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SUNFLOWER MEAL IN DIETS OF GROWING-FINISHING PIGS

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Sunflower meal, a by-product of the sunflower oil industry, has become increasingly available as a livestock supplement in recent years. Although lower in protein and lysine than soybean meal, an economic advantage for sunflower meal may exist on a cost per unit of lysine or protein basis. Using synthetic lysine and sunflower meal as feed ingredients, diets can be formulated which are equal in protein and lysine to corn-soybean meal diets. The study reported herein was designed to evaluate substituting sunflower meal for soybean meal in growing-finishing pig diets.

Experimental Procedure

One hundred sixty pigs weighing approximately 55 lb were allotted to five dietary treatments replicated four times. Allotment was on the basis of sex and weight with four barrows and four gilts assigned to each pen. The pigs were purchased from one source and allotment was made after about a 2-week adjustment period. The experiment was conducted at the Cornbelt Research and Extension Center near Beresford, South Dakota, during the months of December through March. The pigs were housed in a recently remodeled confinement building which had 50% slatted floors with a scraper system for removing wastes. Supplemental heat and exhaust fans provided a modified environment for the pigs. Feed was supplied ad libitum. Pigs were weighed every 2 weeks and feed changes were made at 135 to 140 pounds. The experiment was terminated when individual pens weighed approximately 220 lb on regular weekly weigh days. Feed was mixed at the SDSU Feed Processing Unit and transported to Beresford as complete feed. Sunflower meal (approximately 33% protein, 1.27% lysine and 22% fiber) was obtained from the Cargill Feed Company plant at Riverside, North Dakota. Protein sources added to the corn-based diets formed the five treatments. They and the resulting protein and lysine levels were as follows:

<u>Treatment</u>	<u>Ingredient</u>	<u>55-135 lb</u>		<u>135-220 lb</u>	
		<u>Protein</u>	<u>Lysine</u>	<u>Protein</u>	<u>Lysine</u>
1	Soybean meal	15	.72	13.2	.58
2	Sunflower meal + lysine	15	.72	13.2	.58
3	Sunflower meal (1b for 1b substitution) + lysine	13.1	.72	11.8	.58
4	Sunflower meal and soybean meal (equal parts)	15	.63	13.2	.52
5	Sunflower meal and soybean meal (equal parts) + lysine	15	.72	13.2	.58

Table 1 shows the composition of the experimental diets for both the growing and finishing periods.

Table 1. Composition of Experimental Diets (%)

Ingredient	Treatment				
	1	2	3	4	5
	<u>Growing</u>				
Ground corn	79.3	71.2	78.9	76.1	76.0
Soybean meal, 44%	18.0	--	--	10.6	10.6
Sunflower meal, 33%	--	26.0	18.0	10.6	10.6
Dicalcium phosphate	1.3	1.15	1.3	1.3	1.29
Limestone	.7	.7	.7	.7	.7
Trace mineral salt	.3	.3	.3	.3	.3
Vitamin-antibiotic premix ^a	.4	.4	.4	.4	.4
Lysine hydrochloride	--	.25	.37	--	.11
Protein, %	15.0	15.0	13.1	15.0	15.0
Lysine, %	.72	.72	.72	.63	.72
	<u>Finishing</u>				
Ground corn	84.7	78.5	84.4	82.4	82.32
Soybean meal, 44%	12.7	--	--	7.5	7.5
Sunflower meal, 33%	--	18.5	12.7	7.5	7.5
Dicalcium phosphate	1.2	1.2	1.24	1.2	1.2
Limestone	.7	.7	.7	.7	.7
Trace mineral salt	.3	.3	.3	.3	.3
Vitamin-antibiotic premix	.4	.4	.4	.4	.4
Lysine hydrochloride	--	.2	.26	--	.08
Protein, %	13.2	13.2	11.8	13.2	13.2
Lysine, %	.58	.59	.58	.52	.58

^a Supplied per pound of diet: vitamin A, 1500 IU; vitamin D, 150 IU; vitamin E, 3 IU; vitamin K, 1.2 mg; riboflavin, 1.5 mg; pantothenic acid, 6.0 mg; niacin, 9.6 mg; choline, 30 mg; vitamin B₁₂, 6 mcg; selenium, 54 mcg; and aureomycin, 20 mg (to 135 lb) and 12.5 mg (135 to 220 lb).

Results

The results of the growing-finishing trial are shown in table 2. During the grower period (55 to 135 lb), pigs receiving the corn-soybean diet gained significantly faster than pigs receiving diets which contained sunflower meal either as the sole source of protein or in combination with soybean meal. Feed intake was not different among treatments. Differences were observed in efficiency of gain. Pigs receiving the soybean meal supplemented diet were more efficient than pigs receiving either the all sunflower meal supplemented diets or the lower lysine combination sunflower meal-soybean meal supplemented diet. However, they were not statistically more efficient than pigs receiving the sunflower meal-soybean meal diet which had been supplemented with lysine. The all sunflower meal supplement diets resulted in less efficient gains than diets which were a combination of sunflower meal and soybean meal.

Table 2. Pig Performance Due to Dietary Protein Supplementation

Diet	1	2	3	4	5
Protein supplement ^a	SBM	SFM + L	SFM + L	SFM + SBM	SFM + SBM + L
Level of substitution ^b			Lb for lb	Equal parts	Equal parts
		Equal protein	Lower protein	Equal protein	Equal protein
		Equal lysine	Equal lysine	Lower lysine	Equal lysine
Initial wt, lb	55.4 ^f	55.2	55.1	55.2	55.3
Middle wt, lb	139.6 ^f	131.3 ^g	131.8 ^g	132.7 ^g	134.0 ^g
Final wt, lb	220.8	217.4	216.5	218.7	218.0
<u>Grower Period</u>					
Avg daily gain, lb	1.64 ^f	1.48 ^g	1.49 ^g	1.51 ^g	1.53 ^g
Avg daily feed, lb	4.44	4.63 ^d	4.57	4.42	4.43
Feed/gain	2.78 ^c	3.13 ^d	3.07 ^d	2.93 ^e	2.90 ^{ce}
<u>Finishing Period</u>					
Avg daily gain, lb	1.68	1.64	1.64	1.68	1.61
Avg daily feed, lb	6.08	6.13	6.33	6.00	5.98
Feed/gain	3.80	3.74	3.90	3.58	3.73
<u>Overall</u>					
Avg daily gain, lb	1.66 ^c	1.56 ^d	1.57 ^d	1.59 ^d	1.57 ^d
Avg daily feed, lb	5.10 ^f	5.38 ^h	5.45 ^h	5.20 ^{fg}	5.21
Feed/gain	3.18 ^f	3.44 ^h	3.49 ^h	3.25 ^{fg}	3.32 ^g

^a SBM = soybean meal, SFM = sunflower meal and L = lysine.

^b All comparisons are to diet 1, the soybean meal supplement diet.

^{c,d,e} Means with unlike superscripts differ (P<.05).

^{f,g,h} Means with unlike superscripts differ (P<.01).

No statistical differences in gain, feed intake or feed/gain due to dietary treatments were observed during the finishing period (135 to 220 lb). However, the differences in growth and feed efficiency observed during the grower period were still present, essentially unchanged, when the growing and finishing periods were combined. Pigs receiving the soybean supplemented diet grew significantly faster than pigs receiving any other diet and also had the most desirable feed efficiency. Pigs receiving sunflower meal as the only protein source were statistically poorer in feed conversion than pigs which were provided another protein supplement source. Additions of lysine to the diets to make them equal to the soybean supplemented diet in both lysine and protein did not improve performance of pigs fed diets supplemented with sunflower meal. This would indicate that energy may have been the limiting factor in these diets rather than the amino acid, lysine.

Table 2. Pig Performance Due to Dietary Protein Supplementation

Diet	1	2	3	4	5
Protein supplement ^a	SBM	SFM + L	SFM + L	SFM + SBM	SFM + SBM + L
Level of substitution ^b			Lb for lb	Equal parts	Equal parts
		Equal protein	Lower protein	Equal protein	Equal protein
		Equal lysine	Equal lysine	Lower lysine	Equal lysine
Initial wt, lb	55.4 ^f	55.2	55.1	55.2	55.3
Middle wt, lb	139.6 ^f	131.3 ^g	131.8 ^g	132.7 ^g	134.0 ^g
Final wt, lb	220.8	217.4	216.5	218.7	218.0
<u>Grower Period</u>					
Avg daily gain, lb	1.64 ^f	1.48 ^g	1.49 ^g	1.51 ^g	1.53 ^g
Avg daily feed, lb	4.44	4.63 ^d	4.57	4.42	4.43
Feed/gain	2.78 ^c	3.13 ^d	3.07 ^d	2.93 ^e	2.90 ^{ce}
<u>Finishing Period</u>					
Avg daily gain, lb	1.68	1.64	1.64	1.68	1.61
Avg daily feed, lb	6.08	6.13	6.33	6.00	5.98
Feed/gain	3.80	3.74	3.90	3.58	3.73
<u>Overall</u>					
Avg daily gain, lb	1.66 ^c	1.56 ^d	1.57 ^d	1.59 ^d	1.57 ^d
Avg daily feed, lb	5.10 ^f	5.38 ^h	5.45 ^h	5.20 ^{fg}	5.21
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Summary

In a growing-finishing trial, 160 pigs were used to evaluate the effect of substituting sunflower meal for soybean meal in a corn diet. Synthetic lysine was used to increase the lysine content in several of the sunflower diets to equal the lysine content of the soybean diet. During the grower period, 55 lb to 135 lb, pigs which received sunflower meal as the sources of 100% or 50% of the supplemental protein gained more slowly and less efficiently than those receiving the corn-soybean meal diet. Pigs which received an equal mixture of sunflower meal and soybean meal gained more efficiently than those receiving only sunflower meal as the protein source. No differences in gain or feed efficiency were seen during the finishing period (135 to 220 lb). The differences which were observed during the growing period still existed when the growing-finishing periods were combined. The addition of lysine to the sunflower diets to make them equal in lysine and protein to the soybean meal diet did not improve pig performance to the level of pigs receiving the soybean meal diet.