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Effect of fat source and fat combinations on starter pig performance

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EFFECT OF FAT SOURCE AND FAT COMBINATIONS ON STARTER PIG PERFORMANCE[1]

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Summary

Two 5-wk trials utilizing a total of 324 weanling pigs (21 ± 3 d) were conducted to determine the effects of different fat sources and combinations on starter pig performance. Treatments consisted of a control (CONT) with no added fat and fat additions of either soybean oil (SOY), coconut oil (COCO), choice white grease (CWG), 1/2 SOY : 1/2 COCO (SOCO), or 1/2 CWG : 1/2 COCO (CWCO). Diets were supplemented with 10% fat for the first two wk of the study, and 5% fat for the next three wk. Daily feed intake (ADFI) was decreased for the first 2 wk when fat was added, but gains (ADG) and feed efficiency (F/G) were unaffected by dietary treatment. During the last 3 wk of the study, fat additions improved ADG and F/G. Also, pigs utilized CWCO diets more efficiently than CWG diets. For the overall 5 wk study, ADG and F/G were improved by fat additions. Within fat treatments, pigs gained faster on SOCO diets than on COCO diets and consumed more of the SOCO diets than either of the COCO or CWCO diets. Based on the results of this study, fat additions do enhance starter pig performance, with the soybean oil-coconut oil combination maximizing performance.

(Key Words: Starter pig, Fat, Soybean oil, Coconut oil, Choice white grease.)

Introduction

Dietary fat additions have been shown to enhance performance of the early-weaned pig. However, several factors influence the type of response observed from fat additions. Factors such as calorie:protein ratio, inclusion rate, carbohydrate and protein sources, and performance level determine the magnitude of fat response and if the response is negative or positive. As is the case with any by-product, source and quality play a very important role in determining the efficacy of a product. Previous research from this station has shown that pigs performed better on diets containing either soybean oil (SOY), choice white grease (CWG), or coconut oil (COCO) than on diets containing tallow. Therefore, the objective of this study was to determine which fat source or combination of sources resulted in optimum starter pig performance.

Procedures

A total of 324 pigs weaned at 21 ± 3 day of age were utilized in two 5-wk growth trials. Initial weight ranged from 8.7 to 18.8 lb. Pigs were allotted to pens based on weight, sex, and ancestry and randomly assigned to one of six dietary treatments. Six pigs were housed in each 4 ft x 5 ft pen on woven wire floors over a Y-flush gutter with feed and water offered ad libitum.

For the first 2 wk of the study (Phase 1), pigs were fed a pelletized, 40% milk products diet containing either 0 (CONT) or 10% added fat. For the last 3 wk (Phase 2), pigs were fed a pelleted, 20% dried whey diet containing either 0 or 5% added fat. Fat sources investigated

[1]We gratefully acknowledge the support of Merrick Foods, Union Center, WI.

included SOY, COCO, CWG, 1/2 SOY : 1/2 COCO (SOCO), and 1/2 CWG : 1/2 COCO (CWCO). Phase 1 CONT diets contained 1.30% lysine, .90% calcium, and .80% phosphorus and Phase 2 CONT diets contained 1.25% lysine, .90% calcium, and .80% phosphorus. A constant calorie:lysine ratio of 250 calories/g was maintained across all treatments within each phase. Therefore, fat diets contained a greater percentage of lysine in order to keep the calorie:lysine ratio constant with that of the CONT diet. Diet compositions are shown in Table 1.

Pen was considered the experimental unit so there were 9 replications per treatment. Individual pig and feeder weights were obtained weekly, and all feed additions were recorded in order to calculate average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G).

Results and Discussion

The effects of fat source on starter pig performance are shown in Table 2. Fat additions had no effect on ADG or F/G for the first 2 wk, but did decrease ADFI when compared to the CONT diet ($P<.01$). The lack of improvement in gain and efficiency could be attributed to the high level of performance exhibited by all pigs in Phase 1. The decrease in feed consumption may be indicative of the young pig eating to meet its energy requirement. During Phase 2, fat supplementation enhanced both ADG and F/G ($P<.01$). Also, within fat treatments, pigs consuming CWCO diets were more efficient than pigs consuming CWG diets ($P<.05$). For the overall 5 wk study, fat additions improved ADG ($P<.06$) and F/G ($P<.01$). Within fat treatments, pigs fed SOCO diets consumed more feed than pigs fed either COCO or CWG diets ($P<.05$) and gained faster than pigs fed COCO diets ($P<.05$).

In this study, fat additions did enhance performance of the early-weaned pig. It should be noted, though, that certain sources and combinations were more efficacious than others, most notably the soybean oil-coconut oil combination. Since fat is a by-product, differences in fat quality could be correlated to differences in performance. However, as can be seen in Table 3, all three fat sources were of excellent quality. A more plausible explanation deals with the composition of fats. Just as proteins are composed of a series of amino acids such as lysine and tryptophan, fats are composed of a glycerol "backbone" and a series of fatty acids. Since pigs have requirements for most of the amino acids, they may have requirements for fatty acids also. In fact, the 1988 NRC lists a requirement for the fatty acid, linoleic acid, for swine for the first time. It also has been shown that fatty acids of different chain lengths and degrees of saturation are metabolized differently by the pig, and one fatty acid can affect how well another fatty acid is utilized. With these variables coming into play, it is very difficult to explain the exact way in which fats, and particularly, the SOCO combination improve starter pig performance. Further research is needed to answer these questions.

Table 1. Composition of the Control Diets[a]

Ingredients, %	Phase 1	Phase 2
Corn	42.20	45.55
Soybean meal,44%	15.00	31.00
Dried whey	20.00	20.00
Dried skimmilk	20.00	---
Synthetic lysine	.10	.10
Synthetic methionine	.10	---
Salt	.25	.25
Monocalcium phosphate	.90	1.35
Limestone	.60	.90
Trace mineral mix	.10	.10
Vitamin premix	.25	.25
Selenium premix	.15	.15
Copper Sulfate	.10	.10
Antibiotic	.25	.25
	100.00	100.00

[a]Fat (10% - Phase 1; 5% - Phase 2) and synthetic lysine (.25% - Phase 1; .15% - Phase 2) were substituted for corn in order to maintain a constant calorie:lysine ratio of 250 calories/g.

Table 2. Effect of Fat Source and Combinations on Starter Pig Performance

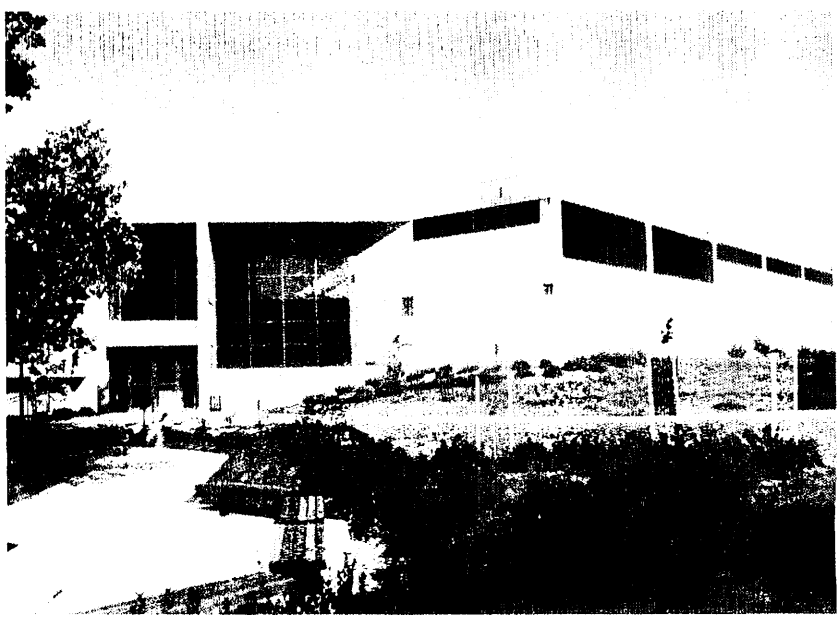
Period	CONT	SOY	COCO	SOCO	CWG	CWCO	S.E.
0 to 2 wk, 10% fat							
ADG, lb	.62	.58	.56	.60	.61	.55	.025
ADFI, lb[a]	.71	.63	.62	.65	.67	.62	.021
F/G	1.15	1.11	1.13	1.08	1.11	1.14	.031
2 to 5 wk, 5% fat							
ADG, lb[a]	.99	1.08	1.06	1.15	1.08	1.10	.035
ADFI, lb	1.64	1.65	1.58	1.69	1.66	1.59	.045
F/G[a]	1.68	1.52	1.50	1.47	1.55^{x}	1.46^{y}	.030
0 to 5 wk							
ADG, lb[b]	.84	.88	$.86^{x}$	$.93^{y}$	.89	.88	.023
ADFI, lb	1.27	1.24	1.19^{x}	1.28^{y}	1.27	1.19^{x}	.030
F/G[a]	1.52	1.41	1.39	1.37	1.43	1.37	.024

[a]Control vs fat (P<.01).
[b]Control vs fat (P<.06).
[x,y]Means with unlike superscripts differ (P<.05).

Table 3. Analyses of Fat Sources

Item	CWG	COCO	SOY
Moisture, impurities, and unsaponifiable matter	1.04	.35	.50
Free fatty acids	3.00	.25	1.75
Total fatty acids	89.80	86.60	93.70
Peroxide value (MEQ/Kg)	1.60	.80	2.30
Fatty acids, %[a]			
C 8:0	.20	5.90	<.10
C 10:0	.26	5.18	<.10
C 12:0	1.35	42.55	.49
C 14:0	1.86	18.39	.28
C 16:0	23.74	11.24	10.58
C 16:1	3.13	.23	<.10
C 16:2	.37	<.10	<.10
C 17:1	.42	.00	<.10
C 18:0	12.52	3.94	4.07
C 18:1	44.59	9.90	23.17
C 18:2	8.71	2.38	52.59
C 18:3	.37	<.10	7.66
C 20:0	.18	<.10	.24
C 20:1	1.18	<.10	.00

[a]No. of carbon atoms : no. of double bonds.



East entrance to the renovated and expanded Weber Hall.