals than other treatments. Pigs fed diets without DDGS throughout had lower removal rate than 20/10% with pigs fed 20% DDGS throughout intermediate. No differences ($P > 0.05$) were found for mortality rate. When DDGS were fed to pigs, feed cost per pig and per lb of gain were lower ($P < 0.05$) than when pigs were fed 0% DDGS. However, all four treatment strategies resulted in similar ($P > 0.05$) revenue and IOFC. For carcass characteristics, in the first marketing event, no differences ($P > 0.05$) were observed for yield, HCW, backfat and loin depth, and

[1] Department of Diagnostic Medicine/Pathobiology, College of Veterinary Medicine, Kansas State University.

lean. However, pigs fed 0% DDGS had lower ($P < 0.001$) IV than the others, suggesting better fat quality. In the last marketing event, pigs fed 20/10% DDGS had greater ($P = 0.033$) backfat depth than those fed 20% with the other treatments being intermediate. This fact resulted in a tendency ($P = 0.054$) for lower lean percentage for pigs fed 20/10% DDGS compared to the treatments. For HCW, yield, and loin depth, no differences ($P > 0.05$) were observed. In conclusion, feeding 6% oil corn DDGS to grow-finishing pigs, whether throughout the entire period or with a withdrawal strategy, decreased early growth performance and overall feed efficiency compared to pigs fed diets without DDGS. Overall growth, feed intake, carcass yield, HCW, and loin depth were similar between all dietary treatments, but feeding diets with DDGS worsened fat quality expressed by the higher IV. Finally, even though not statistically different, pigs fed diets without DDGS generated a numerically greater IOFC than treatments fed DDGS throughout the whole period or when applying a withdrawal strategy.

Introduction

Dried distillers' grains with solubles (DDGS) are a byproduct often included in swine diets to help reduce feed costs. Although DDGS can lower diet costs, they are high in fiber, which may negatively affect growth performance and hot carcass weights and decrease fat quality due to their increased concentration of unsaturated fatty acids.[2] Understanding the appropriate duration for feeding DDGS before harvest is crucial to maximize feed-cost savings while minimizing negative effects on performance, yield, and fat quality. Asmus et al. (2014),[3] fed finishing pigs both DDGS and wheat middlings that were then removed from the diet either 43 or 67 days before slaughter. That study concluded that shorter withdrawal periods could recover yield losses, while longer withdrawal periods were necessary to restore fat quality. Additionally, the oil content of the DDGS source is also a factor on pig growth and low-oil DDGS may negatively affect growth performance to a larger extent than the DDGS sources used in previous studies.[4] In the current experiment, 6% oil DDGS were available to build upon the work by Lazaga et al. (2024)[5] in a commercial environment to further characterize the effects of withdrawal strategies using corn DDGS with lower oil content than previous research. The objective of the experiment was to determine the effect of 6% oil DDGS in pig diets and understand the optimal withdrawal strategy for grow-finish pigs.

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[2] Lerner, A. B., Tokach, M. D., DeRouchey, J. M., Dritz, S. S., Goodband, R. D., Woodworth, J. C., Hastad, C. W., Coble, K. F., Arkfeld, E., Cartagena, H. C., & Vahl, C. (2020). Effects of corn distillers dried grains with solubles in finishing diets on pig growth performance and carcass yield with two different marketing strategies. Transl. Anim. Sci. 4(2):737–749. doi:10.1093/tas/txaa071.

[3] Asmus, M. D., DeRouchey, J. M., Tokach, M. D., Dritz, S. S., Houser, T. A., Nelssen, J. L., & Goodband, R. D. (2014). Effects of lowering dietary fiber before marketing on finishing pig growth performance, carcass characteristics, carcass fat quality, and intestinal weights. J. Anim. Sci. 92:119–128. doi:10.2527/jas.2013-6679.

[4] Graham, A. B., Goodband, R. D., Tokach, M. D., Dritz, S. S., DeRouchey, J. M., Nitikanchana, S., & Updike, J. J. (2014). The effects of low-, medium-, and high-oil distillers dried grains with solubles on growth performance, nutrient digestibility, and fat quality in finishing pigs. J. Anim. Sci. 92(8), 3610–3623. doi:10.2527/jas.2014-7678.

[5] Lazaga, R., K. Gaffield, M. Spinler, R. D. Goodband, J. T. Gebhardt, M. D. Tokach, J. M. DeRouchey, and J. C. Woodworth. 2024. Effect of Increasing 6% Oil Corn Dried Distillers Grains with Solubles on Finishing Pigs Growth Performance, Carcass Characteristics, and Diet Economics. 2024 KSU Swine Day reports.

Material and Methods

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 site in southwest Minnesota. The barns were naturally ventilated and double-curtain sided. Each pen was equipped with a 5-hole stainless steel dry self-feeder and a cup waterer for ad libitum access to feed and water. Daily feed additions to each pen were accomplished using a robotic feeding system (FeedPro, FeedLogic by ComDel Innovation, Wahpeton, ND) able to record feed deliveries for individual pens.

Animals and diets

A total of 1,080 finishing pigs (PIC 337 × 1050; initially 39.0 ± 1.22 lb) were used in a 125-d study to investigate growth performance, carcass characteristics, and economics of pigs fed diets with different DDGS-withdrawal strategies. Pigs were housed in mixed-sex pens, with 27 pigs per pen and 10 pens per treatment. Pens of pigs were allotted to 1 of 4 dietary treatments using a completely randomized block design, with initial BW as blocking factor. The four treatments included a negative and positive control diets with 0 or 20% DDGS throughout the whole trial, respectively. The two additional treatments included pigs fed diets with 20% DDGS for 55 days and then 10% for the rest of the study (20/10%), or pigs fed 20% DDGS until day 105 then 0% until the end (20/0%). Treatment diets were corn-soybean meal based. A six-phase diet program was used. Phase 1 diet was fed from 39 to 60 lb, phase 2 from 60 to 110 lb, phase 3 from 110 to 145 lb, phase 4 from 145 to 195 lb, phase 5 from 195 to 225 lb, and phase 6 from 225 lb to market. The trial was divided into three periods where: in the first, from d 0 to 55 d phases 1, 2, and 3 diets were fed; in the second, from d 56 to 105, phases 4 and 5 diets were fed; and in the last period, from d 106 to 125, the phase 6 diet was fed. All treatment diets were manufactured at the Hord Farms West Feed Mill in Pipestone, MN (Tables 1 and 2).

Pens of pigs were weighed every two weeks to determine ADG, ADFI, and F/G. Three weeks prior to the end of the trial, four of the heaviest barrows in each pen were tattooed with the specific pen identification number and marketed at a commercial abattoir (JBS Swift, Worthington, MN) for collection of standard carcass measurements (carcass yield, hot carcass weight, backfat depth, loin depth, and percentage lean). After harvest, the carcasses were held in a cooler for 5 h before fat samples were collected from the dorsal loin-butt junction. Individual samples were analyzed for IV using Bruker Tango Near Infrared Spectroscopy (NIR) located at the abattoir's laboratory. The remaining pigs were then marketed at the end of the study and carcass characteristics were collected. Carcass IV could not be collected on pigs harvested in the final marketing event.

Economic analysis

Feed cost per pig was calculated as diet feed cost times feed intake per pen and phase divided by pigs placed. Feed cost per lb of gain was calculated by dividing total feed cost per pen by total gain per pen. Revenue per pig placed was calculated by multiplying total pen gain by carcass yield and carcass price. Income over feed cost (IOFC) was calculated by subtracting feed cost per pig from revenue.

Statistical analysis

Data were analyzed using the GLIMMIX procedure of SAS (v. 9.4, SAS Institute, Inc., Cary, NC) in a randomized complete block design with pen serving as the experimental unit. The statistical model considered fixed effects of dietary treatment and random effect of the block. Hot carcass weight (HCW) was used as a covariate for analysis of backfat depth, loin depth, and lean percentage. All results were considered significant at $P \leq 0.05$ and marginally significant between $P > 0.05$ and $P \leq 0.10$.

Results and Discussion

For the first three diet phases (0 to 55 d, Table 3), pigs fed diets containing 20% DDGS had decreased ADG ($P = 0.040$) compared to pigs fed diets without DDGS but similar ADFI ($P = 0.782$), which contributed to poorer feed efficiency ($P = 0.038$). For phases 4 and 5 (56 to 105 d), although pigs fed 20/10% had the diets changed to 10% DDGS, no differences ($P > 0.05$) were observed for growth, feed intake, and F/G. In the last phase (106 to 125 d), no differences were observed for growth performance. Overall, pigs fed diets without DDGS throughout the whole trial had approximately 2.4% better feed efficiency ($P < 0.05$) than all other treatments; however, ADG and ADFI were similar between treatments. For removals and mortality, pigs fed 20/0% DDGS had greater ($P < 0.05$) removals than the other treatments. Also, pigs fed diets without DDGS had lower ($P < 0.05$) removals than 20/10% with pigs fed 20% DDGS throughout intermediate. No differences ($P > 0.05$) were observed for mortality rate. The higher removal rate contributed to a higher ($P < 0.05$) rate of total losses for pigs fed 20/0% than the other treatments.

Using a carcass price of $0.90/lb, corn price of $154/ton and DDGS price of $162/ton, regardless of the strategy, when DDGS were fed to pigs, feed cost per pig and per lb of gain were lower ($P < 0.05$) than when pigs were fed 0% DDGS. However, all four treatment strategies resulted in similar ($P > 0.05$) revenue and IOFC.

For carcass characteristics, in the first marketing event, no differences ($P > 0.05$) were found in yield, HCW, backfat and loin depth, and % lean (Table 4). However, pigs fed 0% DDGS had lower ($P < 0.05$) IV than the others, indicating better fat quality. In the last marketing event, pigs fed 20/10% DDGS had greater ($P < 0.05$) backfat depth than those fed 20% DDGS throughout, with the other treatments intermediate, which resulted in a tendency ($P = 0.054$) for lower lean percentage for pigs fed 20/10% DDGS compared with other treatments. There were no differences in HCW, yield, and loin depth ($P > 0.05$).

In conclusion, feeding DDGS containing 6% oil to grow-finishing pigs throughout the entire period or with a withdrawal strategy decreased early growth performance and overall feed efficiency compared to pigs fed diets without DDGS. However, overall growth and feed intake, as well as carcass yield, HCW, and loin depth were similar between all dietary treatments. Feeding pigs without DDGS resulted in improved fat quality expressed by the lower IV. Finally, even though not statistically different, pigs fed diets without DDGS generated a numerically greater IOFC compared to pigs fed DDGS throughout the whole period or when applying a withdrawal strategy.

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The authors would like to thank Hord Farms West, Pipestone, MN, for providing technical assistance for this study, and JBS, Worthington, MN for help with carcass data collection.

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Table 1. Composition of phase 1, 2, and 3 diets (as-fed basis)[1]

	Phase 1		Phase 2		Phase 3	
	DDGS, %		DDGS, %		DDGS, %	
Item	**0**	**20**	**0**	**20**	**0**	**20**
Ingredient, %						
Corn	72.88	59.51	77.55	64.15	82.19	68.69
Soybean meal (47.7% CP)	23.87	17.49	19.49	13.11	15.05	8.78
DDGS, 6% oil	---	20.00	---	20.00	---	20.00
Monocalcium P (21% P)	0.61	0.18	0.50	0.08	0.45	---
Calcium carbonate	1.00	1.28	0.95	1.23	0.93	1.19
Sodium chloride	0.35	0.35	0.35	0.35	0.35	0.35
Tribasic copper chloride	0.03	0.03	0.03	0.03	0.03	0.03
Liquid lysine (55%)	0.67	0.76	0.62	0.67	0.57	0.67
DL-Met	0.13	0.06	0.10	0.72	0.06	---
L-Trp	0.04	0.05	0.04	0.05	0.04	0.04
L-Val	0.08	---	0.06	---	0.04	---
Thr[2]	0.21	0.17	0.18	0.14	0.16	0.12
Phytase[3]	0.04	0.04	0.04	0.04	0.04	0.04
Vitamin-trace mineral premix	0.10	0.10	0.10	0.10	0.09	0.09
Calculated analysis						
SID amino acids, %						
Lys	1.13	1.11	1.00	0.98	0.87	0.85
Ile:Lys	55.0	55.0	55.0	55.0	54.9	55.0
Leu:Lys	120.7	140.1	126.7	148.9	134.4	160.1
Met:Lys	33.9	31.4	32.7	30.0	31.3	29.6
Met & Cys:Lys	56.0	56.0	55.9	56.0	55.9	57.5
Thr:Lys	62.0	62.0	62.0	62.0	63.0	63.0
Trp:Lys	19.0	19.0	19.0	19.0	19.0	19.0
Val:Lys	68.0	68.0	68.0	69.6	67.9	72.1
Total Lys, %	1.26	1.28	1.12	1.14	0.97	0.99
NE NRC, kcal/lb	1,118	1,094	1,136	1,112	1,145	1,122
SID Lys:NE, g/Mcal	4.59	4.60	4.00	3.99	3.43	3.42
CP, %	18.1	19.6	16.4	17.8	14.5	16.0
Ca, %	0.59	0.59	0.53	0.54	0.50	0.50
STTD P, %	0.40	0.40	0.37	0.37	0.35	0.35
Ca:P	1.20	1.20	1.19	1.19	1.20	1.20

[1]Phases 1, 2 and 3 were fed from 39 to 60 lb, 60 to 110 lb, and 110 to 145 lb, respectively.
[2]ThreoPro; CJ America-Bio, Downers Grove, IL.
[3]Optiphos (Huvepharma, Sofia, Bulgaria) was included at 454 FTU/lb providing an estimated release of 0.14% STTD P for phase 1, 2, and 3.

Table 2. Diet composition of phase 4, 5, and 6 diets (as-fed basis)[1]

	Phase 4			Phase 5			Phase 6		
	DDGS, %			DDGS, %			DDGS, %		
Item	0	10	20	0	10	20	0	10	20
Ingredient, %									
Corn	83.03	76.42	69.37	86.06	79.36	72.27	86.54	81.48	74.34
Soybean meal (47.7% CP)	14.40	11.24	8.11	11.55	8.38	5.28	11.49	6.34	3.26
DDGS, 6% oil	---	10.00	20.00	0.00	10.00	20.00	---	10.00	20.00
Monocalcium P (21% P)	0.30	---	---	0.30	---	---	0.10	---	---
Limestone, ground	0.90	1.02	1.19	0.90	1.00	1.18	0.85	0.99	1.17
Sodium chloride	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Tribasic copper chloride	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
DL-Met	0.06	0.03	---	0.06	0.01	---	---	---	---
L-Trp	0.04	0.04	0.04	0.04	0.04	0.04	0.02	0.04	0.04
L-Val	0.04	---	---	0.04	---	---	---	---	---
Liquid lysine 55%	0.57	0.62	0.66	0.57	0.59	0.63	0.42	0.56	0.61
Thr[2]	0.17	0.15	0.13	0.17	0.14	0.12	0.10	0.12	0.10
Phytase[3]	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Vitamin-trace mineral premix	0.08	0.08	0.08	0.07	0.07	0.07	0.06	0.06	0.06
Calculated analysis									
SID amino acids, %									
Lys	0.85	0.84	0.83	0.76	0.75	0.74	0.69	0.69	0.68
Ile:Lys	55.0	55.0	55.0	55.0	55.0	55.0	60.3	55.0	55.0
Leu:Lys	136.0	149.0	162.2	142.8	157.4	172.1	157.1	164.7	180.7
Met:Lys	32.0	30.5	30.0	31.7	30.0	31.8	29.2	30.2	33.4
Met & Cys:Lys	56.9	57.0	58.2	57.8	58.0	61.6	57.9	59.4	64.6
Thr:Lys	64.0	64.0	64.0	64.9	65.0	65.0	65.0	65.0	65.0
Trp:Lys	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0	19.0
Val:Lys	67.9	68.0	72.6	67.9	69.7	74.8	71.1	71.2	76.8
Total Lys, %	0.95	0.96	0.97	0.86	0.87	0.88	0.79	0.80	0.81
NE NRC, kcal/lb	1,152	1,142	1,127	1,161	1,150	1,135	1,163	1,155	1,141
SID Lys:NE, g/Mcal	3.34	3.33	3.33	2.97	2.96	2.96	2.70	2.70	2.70
CP, %	14.3	15.1	15.8	13.2	13.9	14.7	13.0	13.1	13.8
Ca, %	0.46	0.44	0.50	0.43	0.43	0.49	0.40	0.43	0.48
STTD P, %	0.32	0.30	0.35	0.30	0.30	0.34	0.28	0.29	0.33
Ca:P	1.21	1.20	1.20	1.21	1.20	1.20	1.21	1.20	1.20

[1] Phases 4, 5, and 6 were fed from 145 to 195 lb, 195 to 225 lb, and 225 lb to market, respectively.
[2]ThreoPro; CJ America-Bio, Downers Grove, IL.
[3]Optiphos (Huvepharma, Sofia, Bulgaria) was included at 454 FTU/lb providing an estimated release of 0.14% STTD P for phases 4, 5, and 6.

Table 3. Effects of different DDGS-withdrawal strategy on growth performance and economics of grow-finishing pigs[1]

	DDGS-withdrawal strategy[2]					
Item	**0%**	**20%**	**20/10%**	**20/0%**	**SEM**	***P* =**
BW, lb						
d 0	39.03	38.98	38.92	38.95	1.22	0.978
d 55	146.8	143.4	143.0	144.4	2.82	0.120
d 105 (first marketing)	262.4	257.8	258.4	260.5	3.20	0.391
d 125 (final marketing)	291.6	287.8	286.8	288.7	3.73	0.542
0 to 55 d						
ADG	1.95[a]	1.89[b]	1.88[b]	1.90[b]	0.031	0.040
ADFI	3.80	3.74	3.75	3.76	0.079	0.782
F/G	1.94[a]	1.98[b]	1.99[b]	1.98[b]	0.016	0.038
56 to 105 d						
ADG	2.26	2.24	2.26	2.25	0.023	0.807
ADFI	6.13	6.20	6.19	6.20	0.078	0.896
F/G	2.72	2.77	2.74	2.76	0.024	0.114
106 to 125d						
ADG	1.91	1.90	1.79	1.85	0.045	0.240
ADFI	6.34	6.57	6.38	6.49	0.127	0.448
F/G	3.33	3.46	3.58	3.50	0.075	0.118
0 to 125 d (Overall)						
ADG	2.08	2.03	2.03	2.04	0.022	0.225
ADFI	5.09	5.11	5.09	5.10	0.072	0.986
F/G	2.45[a]	2.52[b]	2.51[b]	2.51[b]	0.018	0.023
Removals, %	3.33[a]	4.07[ab]	4.44[b]	6.67[c]	0.380	< 0.001
Mortality, %	1.48	1.48	1.11	1.48	0.184	0.359
Total Losses, %	4.82[a]	5.56[a]	5.56[a]	8.15[b]	0.416	< 0.001
Economics[3]						
Feed cost, $/pig placed	70.03[b]	65.62[a]	66.74[a]	67.43[a]	1.063	0.006
Feed cost, $/lb gain	0.271[b]	0.258[a]	0.262[a]	0.260[a]	0.0019	< 0.001
Revenue, $/pig placed[4]	163.40	158.75	159.59	157.18	2.284	0.187
IOFC, $/pig placed[5]	93.37	93.13	92.84	89.75	2.213	0.627

[a,b,c] Means in the same row that do not have a common superscript differ ($P < 0.05$).

[1]A total of 1,080 (PIC 337 × 1050; initially 39.0 ± 1.22 lb) pigs were used in a grow-finish trial.

[2]Treatment diets were 0% and 20% DDGS throughout the whole trial; 20% DDGS from 0 to 55 d and 10% from 56 to 125 d, and 20% DDGS from 0 to 105 d and 0% from 106 to 125 d.

[3]Market price for the revenue calculation: carcass price = $0.90/lb; corn = $154/ton; soybean meal = $376/ton; DDGS = $162/ton; Liquid Lys 55% = $0.55/lb; DL-Met = $1.34/lb; ThrPro = $0.78/lb; L-Trp = $4.50/lb; L-Val = $1.75/lb; Optiphos Plus 2500 G = $0.785/lb; VTM = $1.61/lb.

[4]Revenue = (total gain × carcass yield) × carcass price.

[5]Income over feed cost = revenue – feed cost.

Table 4. Effects of different DDGS-withdrawal strategy on carcass characteristics of grow-finishing pigs

	DDGS-withdrawal strategy[1]					
Item	**0%**	**20%**	**20/10%**	**20/0%**	**SEM**	***P* =**
Carcass characteristics						
First marketing event[2]						
Yield, %	74.3	73.7	73.2	73.9	1.10	0.327
HCW, lb	218.1	210.5	211.0	215.8	3.29	0.147
Backfat depth, in[3]	19.75	19.03	19.65	18.48	0.628	0.420
Loin depth, in[3]	67.19	68.21	65.77	67.49	1.285	0.516
Lean, %[3]	54.88	55.45	54.83	55.67	0.439	0.410
Iodine value, mg/g	62.42[a]	67.36[b]	65.82[b]	66.77[b]	0.510	< 0.001
Final marketing event						
Yield, %	74.5	74.2	74.6	74.6	0.96	0.525
HCW, lb	217.4	213.6	213.8	215.3	2.95	0.559
Backfat depth, in[3]	16.91[ab]	16.03[b]	17.26[a]	16.31[ab]	0.328	0.033
Loin depth, in[3]	71.34	71.02	70.63	71.11	0.451	0.719
Lean, %[3]	57.12	57.62	56.83	57.47	0.216	0.054

[a,b] Means in the same row that do not have a common superscript differ ($P < 0.05$).

[1]Treatment diets were 0% and 20% DDGS throughout the whole trial; 20% DDGS from 0 to 55 d and 10% from 56 to 125 d, and 20% DDGS from 0 to 105 d and 0% from 106 to 125 d.

[2]On d 105 of the experiment, 160 pigs (four heaviest barrows per pen) were tattooed and sent to the packing plant for carcass data and fat sample collection. Data from 155 carcasses were collected at the plant and used for this analysis. Fat samples were collected from the dorsal loin-butt junction and were immediately chilled and later analyzed for iodine value using Near Infrared Spectroscopy (NIR).

[3]Adjusted using HCW as covariate.