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Digestibility of fat sources by sows

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Abstract

Twelve crossbred sows averaging 337 lb were used to determine apparent nutrient digestibility of three fat sources. Fat sources evaluated were soybean oil, a 85% dry-fat product composed of animal and vegetable fat, and a 80% dry- fat product made with casein encapsulated choice white grease. The control diet was a 13.0% crude protein corn-soybean diet with 8% cornstarch. Fat sources were added to the control diet to supply 8% added fat. The 12 sows were used in a crossover design, with three sows per diet in each of two periods. Each period consisted of a 5-day adjustment and a 5-day collection. Sows were fed 4.4 lb per day. Digestibility of dry matter, energy, and ether extract were significantly (P<.05) higher for diets containing soybean oil and the casein encapsulated choice white grease than for the dry fat product composed of animal and vegetable fat. Rate of passage increased when sows were fed the dry-fat product composed of animal and vegetable fat. These results suggest that dry-fat sources vary in nutritional value.; Swine Day, Manhattan, KS, November 15, 1984

Keywords

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DIGESTIBILITY OF FAT SOURCES BY SOWS

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Summary

Twelve crossbred sows averaging 337 lb were used to determine apparent nutrient digestibility of three fat sources. Fat sources evaluated were soybean oil, a 85% dry-fat product composed of animal and vegetable fat, and a 80% dry-fat product made with casein encapsulated choice white grease. The control diet was a 13.0% crude protein corn-soybean diet with 8% cornstarch. Fat sources were added to the control diet to supply 8% added fat. The 12 sows were used in a crossover design, with three sows per diet in each of two periods. Each period consisted of a 5-day adjustment and a 5-day collection. Sows were fed 4.4 lb per day. Digestibility of dry matter, energy, and ether extract were significantly ($P<.05$) higher for diets containing soybean oil and the casein encapsulated choice white grease than for the dry fat product composed of animal and vegetable fat. Rate of passage increased when sows were fed the dry-fat product composed of animal and vegetable fat. These results suggest that dry-fat sources vary in nutritional value.

Introduction

University trials and producer observations have consistently demonstrated benefits from adding fat to sow diets. Adding fat to sow diets during late gestation and lactation increases the fat content of colostrum and milk and can result in improved survival rates of baby pigs. Many sows, especially those producing their first litter, will not consume sufficient energy during lactation to maximize milk production and maintain body condition. Body weight loss during lactation seems to be the major factor in sows failing to recycle. Adding supplemental fat to lactation diets results in sows consuming more energy and seems to be a logical approach to decreasing the interval from weaning to remating and keeping the high producing sows in the breeding herd. In the past few years various "dry" fat products have been developed, which allow swine producers to conveniently add fat to sow diets or "top dress" fat on the existing sow diet. However, there is little information comparing the nutritional value of various fat products for sows. This experiment was conducted to determine the apparent nutrient digestibility of three fat sources.

Procedures

Sows were housed in individual 21 x 66 in gestation stalls with a solid concrete floor. Plywood was placed between the stalls to aid in separation of feces. Daily feed intake was constant for each treatment (4.4 lb), and was fed once daily in the morning. Fresh water was supplied via a nipple waterer for 2 h in the morning and 2 h in the afternoon. A ferric oxide marker was fed (1 oz/sow) at the beginning and end of each collection period.

Urine was collected in covered 5 gallon plastic containers, containing 10 cc concentrated HCl. The total volume of urine was weighed daily, and a 5% sample was taken to analyze for nitrogen. Representative feed and fecal samples were analyzed for nitrogen, dry matter, fat and energy. Rate of passage, measured as time from feeding the ferric oxide marker until its first appearance in the feces, was visually observed and recorded.

The fat sources evaluated were soybean oil (SO), an 85% dry animal and vegetable fat (DAV), and an 80% dry fat product made by encupsulating choice white grease with casein (DCWG). The control diet was a 13.1% crude protein corn-soybean meal diet with 8% corn starch (CONT). Fat sources were added to the control diet to supply 8% added fat. Analysis of the diets is given in table 1. Twelve sows were used in a crossover design, with three sows per diet in each of two periods. Each period consisted of a 5-day adjustment and a 5-day total collection of urine and feces.

Results and Discussion

The apparent digestibilities of the diets used in this trial are shown in table 2. These results indicate that some property of the dried animal and vegetable fat (DAV) diet had an effect on the nutrient digestibilities when compared to the other diets. The DAV diet had lower digestibility coefficients for energy, ether extract, and dry matter than did the soybean oil (SO) and dried choice white grease (DCWG) diets.

Rate of passage through the sow's digestive tract (figure 1) was increased ($P<.05$) with sows fed DAV, offering an explanation for the decreased digestibilities of the various nutrients.

Ether extract digestibility of the control diet was 70.19%. The addition of 8% fat, regardless of the source, increased the digestibility significantly ($P<.001$). The ether extract digestibility for the control diet is low due to the greater relative proportion of metabolic fecal fat of those sows. However, the DAV treatment was lower ($P<.05$) than the SO and DCWG. Gross energy values are similar for the two dried fat products. However, the digestible energy value for the DAV diet was lower than for SO or DCWG diets.

Fatty acid analysis of the three fat sources is presented in table 3. These results indicate that the fatty acid composition may affect the utilization of dietary fat by the sow. Degree of saturation also may be a cause of the reduced digestibilities seen in the DAV treatment. The DAV fat product may be processed in such a way as to improve its flowability and in this process the fat may become saturated and apparently less digestible.

Table 1. Analysis of Crude Protein, Ether Extract, and Energy of Diets

Diet	Crude Protien, %	Ether Extract, %	Energy, kcal/lb
Control	13.1	2.4	1925
Soybean oil	13.8	10.0	2089
Dried animal and vegetable fat	14.2	10.6	2131
Dried choice white grease	14.1	10.8	2124

Table 2. Apparent Digestibilities and Other Properties of Diets[a] Containing Various Fat Sources[b]

Item	CONT	SO	DAV	DCWG	SE[c]
DM digestibility, %	88.34[e]	88.27[e]	88.27[f]	88.14[e]	.29
Energy digestibility, %	88.67[e]	88.47[e]	79.95[f]	88.63[e]	.36
Ether extract digestibility, %	70.19[g]	92.17[e]	88.10[f]	93.55[e]	1.21
Nitrogen digestibility, %	83.54[f]	85.72[e]	84.85[ef]	85.47[ef]	.62
Digestibility energy, kcal/lb	1707	1848	1704	1883	16
Rate of passage[d], hr	50.4[e]	50.4[e]	38.0[f]	53.0[e]	2.9

[a]CONT = control; SO = soybean oil; DAV = dried animal & vegetable fat; DCWG = dried choice white grease.

[b]5-day total collection digestion trial.

[c]Standard error.

[d]Rate of passage measured as time from feeding marker until first appearance in feces.

[efg]Means in the same row with different superscripts differ (P<.05).

Table 3. Fatty Acid Composition of Fat Sources

Source	% of total										%	
	12:0	14:0	16:0	16:1	17:0	17:1	18:0	18:1	18:2	18:3	Sat.	Unsat.
Soybean oil		.5	14.3	.5			1.6	27.4	45.5	10.2	16.4	83.6
Dried animal & vegetable fat	1.37	2.81	25.5	1.31	1.07	.09	46.1	16.4	3.18	.16	76.8	21.2
Dried choice white grease	1.0	1.4	23.7	5.0			12.0	47.9	9.0		38.1	61.9

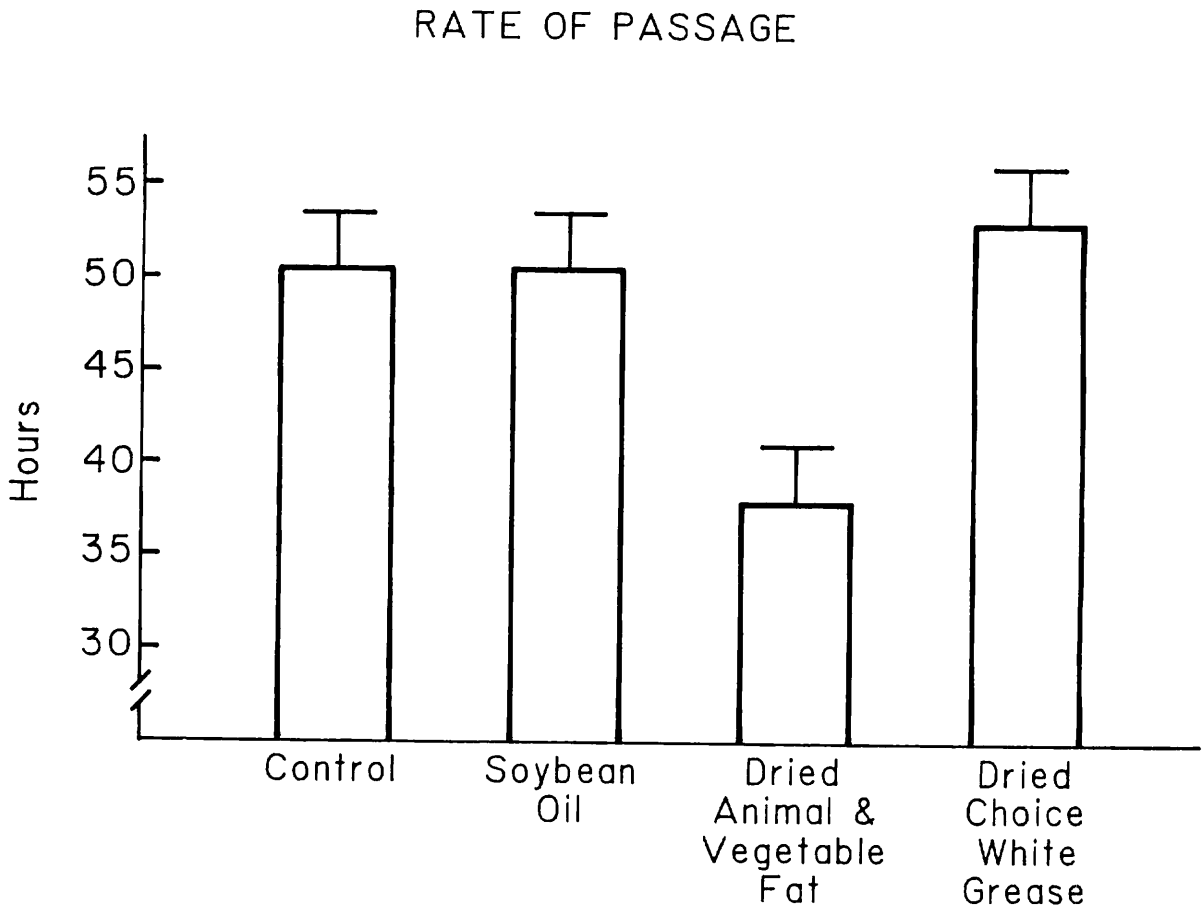

Figure 1.