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EFFECTS OF VARIOUS LEVELS OF SUNFLOWER SEEDS ON GROWING-FINISHING SWINE

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Sunflowers are becoming a very important crop in South Dakota. Currently, most seeds are used to produce confectionary seeds or sunflower oil and sunflower meal. For various reasons, some sunflower seeds may not be suitable for these purposes. Feeding these seeds to livestock is one possible way to utilize them. Although at the present time sunflower seeds are not considered an economically feasible feed ingredient, prices may change, making them a more practical substitute for the common feed grains. For these reasons, this study has been conducted to determine growth and carcass characteristics of swine fed diets containing various levels of sunflower seeds.

Experimental Procedure

A total of 96 pigs with an average initial weight of 56 pounds were allotted to six replications of four treatments. There were four pigs per pen for a total of 24 pigs per treatment. The pigs were housed in the environmentally controlled confinement barn at the swine unit until they reached an average pen weight of 220 pounds.

The trial was split into two periods (56-130 lb and 130-220 lb) so that the diets could reflect the lower protein requirement of heavier pigs. The four dietary treatments contained 0, 5, 10 and 20% sunflower seeds (table 1). The sunflower seeds replaced corn and soybean meal at levels calculated to be equal in lysine content. The chemical analyses of all diets are shown in table 2.

Table 1. Ingredient Composition of Diets (%)

	To 130 lb				130-220 lb			
	Sunflower seeds, %							
Ingredients	0	5	10	20	0	5	10	20
Ground corn	76.6	71.9	67.1	57.6	82.5	77.8	73.0	63.6
Ground sunflower seeds	0	5.0	10.0	20.0	0	5.0	10.0	20.0
Soybean meal	20.7	20.5	20.3	19.9	15.0	14.8	14.6	14.2
Dicalium phosphate	1.2	1.1	1.0	.9	1.0	.9	.9	.7
Limestone	.8	.8	.9	.9	.8	.8	.8	.8
Trace mineralized salt	.3	.3	.3	.3	.3	.3	.3	.3
Premix[a]	.4	.4	.4	.4	.4	.4	.4	.4

[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 B_{12}, 6 mcg; selenium, 54 mcg, and aureomycin, 12.5 milligrams.

Table 2. Nutrient Composition of Diets (%)[a]

Source	To 130 lb				130-220 lb			
	Sunflower seeds, %							
	0	5	10	20	0	5	10	20
Moisture	7.87	7.58	7.16	6.49	12.20	12.20	11.60	10.80
Crude protein	18.0	18.4	18.9	19.4	15.2	15.5	15.9	16.7
Crude fiber	2.58	3.67	4.30	5.17	2.76	3.87	4.32	5.19
Ether extract	3.58	4.97	6.85	10.30	3.57	5.27	6.66	10.30
Ash	4.52	4.59	4.66	4.49	3.70	4.01	3.96	4.26
Nitrogen-free extract	63.5	60.8	58.1	54.2	62.6	59.2	57.6	52.8
Lysine	.90	.93	.96	.94	.72	.68	.73	.76

[a] Average of three samples of all diets.

After reaching the prescribed slaughter weight, the barrows were slaughtered in the animal science meat laboratory. A fat sample was taken from the midline between the second and fifth lumbar vertebrae and later used for determination of iodine number and individual fatty acid composition. Following a 24-hour chill period, carcass measurements were taken to determine any differences in carcass length, average backfat, percent lean, loin eye area, marbling and color. Three pork chops were saved from each carcass and used to determine chemical composition, tenderness and taste panel desirability.

Results

Performance data are summarized in table 3. During the 56 to 130 lb period, increases in sunflower seeds in the diet resulted in a cubic response of average daily gains. Pigs fed the 5% sunflower seed diet had a higher average daily gain than those on the three other treatments and daily gains decreased as the level of sunflowers was increased to 10 and 20%. For the 130 to 220 lb period and the combined period, linear decreases in average daily gain occurred as the amount of sunflower seeds in the diet increased above 5%.

There were no differences among treatments in feed/gain or average daily feed. However, treatment differences in average daily feed for the entire trial did approach significance ($P<.06$). The data indicate a trend toward decreased feed intake at high levels (10 and 20%) of sunflower seeds. This might be expected since those diets contained higher levels of fat.

Differences in carcass traits are shown in table 4. Differences in loin eye marbling approached significance ($P<.07$). There was a trend toward decreased marbling as the percentage of sunflower seeds in the diet increased.

There were many treatment effects on carcass fat as shown in table 5. Iodine number, which indicates the relative degree of unsaturation of fat, increased in a linear manner with the addition of sunflower seeds to the diet. Individual fatty acids also changed with treatment to reflect diet changes. Increases in dietary sunflower seed content resulted in increases in the percentage of unsaturated fats and decreases in saturated fats. This is a reflection of the different individual fatty acids contained in sunflower seeds versus those found in corn.

Table 3. Performance Characteristics

	Sunflower seeds, %			
	0	5	10	20
Average daily gain, lb				
56-130 lb[a]	1.72	1.89	1.74	1.64
130-220 lb[b]	1.72	1.72	1.57	1.52
Overall[b]	1.73	1.80	1.63	1.57
Feed/gain				
56-130 lb	2.90	2.66	2.58	2.73
130-220 lb	3.20	3.28	3.19	3.43
Overall	3.06	3.00	2.93	3.08
Average daily feed, lb				
56-130 lb	4.99	4.91	4.53	4.67
130-220 lb	5.57	5.66	5.11	5.11
Overall[c]	5.31	5.32	4.86	4.93

[a] Cubic response (P<.05).
[b] Linear response (P<.01).
[c] Cubic response (P<.06).

Table 4. Carcass Characteristics

	Sunflower seeds, %			
	0	5	10	20
Carcass wt, lb	155.3	157.8	157.1	161.6
Carcass length, in.	31.5	31.7	31.5	31.6
Loin eye color[a]	2.75	2.83	2.67	2.50
Loin eye firmness[b]	2.58	2.75	2.42	2.33
Loin eye marbling[bc]	2.83	2.66	2.42	2.17
Tenth rib fat, in.	.90	.98	.85	.83
Average backfat, in.	1.04	1.11	1.06	1.15
Loin eye area, sq. in.	4.75	4.60	4.83	4.75
Percent lean (formula)	55.54	54.50	55.60	55.03

[a] Range of 1 to 5, with 1 being the lightest and 5 the darkest.
[b] Range of 1 to 5, with 1 being the least and 5 the most.
[c] Linear response (P<.07).

Table 5. Analytical Carcass Characteristics

	Sunflower seeds, %			
	0	5	10	20
Iodine number[a]	56.91	62.36	66.28	71.55
Individual fatty acid composition, %				
Myristic (14:0)[a]	1.54	1.51	1.33	1.35
Palmitic (16:0)[a]	26.01	24.17	21.83	19.39
Palmitoleic (16:1)[a]	2.26	1.94	2.00	1.63
Stearic (18:0)[a]	11.89	11.03	9.96	9.43
Oleic (18:1)[a]	42.75	39.23	37.29	34.92
Linoleic (18:2)[a]	15.53	22.11	27.57	33.28
Sum of 14:0, 16:0 and 18:0[a]	39.44	36.70	33.13	30.17
Sum of 16:1, 18:1 and 18:2[a]	61.36	63.30	67.12	69.87
Taste panel results				
Flavor[b]	5.66	5.74	5.73	5.58
Juiciness[c]	5.07	5.43	5.18	5.08
Tenderness[d]	5.35	5.41	5.41	5.21
Overall desirability[b]	5.40	5.57	5.44	5.37
Chemical analysis of meat, %				
Moisture	73.64	73.36	73.76	72.90
Protein	22.30	22.38	22.06	21.95
Fat (wet matter basis)	2.96	3.38	2.96	4.10
Fat (dry matter basis)	11.20	12.60	11.18	14.89
Shear test, lb[e]	23.15	24.52	24.53	24.26

[a] Linear response ($P<.01$).
[b] Based on a 1 to 8 scale, 1 = extremely undesirable and 8 = extremely desirable.
[c] Based on a 1 to 8 scale, 1 = extremely dry and 8 = extremely juicy.
[d] Based on a 1 to 8 scale, 1 = extremely tough and 8 = extremely tender.
[e] Pounds of force to shear 1-in. cores.

With an increase in the amount of unsaturated fat in a meat product, oxidation of the fat and the subsequent rancid taste could become a concern. There were, however, no differences found by the taste panel in any of the parameters measured. Likewise, there were no differences found in tenderness as measured by shear test or in any of the chemical analyses conducted on the meat samples.

Summary

Ninety-six pigs averaging 56 lb were used to study the effects of feeding various levels (0, 5, 10 or 20%) of sunflower seeds in a diet during their growing-finishing period.

The diets did produce differences in average daily gain but not in feed/gain or average daily feed. The higher oil content in the feeds with sunflower seeds produced many differences in fatty acid composition of backfat with a general increase in unsaturated fatty acids. This did not adversely affect the eating quality of the pork.