

Comparing the effects of Corn Oil ONE™ to Soybean Oil on Growth Performance of Nursery Pigs¹

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Summary

A total of 210 pigs (PIC 327 × 1050, initially 28.9 lb BW) were used in a 21-d trial to evaluate the effects of increasing levels of two different oil sources on nursery pig growth performance. The two oil sources were a commercially obtained source of soybean oil and a proprietary source of corn oil obtained from the ethanol industry (Corn Oil ONE™, Feed Energy Company, Pleasant Hill, IA). The 5 experimental diets were: a control diet, diets with 2.5 or 5% added soybean oil, or diets with 2.5 and 5% added Corn Oil ONE™. Diets were fed in meal form and each treatment had 6 replicate pens with 7 pigs per pen.

Overall, from d 0 to 21, increasing added oil from either Corn Oil ONE™ or soybean oil did not influence ADG ($P > 0.60$) or final BW ($P > 0.81$). Average daily feed intake was reduced with increasing concentrations of soybean oil (linear, $P = 0.01$) and Corn Oil ONE™ (linear, $P = 0.03$), which resulted in an improvement in F/G for both oil sources (linear, $P < 0.01$).

Performance of pigs fed soybean oil diets was similar ($P > 0.71$) to that of pigs fed diets containing Corn Oil ONE™. Caloric efficiency was not influenced ($P > 0.19$) by oil source or level. Feed cost per pig tended to decrease (linear, $P = 0.066$) for pigs fed increasing levels of soy oil. Cost per pound of gain decreased for both Corn Oil One™ (linear, $P = 0.032$) and soybean oil (linear, $P = 0.008$) as oil level increased. Value of the weight gain and income over feed cost was similar for pig fed diets with Corn Oil ONE™ and soybean oil ($P = 0.833$).

This study shows the benefits of adding an oil source in late phase nursery pig diets to achieve improved feed efficiency. Corn Oil ONE™ is a suitable alternative for soybean oil and cost and availability should dictate which source to use.

Key words: corn oil, growth performance, nursery pig

Introduction

Soy oil can be added to nursery pig diets as a highly digestible source of energy. However, because of the high price, feed manufacturers often choose to include other sources of dietary energy. Corn Oil ONE™ is a proprietary source of high quality refined corn oil supplied by Feed Energy Company (Pleasant Hill, IA) that has lower levels of free fatty acids and waxes compared to crude corn oil. Corn Oil ONE™ is typically a more economical source of energy compared to soy oil; however, no data is available to compare the impacts on growth performance of pigs when fed diets containing increasing levels of soy oil compared to Corn Oil

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ONE™. The objective of this study is to compare the influence of Corn Oil ONE™ and commercially available soy oil on growth performance of nursery pigs.

Procedures

The protocol for this experiment was approved by the Kansas State University Institutional Animal Care and Use Committee. This experiment was conducted in the nursery facility at the Kansas State University Swine Teaching and Research Center in Manhattan, KS. The facility is a totally enclosed, environmentally controlled, mechanically ventilated barn. Each pen contains a 4-hole, dry self-feeder and a nipple waterer to provide ad libitum access to feed and water. Pens have wire-mesh floors and allowed approximately 3 ft²/pig.

A total of 210 pigs (PIC 327 × 1050, initially 28.9 lb BW) were used in a 21-d trial to evaluate the effects of increasing levels of energy from 2 different oil sources on nursery pig growth performance. Pigs were randomly allotted to 1 of 5 dietary treatments. Each treatment had 6 replicate pens with 7 pigs per pen. Prior to this study, pigs were weaned from d 18 to 25 after birth and fed a common diet with wean day being balanced across the treatments. Pig weight and feed disappearance were measured on d 7, 14, and 21 of the trial to determine ADG, ADFI, and F/G.

All dietary treatments were corn-soybean meal-based and fed in meal form (Table 1). The 5 experimental diets were: a control diet, diets with 2.5 or 5% added soybean oil, and diets with 2.5 or 5% added Corn Oil ONE™. Diet samples were collected and analyzed for DM, CP, Ca, P, and oil at Ward Laboratories (Kearney, NE). At the time this study was completed, the cost of the soybean oil used was 0.40¢/lb and the Corn Oil ONE™ was 0.39¢/lb.

Data were analyzed as a randomized complete block design using the PROC MIXED procedure of SAS (SAS Institute, Inc., Cary, NC) with pen as the experimental unit. Wean day was included in the model as a random effect. The effects of increasing fat level within source were determined by linear and quadratic contrasts. In addition, a pair-wise comparison was made between the diets containing added oil from Corn Oil ONE™ and the diets with added oil from soybean oil. Treatment differences were considered significant at $P \leq 0.05$ and with tendency from $P > 0.05$ to $P \leq 0.10$.

Results and Discussion

Complete diet analysis (Table 2) was similar to formulated expectations. Quality attributes of the two oil sources (Table 3) were similar to expectations and did not differ meaningfully between sources.

Overall, from d 0 to 21, increasing added oil from either Corn Oil ONE™ or soybean oil did not influence ADG ($P > 0.60$) or final BW ($P > 0.81$). Average daily feed intake was reduced with increasing concentrations of soybean oil (linear, $P = 0.01$) and Corn Oil ONE™ (linear, $P = 0.03$), which resulted in an improvement in F/G for both oil sources (linear, $P < 0.01$). Performance of pigs fed soybean oil diets was similar ($P > 0.71$) to that of pigs fed diets containing Corn Oil ONE™. Caloric efficiency was not influenced ($P > 0.19$) by oil source or

level. Feed cost per pig tended to decrease (linear, $P = 0.066$) for pigs fed increasing levels of soy oil. Cost per pound of gain decreased for both Corn Oil One™ (linear, $P = 0.032$) and soybean oil (linear, $P = 0.008$) as oil level increased. Value of the weight gain and income over feed cost was similar for pig fed diets with Corn Oil ONE™ and soybean oil ($P = 0.833$).

In conclusion, this study clearly shows the benefits of adding fat to late phase nursery pig diets to achieve improved feed efficiency. Corn Oil ONE™ is a suitable alternative for soybean oil and cost and availability should dictate which source to use.

Table 1. Diet composition (as-fed basis)¹

Ingredient, %	Control	2.5% Oil	5% Oil
Corn	63.58	58.56	53.52
Soybean meal (47.5% CP)	32.65	35.20	37.75
Oil source	--	2.50	5.00
Monocalcium phosphate	1.30	1.28	1.28
Limestone	1.08	1.08	1.05
Salt	0.35	0.35	0.35
L-lysine-HCl	0.32	0.31	0.30
DL-methionine	0.13	0.14	0.15
L-threonine	0.12	0.12	0.13
Trace mineral premix	0.15	0.15	0.15
Vitamin premix	0.25	0.25	0.25
Phytase	0.08	0.08	0.08
TOTAL	100.00	100.00	100.00
Calculated analysis			
Standardized ileal digestible (SID) amino acids, %			
Lysine	1.23	1.28	1.33
Isoleucine:lysine	62	63	63
Leucine:lysine	128	126	124
Methionine:lysine	34	34	34
Met & Cys:lysine	57	57	57
Threonine:lysine	63	63	63
Tryptophan:lysine	18.4	18.7	19.0
Valine:lysine	68	68	68
Total lysine, %	1.38	1.43	1.49
ME, kcal/lb	1,478	1,536	1,594
NE NRC, kcal/lb	1,089	1,137	1,186
SID Lysine:ME, g/Mcal	3.77	3.78	3.78
CP, %	21.3	22.1	22.9
Ca, %	0.73	0.73	0.73
P, %	0.68	0.68	0.68
Available P, %	0.45	0.45	0.45

¹ Experimental diets were fed for 21-d beginning approximately 42 d after weaning.

Table 2. Chemical analysis of experimental diets¹

Item	Added Oil, %				
	Control 0	Soybean oil		Corn Oil ONE™	
		2.5	5	2.5	5
DM, %	89.59	89.64	90.52	89.97	90.05
CP, %	23.7	23.9	25.1	24.1	24.5
Ca, %	0.91	0.96	0.91	0.83	0.91
P, %	0.78	0.73	0.73	0.69	0.71
Oil, %	2.9	5.1	7.4	4.6	7.1

¹Multiple samples were collected from each diet throughout the study, homogenized, and then sub-sampled for analysis at Ward Laboratories, Kearney, NE.

Table 3. Chemical analysis of oil sources¹

Item	Soybean oil	Corn Oil ONE™
Free fatty acids, %	0.46	1.29
Initial peroxide value (meq/kg)	14.0	16.9
Moisture, %	0.32	0.64
Insoluble impurities, %	0.18	0.04
Unsaponifiables, %	0.41	1.52

¹Samples were analyzed by Midwest Laboratories, Inc. of Omaha, NE.

Table 4. Comparison of soybean oil vs. Corn Oil ONE™ on late nursery pig performance¹

Item	Added Oil, %					SEM	Probability, <i>P</i> <						
	Control	Soybean Oil		Corn Oil ONE™			Source x level		Soybean Oil		Corn Oil ONE™		Soybean oil vs Corn Oil ONE™
		0	2.5	5	2.5		5	Lin	Quad	Lin	Quad	Lin	
d 0 to 21													
ADG, lb	1.42	1.44	1.40	1.42	1.41	0.028	0.657	0.516	0.600	0.314	0.936	0.861	0.965
ADFI, lb	2.18	2.16	1.96	2.08	2.01	0.052	0.483	0.215	0.007	0.164	0.033	0.837	0.805
F/G	1.54	1.50	1.40	1.47	1.42	0.019	0.495	0.173	< 0.01	0.225	<0.01	0.574	0.711
BW, lb													
d 0	29.03	29.02	29.02	29.07	29.14	1.160	0.930	0.996	0.995	0.994	0.935	0.989	0.929
d 21	58.71	59.22	58.25	58.84	58.75	1.415	0.795	0.769	0.812	0.656	0.982	0.946	0.965
CE ²	3686	3757	3668	3674	3717	48.990	0.483	0.178	0.798	0.194	0.654	0.653	0.735
Feed Cost ³ ,\$/pig	11.54	11.65	10.77	11.22	11.04	0.282	0.508	0.212	0.066	0.159	0.223	0.840	0.766
Feed Cost, \$/lb gain	0.39	0.39	0.37	0.38	0.37	0.005	0.555	0.172	0.008	0.219	0.032	0.582	0.636
Gain value ⁴ ,\$/pig	25.00	25.44	24.63	25.08	24.94	0.496	0.657	0.516	0.600	0.314	0.936	0.861	0.965
IOFC ⁵ , \$/pig	13.47	13.79	13.86	13.86	13.90	0.295	0.910	0.909	0.354	0.734	0.300	0.627	0.833

¹A total of 210 pigs (PIC 327 × 1050) were used in a 21-d study with 7 pigs per pen and 6 pens per treatment.

²Caloric efficiency = Kcal of NE per kg of gain((ADFI × NE/kg) /ADG)

³Feed cost was calculated using the following ingredient costs: soybean oil 40¢/lb, Corn Oil One™ 39¢/lb, corn 14¢/lb, and soybean meal 25¢/lb

⁴Gain value was calculated using (Final BW × \$84.00/cwt) – (initial BW × \$84.00/cwt).

⁵Income over feed cost = carcass gain value – feed cost.

Table 5. Main effects of oil source and level

Item	Oil source		Oil level, %			SEM	Probability, <i>P</i> <	
	Soybean oil	Corn Oil ONE™	0	2.5	5		Level	
							Lin	Quad
d 0 to 21								
ADG, lb	1.42	1.42	1.42	1.43	1.41	0.020	0.727	0.437
ADFI, lb	2.06	2.05	2.18	2.12	1.99	0.036	0.006	0.430
F/G	1.45	1.44	1.54	1.48	1.41	0.014	< 0.01	0.663
CE ¹	3712	3695	3685	3715	3692	34.641	0.912	0.570
BW, lb								
d 0	29.02	29.10	29.03	29.04	29.08	0.94	0.966	0.989
d 21	58.74	58.79	58.71	59.03	58.50	1.06	0.901	0.736
Feed Cost ² , \$/pig	11.21	11.13	11.54	11.44	10.90	0.199	0.079	0.422
\$/lb gain	0.38	0.37	0.39	0.38	0.37	0.004	0.007	0.649
Gain value ³ , \$/pig	25.03	25.01	25.00	25.26	24.79	0.351	0.727	0.438
IOFC ⁴ , \$/pig	13.82	13.89	13.47	13.83	13.88	0.209	0.258	0.589

¹ Caloric efficiency = Kcal of NE per kg of gain ((ADFI × NE/kg) / ADG)

² Feed cost was calculated using the following ingredient costs: soybean oil 40¢/lb, Corn Oil One™ 39¢/lb, corn 14¢/lb, and soybean meal 25¢/lb

³ Gain value was calculated using (Final BW × \$84.00/cwt) – (initial BW × \$84.00/cwt).

⁴ Income over feed cost = carcass gain value – feed cost.