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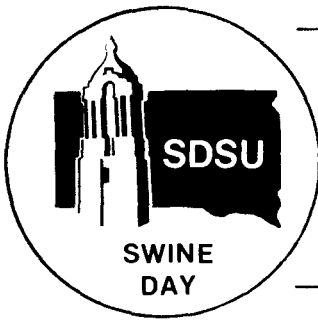
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DIGESTIBILITY OF SUNFLOWER SEEDS IN SWINE DIETS

M. Kepler, G. W. Libal And R. C. Wahlstrom

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Limited research has been performed using sunflower seeds as an ingredient in swine diets. Because of the large amount of sunflowers produced in South Dakota, it would be beneficial to determine their usefulness as a feed ingredient in livestock rations. Work conducted at North Dakota has shown levels of over 10% sunflower seeds in diets of growing-finishing pigs produced oily carcasses. Previous research at this station (SWINE 80-8) has shown the maximum level of ground, whole sunflower seeds to be fed to sows during late gestation and early lactation is between 25 and 50%.

In order to utilize sunflower seeds in swine diets more efficiently, the digestibility of the various nutrient fractions of the seeds must be determined. This study was performed to determine the coefficients of apparent digestibility, digestible energy and nitrogen retention for rations containing various levels of ground sunflower seeds.

Experimental Procedure

Six barrows averaging 145 pounds were used in a digestion trial utilizing two 3 x 3 latin square designs involving three collection periods and diets containing 0, 25 and 50% whole ground sunflower seeds. Composition of the diets is shown in table 1 and nutrient composition of these diets is presented in table 2. Each of the three periods consisted of 5 days for adjustment to the diet followed by 5 days of total fecal and urine collection. Pigs were weighed at the beginning of the adjustment period and at the end of the collection period. Pigs were kept in rectangular digestion crates with expanded metal floors. Crates were in an environmentally controlled room where the temperature was maintained at approximately 70° F. Feed was provided twice daily at a level that was adjusted for the level of consumption at the previous feeding. Water was supplied by addition to the feed. Refused feed was collected and added back into the feed twice daily. Feces were collected twice daily and frozen for later analysis, at which time 5% by weight of the feces was dried in a 158° F oven for 48 hr for dry matter determination. Proximate analyses were performed on the dried feces. Gross energy of feed and feces was determined. Urine was collected and 10% by volume of each day's urine output was combined and refrigerated until analyzed for nitrogen concentration. Digestible energy, percent nitrogen retention and apparent digestibility coefficients of dry matter, crude protein, energy, ether extract, nitrogen-free extract, organic matter and crude fiber were determined.

TABLE 1. INGREDIENT COMPOSITION OF DIETS (%)

Ingredients	Sunflower seeds, %		
	0	25	50
Ground yellow corn	84.50	65.58	46.51
Ground sunflower seeds	0	25.0	50.0
Soybean meal, 44%	11.85	5.85	0
Dicalcium phosphate	2.27	1.89	1.54
Ground limestone	.75	.87	.97
Lysine	.03	.21	.38
Trace mineralized salt ^a	.40	.40	.40
Vitamin-antibiotic mix ^b	.2	.2	.2

^a.8% zinc.

^bSupplied per pound of diet: vitamin A, 2000 IU; vitamin D, 200 IU; vitamin E, 2.5 mg; riboflavin, 1.25 mg; pantothenic acid, 5 mg; niacin, 8 mg; choline, 25 mg; vitamin B₁₂, 5 mcg and aureomycin, 50 mg (trial 1); neomycin, 75 mg; and oxytetracycline, 75 mg (trials 2 and 3).

TABLE 2. NUTRIENT COMPOSITION OF DIETS (PERCENT)^a

Source	Sunflower seeds, %		
	0	25	50
Moisture	10.70	8.90	8.11
Crude protein	12.75	12.64	12.67
Crude fiber	2.29	5.44	7.82
Ether extract	2.80	11.85	20.20
Ash	5.00	5.11	5.30
Nitrogen-free extract	66.44	56.06	46.58
Calcium	.83	.87	.87
Phosphorus	.75	.74	.72
Gross energy ^b	1777	2010	2178

^aAverage of three separate samples of all diets.

^bAs determined by bomb calorimeter (kcal/lb).

Results

The results of this trial are presented in table 3. Data for one pig that became ill were omitted from the results. Gross energy values of the 0, 25 and 50% sunflower seed diets were 1777, 2010 and 2178 kcal per pound, respectively, and the apparent digestibilities of the gross energy were 81.6, 79.1 and 72.7%, respectively. This resulted in digestible energy values (gross energy x percent of energy digested) of 1450, 1590 and 1583 kcal/lb for the 0, 25 and 50% sunflower seed diets, respectively. Although the

TABLE 3. COEFFICIENTS OF APPARENT DIGESTIBILITY,
PERCENT NITROGEN RETENTION AND DIGESTIBLE
ENERGY OF THE DIETS

Item	Sunflower seeds, %		
	0	25	50
Dry matter ^a	82.7	80.3	73.3
Crude protein	77.9	78.5	74.9
Energy ^b	81.6	79.1	72.7
Ether extract ^c	20.6	64.9	68.1
Nitrogen-free extract ^c	89.7	89.3	84.9
Organic matter ^a	84.4	81.5	74.2
Crude fiber ^a	24.1	31.5	15.3
Nitrogen retention, %	42.1	43.8	38.3
Digestible energy, kcal/lb ^{de}	1450	1590	1583

^aLinear and quadratic effect (P<.05).

^bLinear effect (P<.01).

^cLinear and quadratic effect (P<.01).

^dLinear effect (P<.05).

^eDry basis.

gross energy of the 50% sunflower seed diet was the highest, the reduced apparent digestibility of the gross energy in this diet resulted in a digestible energy value approximately the same as the 25% diet. The 50% diet did not supply any more usable energy to the pig than the 25% diet.

A significant increase in apparent digestibility of ether extract occurred with increasing sunflower seed content of the diets with a plateau at the 25 and 50% levels. Coefficients of digestibility of dry matter, nitrogen-free extract, organic matter and crude fiber were all significantly affected in a linear manner with the lowest digestibility for each in diets containing 50% sunflower seeds. No difference was observed in the apparent digestibility of crude protein or in nitrogen retention of the diets.

Overall, the digestibility of the 25% sunflower seed diets was equal to or greater than the control diet. The 50% sunflower seed diet would offer less potential as a swine diet due to its lower digestibility of all nutrients except ether extract. The use of the 25% sunflower seed diet should be restricted to sow diets due to its high content of unsaturated oil.

Summary

Five barrows were used in a total collection digestion trial using diets of 0, 25 and 50% ground, whole sunflower seeds. The results showed the digestibility of components of the 25% sunflower seed diet to be equal to or greater than those of the control diet and that it provided more energy for the pig. Coefficients of digestibility of nutrients in the 50% sunflower diets were reduced.