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Abstract

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Keywords

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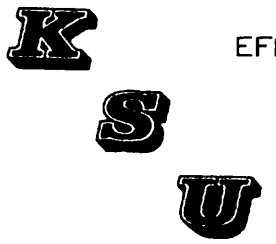

EFFECT OF FAT SOURCE ON PERFORMANCE OF WEANED PIGS[a]

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Summary

A 5-week trial was conducted to compare various fat sources for the weaned pig. A total of 150 pigs were weaned at 19 days of age and allotted, by weight, to five dietary treatments. Treatments consisted of a control with no added fat and four fat sources (choice white grease, coconut oil, soybean oil and tallow). During the first 2 weeks, 10% fat was added, and 5% fat was added during the last 3 weeks. Average daily gain and feed/gain of weaned pigs were improved with the addition of dietary fat. During the first 2 weeks, pigs fed soybean oil had superior performance to other pigs fed additional fat. During the last 3 weeks and over the entire 5 week study pigs fed choice, white grease and soybean oil had a faster rate of gain and were more feed efficient than pigs fed the other fat sources. Among the four fat sources, tallow appeared to be least effective at improving pig performance.

Introduction

Research conducted to determine the ideal fat source has been inconsistent and inconclusive. This is partially due to the level of fat incorporated and the diet formulation procedures used. The young pig's ability to digest fat in a dry diet has been controversial. The fat content of sow's milk is about 45% on a dry matter basis and is highly digestible (98%) by the suckling pig. Thus, the ability of the young pig to digest fat appears to be present. Additional fat has been shown to improve gain and feed efficiency for the weaned pig. Researchers have shown soybean oil, choice white grease, coconut oil, and corn oil to be readily utilized by the young pig, with digestibilities of 85 to 95%. Our objective in this experiment was to compare performance criteria of pigs weaned at 3 weeks of age and fed no additional fat or different fat sources.

Procedures

A total of 150 pigs were weaned at an average age of 19 (17-23) d and at an average initial weight of 10.4 (7.5-13.7) lb. The pigs were allotted by weight across five dietary treatments. With pen as the experimental unit, there were six replications with five pigs per pen. Pigs were housed in 4 ft x 5 ft pens with woven wire floors over a Y-flush gutter. Each pen was equipped with one four-hole feeder and one nipple water. Feed and water were provided ad libitum.

[a]Choice white grease provided by Merrick's Inc., Middleton, WI.

Because of lower feed intake by pigs initially after weaning, high nutrient density diets were fed the first 2 weeks. Thus, the 5-week trial was divided into two phases. Phase 1 consisted of the first 2 weeks with dietary treatments containing 40% milk products (20% dried skim milk and 20% dried whey). During this period, dietary fat inclusion rate was 10%. Phase 2 consisted of the last 3 weeks with dietary treatments containing 20% milk products (20% DW) and fat included at the 5% level.

Dietary treatments included: CNTL - control; CWG = choice white grease; COCO = coconut oil; SOY = soybean oil; and TAL = tallow. Composition of the CNTL treatment is shown in table 1. During phase 1, CNTL treatment was calculated to contain 1.30% lysine, .90% Ca, and .80% P. For the fat source treatments (CWG, COCO, SOY and TAL), 10% fat was added while maintaining a constant calorie:lysine ratio of 250 cal/g. This was accomplished by increasing synthetic lysine; therefore, lysine content was 1.47%. During phase 2, CNTL treatment was calculated to contain 1.25% lysine, .90% Ca, and .80% P. For the fat source treatments, 5% fat was added while maintaining the same calorie:lysine ratio of 250 cal/g. All diets were pelleted to a diameter of 5/32 inches.

Criteria measured included average daily gain, average daily feed intake, and feed efficiency for the two phases and the entire 5-week period.

Results

One pen was removed from experimental analyses because of poor health, unrelated to dietary treatment. Also, three pigs from different pens were removed for similar reasons.

Analyses of fat sources are shown in table 2. Fatty acid profiles are relatively similar to values reported by other researchers. COCO contains predominantly short chain-saturated fatty acids, SOY contains long chain-unsaturated fatty acids, and CWG and TAL are intermediate in chain length and saturation. Insoluble impurities are noticeably higher for TAL than for the other fat sources.

A summary of criteria is shown in table 3. After 2 weeks (phase 1), pigs fed SOY had a faster ($P<.05$) rate of gain than pigs fed the other treatments. During this same period, SOY-fed pigs tended to consume more feed and to have a lower feed/gain ratio than the other pigs. CNTL-fed pigs were significantly less ($P<.05$) efficient than SOY-fed pigs, but they tended to be less efficient than CWG-, COCO- and TAL-fed pigs.

During the last 3 weeks (phase 2) of the 5-week study, pigs fed CWG and COCO had a faster ($P<.07$) rate of gain than pigs fed CNTL. Pigs fed TAL and SOY also tended to gain faster than CNTL-fed pigs. CWG-fed pigs gained faster ($P<.06$) than SOY- and TAL-fed pigs. During the same period, CWG-fed pigs consumed ($P<.05$) more feed than pigs fed all other treatments. During phase 2, pigs fed additional fat tended to be more efficient than pigs fed CNTL.

For the 5 week period, pigs fed CWG, COCO and SOY had a faster ($P<.05$) rate of gain than pigs fed the CNTL, whereas TAL-fed pigs followed a similar trend but to a lesser degree. CWG fed pigs had a faster ($P<.06$) rate of gain than TAL-fed pigs. Pigs fed CWG consumed ($P<.06$) more feed than pigs fed CNTL,

COCO, and TAL, and pigs fed SOY followed a similar trend. Pigs fed additional fat were more ($P<.05$) feed efficient than pigs fed CNTL.

Conclusions

The addition of 10% fat during the first 2 weeks and 5% fat during the next 3 weeks improved average daily gain and feed/gain ratio for pigs weaned at 3 weeks of age. Depending on fat source, feed intake was improved also. For the initial 2 weeks after weaning, the data suggest that the addition of soybean oil improves pig performance to a greater extent than the other fat sources. SOY tended to stimulate feed intake, while at the same time improving feed efficency relative to the other treatments. After the initial 2 weeks, SOY lost its advantage, while CWG improved pig performance above the other treatments. COCO also improved pig growth rate and feed efficiency to a greater extent than during the initial 2 weeks. Over the entire 5-week study, CWG maintained superior pig performance. COCO and SOY improved pig performance as well, but to a slightly less degree. Among the four fat sources, TAL appeared to affect pig performance inconsistently and to contain less nutritive value than CWG, COCO, and SOY.

Based on fatty acid analyses of the fat sources and the pig performance data for phase 1, it would appear that a higher unsaturated/saturated fatty acid ratio is a good indicator of fat source quality as a feedstuff. However, this relationship does not hold true for phase 2 or for the entire 5 week study. The quality of the fat source may be dependent on the level of impurities present, since TAL was of less value as a feedstuff and contained the most insoluble impurities.

Table 1. Composition of Control (CNTL) Treatments[a]

Ingredients, %	Phase 1	Phase 2
Corn	42.20	45.55
Soybean meal, 44%	15.00	31.00
Dried whey (DW)	20.00	20.00
Dried skim milk	20.00	--
Synthetic Lysine	.10	.10
Synthetic Methionine	.10	--
Salt	.25	.25
Dicalcium phosphate	.90	1.35
Limestone	.60	.90
Trace minerals	.10	.10
Vitamins	.25	.25
Selenium	.15	.15
Copper sulphate	.10	.10
Antibiotic	.25	.25
	100.00	100.00

[a]Fat (10% for phase 1, 5% for phase 2) and synthetic lysine (.25% for phase 1; .15% for phase 2) were substituted for corn. Synthetic lysine added to maintain constant calorie:lysine ratio of 250 cal/g.

Table 2. Analyses of Fat Sources

Components, %	Choice White Grease (CWG)	Coconut Oil (COCO)	Soybean Oil (SOY)	Tallow (TAL)
Total fatty acids	89.3	92.4	92.1	92.1
Insoluble impurities	.03	.01	.01	.26
Fatty acids, carbon length:double bonds				
C 8:0	0	7.1	0	0
C 10:0	0	7.5	0	0
C 12:0	1	49.5	0	0
C 14:0	2.5	16.4	0	3.5
C 16:0	26.0	8.2	10.2	25.6
C 16:1	4.3	0	0	5.2
C 18:0	13.2	2.5	3.2	14.9
C 18:1	44.0	6.4	19.7	43.7
C 18:2	8.2	1.9	59.9	5.7
C 18:3	1.8	.6	7.1	1.4
U/S Ratio[a]	1.40	.10	6.50	1.27

[a]U/S ratio = unsaturated/saturated fatty acid ratio.

Table 3. Effects of Fat Source on Weaned Pig Performance

Treatment	CNTL	CWG	COCO	SOY	TAL	S.D.[a]
Average daily gain, lb						
Weeks 0-2[b]	.46	.51	.51	.62	.51	.086
Weeks 2-5[c]	.88	1.10	1.00	.97	.95	.112
Weeks 0-5[d]	.73	.86	.81	.84	.77	.077
Average daily feed, lb						
Weeks 0-2	.53	.53	.53	.59	.57	.066
Weeks 2-5[e]	1.45	1.61	1.47	1.52	1.43	.095
Weeks 0-5[f]	1.10	1.19	1.10	1.14	1.08	.068
Feed/gain ratio						
Weeks 0-2[g]	1.16	1.05	1.05	1.00	1.10	.123
Weeks 2-5[h]	1.69	1.49	1.48	1.60	1.49	.185
Weeks 0-5[i]	1.54	1.38	1.36	1.40	1.39	.122

[a]S.D. = standard deviation.
[b]SOY > CNTL, CWG, COCO, TAL ($P<.05$).
[c]CNTL < CWG, COCO ($P<.07$); CWG > SOY, TAL ($P<.06$).
[d]CNTL < CWG, COCO, SOY ($P<.05$); CWG > TAL ($P<.06$).
[e]CNTL < CWG ($P<.01$); CWG > COCO, TAL ($P<.04$).
[f]CNTL < CWG ($P<.03$); CWG > COCO, TAL ($P<.06$).
[g]CNTL > SOY ($P<.05$).
[h]CNTL > CWG, COCO, TAL ($P<.08$).
[i]CNTL > CWG, COCO, SOY, TAL ($P<.05$).