

Evaluating High Oil Corn and Normal Corn on an Equal Lysine to Calorie Ratio for Grow-Finish Pigs

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Introduction

High oil corn is a specialty hybrid type of yellow corn that has a higher oil content than normal yellow corn. The higher oil content of this corn increases the energy density of grow-finish swine diets. Energy dense diets have the potential to improve feed efficiency, which is economically valuable to pork producers.

A grow-finish pig study was conducted to evaluate the effects of high oil corn and normal corn during the grower and finisher phases on average daily gain (ADG), average daily feed intake (ADFI), feed efficiency (G:F), fat and loin depth, carcass weight and premium, and percent lean. The trial was conducted from May to August, 1998.

Experimental Procedures

Four dietary treatments were formulated using normal corn (NC) and high oil corn (HOC) and fed during a 16-week period (8-week grower and 8-week finisher). Treatments were as follows: 1) NC in both grower and finisher periods (NC/NC), 2) NC in the grower period and HOC in the finisher period (NC/HOC), 3) HOC in the grower period and NC in the finisher period (HOC/NC), and 4) HOC in both periods (HOC/HOC). The HOC and NC diets were formulated on an equal lysine to calorie ratio for each sex and phase of growth (Table 1). Diets were changed every 4 weeks to create 2 grower and 2 finisher diets. Near infrared spectrophotometry analysis of the two corn types after harvest showed 3.9% oil, 9.4% crude protein, and 59.8% starch in normal corn, and 8.2% oil, 9.4% crude protein, and 54.7% starch in high oil corn.

One hundred ninety-two pigs (96 barrows and 96 gilts) were blocked by sex, ancestry, and weight into 32 pens (6 pigs/pen). One of the four dietary treatments was randomly assigned to each pen within a block. Pigs were weighed and feed intake recorded every 2 weeks for the 16 week period to determine ADFI and ADG, from which G:F was calculated. Backfat was measured on 3 pigs/pen with an Aloka 210 ultrasound at weeks 8 and 16. Pigs were marketed at 16 weeks, and fat and loin depth, percent lean, carcass weight, and carcass premium were determined at a commercial slaughter facility in Indiana.

Statistical analysis of the data collected was performed using the GLM procedure of SAS. Pigs were blocked by sex and initial body weight. Dietary treatment, sex, and treatment x sex interaction were examined to determine their effect on growth and carcass characteristics.

Results and Discussion

Barrows had greater ADG than gilts during the grower period ($P < .01$), finisher period ($P < .001$), and overall ($P < .001$; Table 2). There were no dietary treatment differences in ADG.

Pigs fed HOC had a higher G:F ratio than pigs fed NC during the grower period ($P<.042$) and during the finisher ($P<.05$); however, over the entire 16-week period there was only a trend ($P<.09$) for pigs fed the HOC/HOC treatment to have greater G:F than pigs fed the NC/NC treatment. Barrows had a higher ADFI than gilts during the grower period ($P<.03$), finisher period ($P<.0001$), and overall ($P<.01$).

Pigs fed the NC/NC dietary treatment had a greater fat depth ($P<.01$) compared to pigs fed the HOC/HOC treatment. Gilts fed the HOC/HOC treatment had greater loin depth than gilts fed the NC/NC diets. However, these loin depth treatment trends were reversed for the barrows. Barrows had a greater fat depth ($P<.0001$), a lower loin depth ($P<.0001$), and a lower percent lean ($P<.0001$) than gilts. Gilts had a higher carcass premium than barrows ($P<.0001$), but barrows had a heavier carcass weight at slaughter ($P<.01$).

The increase in loin depth of the gilts and decrease in fat depth in both sexes of pigs fed high oil corn may be due to the increased nutrient concentration of the HOC diet better meeting the nutrient needs of the pigs during the summer heat. The lysine to calorie ratio was balanced for each diet in order to prevent a deficiency in lysine in the higher energy diet of high oil corn. As with most supplemental energy sources, pigs fed the HOC treatments had better feed efficiency. Gilts showed a greater response in G:F to the high oil corn diets during the grower period (3.9% increase) compared to the barrows (2.9%). However, barrows had a greater response in G:F during the finishing period (4.7%) and overall (4.1%) compared to the gilts (2.7% and 2.8%, respectively). The level of improvement in G:F was not as high as the standard rule of thumb of 2% improvement for each 1% added fat. The HOC diets had 3 to 3.75% more fat, which would project to a 6 to 7% improvement in feed efficiency, but only a 3% improvement was observed for the gilts and 4% for the barrows.

Application

These results suggest that high oil corn can increase the gain to feed ratio in grow-finish pigs during hot weather. High oil corn diets being more nutrient dense may reduce backfat and increase loin depth when fed during the summertime, with gilts having a greater response than barrows. Summer is the ideal time to utilize this specialty grain for grow-finish pigs. The cost of raising high oil corn needs to be carefully calculated and compared to the costs of purchasing rendered fat and the maintenance issues associated with the identity of high oil corn versus the equipment cost of fat tanks and associated feed mixing equipment; the response observed in this trial may not pay the seed cost premiums and storage costs for high oil corn.

Table 1. Example diet formulation using high oil corn.

Grower 1 Period; 50 to 100 lb body weight

Ingredients, %	<u>Barrow</u>		<u>Gilt</u>	
	NC Diet	HOC Diet	NC Diet	HOC Diet
Normal Corn	75.06	0	71.53	0
High Oil Corn	0	74.35	0	69.40
Soybean Meal, 48%	21.4	22.13	25.01	27.24
Lysine-HCL	.15	.15	.15	.10
Vit/Min/Anti	3.39	3.37	3.31	3.26
Total	100	100	100	100
Nutrient Content				
Lysine, %	.95	1.00	1.05	1.10
Fat, %	3.12	6.30	3.01	5.94
ME, kcal/lb	1492	1574	1493	1570
Lys:Cal, g/Mcal ME	2.89	2.88	3.19	3.18

Finisher 2 Period; 200 lb to market

Ingredients, %	<u>Barrow</u>		<u>Gilt</u>	
	NC Diet	HOC Diet	NC Diet	HOC Diet
Normal Corn	90.61	0	87.07	0
High Oil Corn	0	90.66	0	86.89
Soybean Meal, 48%	6.82	6.77	10.44	10.63
Lysine-HCL	.15	.15	.15	.15
Vit/Min/Anti	2.42	2.42	2.34	2.34
Total	100	100	100	100
Nutrient Content				
Lysine, %	.55	.59	.65	.69
Fat, %	3.60	7.49	3.49	7.22
ME, kcal/lb	1510	1609	1511	1605
Lys:Cal, g/Mcal ME	1.65	1.65	1.95	1.95

Table 2. Effect of feeding high oil corn or normal corn during the grow-finish period.

Item	Barrows				Gilts				CV	Significance
	NC/NC	NC/HOC	HOC/NC	HOC/HOC	NC/NC	NC/HOC	HOC/NC	HOC/HOC		
Days 0-56										
ADG, lb	1.88	1.83	1.90	1.89	1.81	1.81	1.75	1.75	5.13	Sex (P=.006)
ADFI, lb	4.95	4.72	4.86	4.76	4.66	4.67	4.33	4.36	8.37	Sex (P=.030)
G:F	.380	.390	.394	.398	.389	.388	.405	.402	4.33	Trt (P=.042)
Days 56-112										
ADG, lb	1.84	1.78	1.74	1.79	1.67	1.70	1.65	1.65	5.20	Sex (P=.0007)
ADFI, lb ^a	6.85	6.44	6.68	6.47	6.17	6.01	5.96	5.92	5.83	Sex (P=.0001), Trt (P<.132)
G:F ^b	.269	.278	.261	.277	.272	.284	.277	.280	4.77	Trt (P=.046), Sex (P<.15)
Days 0-112										
ADG, lb	1.86	1.81	1.82	1.84	1.74	1.76	1.70	1.70	4.05	Sex (P=.0003)
ADFI, lb	5.93	5.61	5.80	5.65	5.44	5.36	5.17	5.16	6.59	Sex (P=.0014)
G:F ^c	.314	.323	.315	.327	.321	.328	.329	.330	3.84	
Carcass ^d										
Fat depth, in.	1.01	1.00	.992	.952	.843	.843	.779	.684	16.31	Trt (P=.005), Sex (P=.0001)
Loin depth, in.	2.31	2.15	2.14	2.21	2.35	2.25	2.30	2.46	9.30	Trt (P=.006), Sex (P=.0001)
% Lean	51.7	51.0	51.0	51.6	52.9	52.5	53.1	54.4	4.67	Sex (P=.0001)
Premium	1.74	.864	.881	1.80	3.34	3.06	3.84	5.56	146.1	Sex (P=.0001)
Carcass wt, lb	202	197	202	200	198	193	190	193	7.67	Sex (P=.008)

^a Treatment contrast HOC/HOC vs. NC/NC (P<.134).

^b Treatment contrast HOC/HOC vs. NC/NC (P<.093).

^c Treatment contrast HOC/HOC vs. NC/NC (P<.093).

^d Fat-o-meter probe data, determined at a local Indiana slaughter facility.