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High Protein Oats and Animal Fat in Diets
for Growing-Finishing Swine

Richard C. Wahlstrom and George W. Libal

In early work with high protein grains it was found that the increase in protein generally resulted in a lowering of the quality of protein in the grain. Recently varieties of grains have been identified that have increased amounts of the essential amino acids, particularly lysine which is generally the most limiting amino acid in cereal grains. At the 1974 Swine Day it was reported (A.S. Series 74-31) that Dal oats contains a higher level of protein and lysine than that considered average for oats. It was also shown that this oats could replace a greater amount of corn in swine diets than previously recommended and that a considerable reduction in amount of soybean meal could be made because of the higher lysine content.

The objectives of the experiment reported herein were to obtain further information on substituting high lysine oats for corn in swine diets and to evaluate the effect of added energy, in the form of animal fat, to these diets.

Experimental Procedure

Four replicate groups of 24 crossbred pigs averaging approximately 52 lb. were allotted on the basis of weight, sex and ancestry to provide 6 pens of 4 pigs (2 barrows and 2 gilts) within each replicate. The groups of 4 pigs were then randomly assigned to treatment. The pigs were kept in uninsulated wooden houses placed on concrete. Pen area inside was 6 by 8 feet and pigs also had access to outside lots 6 by 12 feet where self-feeders and waterers were located.

The composition of the diets is shown in table 1. Diets were calculated to contain equal amounts of lysine, 0.80% in diets fed to 125 lb. and 0.60% in diets fed from 125 to 210 pounds. The Dal oats contained 16% protein and 0.62% lysine.

The experimental treatments were as follows:

1. Corn-soybean meal diet, 14-12% protein, plus 0.15% lysine
2. Corn-oats (1:1)
3. Corn-oats (2:1)
4. Corn-oats (1:1) plus 5% fat to equalize energy to diet 1
5. Corn-oats (2:1) plus 3.5% fat to equalize energy to diet 1
6. Corn-soybean meal diet, 16-13% protein

Results

The results of this experiment are summarized in table 3. The means for average daily gain did not differ significantly from one another during the growing period, 52 to 125 pounds. However, during the finishing period, from 125 to 210 lb., pigs fed the lower protein corn-soy diet (diet 1) gained at a slower rate than pigs fed any of the other treatments. The gain of these pigs was only 1.51 lb. per day which was significantly less than the 1.77 lb. per day gain of pigs fed diets 2 and 5. Rate of gain for the entire experimental period was also significantly less for pigs fed diet 1 than for pigs fed diets 5 and 6. It is possible that the reduced gain of pigs fed diet 1 may have been due to a deficiency of an amino acid other than lysine during the finishing period.

Pigs fed diets where one-third or one-half of the grain was Dal oats gained similarly to those fed corn as the only grain (diet 6). Adding fat to the oat diets did not significantly affect rate of gain. Pigs fed diet 4 which contained 5% fat did consume less feed per day. Other research has also shown that feed consumption is reduced as energy content of the diet is increased.

Feed/gain varied from 3.31 lb. for pigs fed the low protein corn diet, diet 1, to 3.06, 3.16, 2.97, 2.99 and 2.99 for pigs fed diets 2, 3, 4, 5 and 6, respectively. Adding fat to the oat diets reduced feed/gain approximately 3 to 5%. The differences in feed efficiency were not significantly different among treatments.

The dietary treatments did not affect carcass development as backfat depth, carcass length and loin eye area were quite similar among groups.

The results of this experiment confirm our previous work and indicate that Dal oats can be used in growing-finishing swine diets to replace at least half of the corn in the diet. With oats containing 0.60% or more lysine it is also possible to reduce the amount of soybean meal by at least 100 lb. per ton of feed.

Summary

Ninety-six crossbred pigs were fed diets consisting of corn as the only grain compared to diets containing Dal oats (0.62% lysine) as one-third or one-half of the grain with and without added fat. All diets were equal in lysine content. The increasing levels of oats resulted in decreasing levels of soybean meal required in the diets. No significant differences in average daily gain, feed efficiency or carcass data were noted among treatments except that pigs fed a low protein corn diet supplemented with lysine gained significantly slower during the finishing period. There was no benefit in adding fat to the diets containing oats.

Table 1. Composition of Diets to 125 Pounds (Percent)^a

Ingredients	1A	2A	3A	4A	5A	6A
Ground corn	82.2	40.9	53.5	38.0	50.8	76.8
Dal oats	--	40.9	26.7	38.0	25.4	--
Soybean meal, 44%	15.0	15.7	17.3	16.5	17.8	20.7
Animal fat	--	--	--	5.0	3.5	--
Dicalcium phosphate	1.2	1.2	1.2	1.2	1.2	1.2
Ground limestone	0.7	0.6	0.6	0.6	0.6	0.6
Trace mineral salt ^b	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin-antibiotic premix ^c	0.2	0.2	0.2	0.2	0.2	0.2
L-lysine hydrochloride ^d	0.2	--	--	--	--	--

^aAll diets formulated to contain 0.80% lysine.

^bContained 0.8% zinc.

^cSupplied per lb. of diet: vitamin A, 1500 IU; vitamin D, 150 IU; vitamin E, 5 IU; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 8 mg; choline, 25 mg; vitamin B₁₂, 5 mcg and aureomycin, 10 milligrams.

^dContained 78% lysine.

Table 2. Composition of Diets From 125 to 210 Pounds (Percent)^a

Ingredients	1B	2B	3B	4B	5B	6B
Ground corn	87.89	44.95	58.7	41.75	56.0	84.7
Dal oats	--	44.95	29.35	41.75	28.0	--
Soybean meal, 44%	9.5	7.7	9.5	8.7	10.0	12.8
Animal fat	--	--	--	5.4	3.5	--
Dicalcium phosphate	1.1	1.0	1.1	1.1	1.05	1.1
Ground limestone	0.7	0.7	0.65	0.6	0.65	0.7
Trace mineral salt ^b	0.5	0.5	0.5	0.5	0.5	0.5
Vitamin-antibiotic premix ^c	0.2	0.2	0.2	0.2	0.2	0.2
L-lysine hydrochloride ^d	0.11	--	--	--	--	--

^aAll diets formulated to contain 0.60% lysine.

^{b,c,d}See footnotes table 1.

Table 3. Effect of High Protein Oats and Animal Fat in Diets of Growing-Finishing Swine

	Dietary treatments					
	1	2	3	4	5	6
Number of pigs ^a	16	16	16	16	16	16
Avg. initial wt., lb.	52.2	52.2	52.1	52.2	52.3	52.2
Avg. final wt., lb.	207.0	211.0	207.8	209.6	211.3	210.1
Avg. daily gain, lb.						
52-125 lb. ^b	1.71	1.66	1.70	1.72	1.76	1.80
125-210 lb. ^b	1.51 ^c	1.77	1.68	1.70	1.77	1.74
52-210 lb. ^b	1.59 ^d	1.72	1.69	1.71	1.77	1.77
Daily feed consumed, lb.						
52-125 lb.	4.64	4.36	4.55	4.45	4.51	4.62
125-210 lb.	5.87	6.07	6.04	5.61	5.93	5.79
52-210 lb.	5.33	5.31	5.34	5.09	5.27	5.25
Feed/gain						
52-125 lb.	2.72	2.66	2.68	2.58	2.56	2.56
125-210 lb.	3.82	3.44	3.60	3.30	3.37	3.37
52-210 lb.	3.31	3.07	3.16	2.97	2.99	2.99
Carcass data ^e						
Avg. backfat, in.	1.25	1.21	1.24	1.25	1.21	1.23
Avg. length, in.	31.0	30.7	30.6	30.6	30.4	30.6
Avg. loin eye area, sq. in.	5.11	5.00	4.76	5.24	5.48	5.63

^aFour lots of 4 pigs each per treatment.

^bSignificant difference due to sex (P<.01).

^cSignificantly different than treatments 2 and 5 (P<.05).

^dSignificantly different than treatments 5 and 6 (P<.05).

^eEight barrows per treatment, data adjusted to equal weight.