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Pelleting corn-soybean meal swine diets

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Summary

One hundred forty-six pigs were used to study the effects of steam pelleting a corn-soybean meal diet on pig performance. Treatments included ground meal, meal steam conditioned to 80 C (176F) before pelleting, meal pelleted without steam conditioning, and a meal diet with 2½% molasses replacing corn. Steam-conditioning the meal before pelleting resulted in less starch damage, and less electrical energy was required for pelleting. Pellet durability was considerably increased with steam conditioning. None of the processing methods studied caused significant ($P < .05$) improvement in daily gain, feed efficiency, or energy digestibility for weanling pigs. A significant improvement ($P < .05$) over the control diet in feed efficiency and energy digestibility, was found with either pelleting treatment for grower-finisher pigs. However, daily gain was not significantly ($P < .05$) improved.

Introduction

Pelleted swine diets are usually more palatable and often improve feed efficiency. These improvements have been attributed to decreased dustiness, increased consumption, less feed

wastage, and increased nutrient availability. Results vary among researchers, processing techniques, and feed ingredients studied. These experiments were conducted to correlate pelleting variables with their effects on the nutritional value of corn-soybean meal swine diets.

Experimental Procedure

One hundred forty-six pigs were used to study effects of steam pelleting a corn-soybean meal diet on pig performance. Steam was used to condition the meal before pelleting to increase temperature and increase moisture content.

The four processing treatments studied were as follows: (1) meal (M); (2) meal with 2½% cane molasses replacing corn (MM); (3) meal pelleted without prior steam conditioning (NSCP); and (4) meal steam conditioned to 80 C (176 F) before pelleting (HSCP).

Growing trials were conducted with 8.5-kg (19-lb) weanling pigs and 48-kg (106-lb) grower-finisher pigs. Pigs were randomly assigned to treatments based on sex and initial weight. Weanling pigs were housed on slatted floors and finishing pigs on concrete floors. All feeders were carefully adjusted to prevent feed wastage. Animal performance data were summarized at the end of a 35-day trial for weanling pigs and when finishing pigs in a replicate averaged 98 kg (216 lb).

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Digestibility trials were conducted in conjunction with growth studies using M, NSCP, and HSCP treatments. Pigs were housed individually in metal metabolism crates to allow feces collection. Feed was provided in two equal portions daily, and water was available at each feeding. A five-day pretest preceded each five-day collection period. Feces were analyzed for protein, dry matter, and energy.

Results and Discussion

Pelleting corn-soybean meal diets (Table 6) using steam decreased the mechanical friction between the meal and die hole surface. This decreased the electrical energy required to pellet a ton of feed by two-thirds compared to dry pelleting. Pellet hardness was considerably increased with steam conditioning. A greater degree of starch damage occurred in dry pelleting compared to steam pelleting. This starch damage may be a factor in energy utilization by the pig. However, the degree of starch damage caused by either pelleting method was less than 25%.

Weanling pigs showed no difference ($P<.05$) in daily gain, daily feed intake, or feed/gain (Table 7) when fed conditioned or nonconditioned pellets or meal. No difference ($P<.05$) was noted between the control meal and the soybean-corn-molasses diet with weanling pigs. There were no differences among M, NSCP, and HSCP in dry matter or energy digestibility. Protein digestibility was decreased ($P<.05$) between M and HSCP. However, this decrease did not affect growth performance. This probably can be explained by the diets being more than adequate in crude protein.

A significant improvement ($P<.05$) in feed/grain and energy digestibility with either pelleting

treatment compared to the control meal was found for grower-finisher pigs (Table 8). However, daily gain was not improved ($P<.05$). The energy digestibility data suggest that the starch damage during pelleting had a beneficial effect on pig performance.

In these studies, close management of feeders kept wastage to a minimum for all treatments. Differences in results for pelleting process methods may become apparent if other feed ingredients are studied.

Table 6. Composition of diets.

Ingredient	Weanling Trial %	Finishing Trial %
Soybean meal	32.7	17.0
Corn	62.4	79.5
Dicalcium phosphate	2.2	.9
Limestone	1.2	1.1
Salt	.5	.5
Vitamin mineral premix	<u>1.0</u>	<u>1.0</u>
Total	100.0	100.0

Crude protein	20.0	14.5
Calcium	.9	.6
Phosphorus	.8	.5

Table 7. Effect of pelleting on performance of weanling pigs.

Parameter	Treatment			
	M	MM	NSCP	HSCP
Avg. daily gain, lb ^a	.81	.84	.79	.75
Daily feed, lb ^a	1.62	1.69	1.59	1.50
Feed/gain ^b	2.00	2.01	2.01	2.00
Apparent digestibilities, % ^c				
Dry matter	86.2	--	85.1	85.1
Protein	86.9 ^d	--	85.5 ^{de}	85.2 ^e
Energy	86.9	--	86.0	86.2

^aValues are means of 12 pigs per treatment.

^bValues are means of 3 replications.

^cValues are means of 8 observations.

^{de}Means on the same line without a common superscript are significantly different (P<.05). No superscripts indicate lack of significance among means.

Table 8. Effects of pelleting on performance of grower-finisher pigs.

Parameter	Treatment			
	M	MM	NSCP	HSCP
Avg. daily gain, lb ^a	1.70	1.67	1.85	1.85
Daily feed, lb ^a	5.27	5.01	5.32	5.43
Feed/gain ^b	3.10 ^d	3.00 ^{def}	2.88 ^f	2.93 ^{ef}
Apparent digestibilities, % ^c				
Dry matter	89.9	--	90.1	90.4
Protein	88.1	--	89.2	89.0
Energy	89.7 ^d	--	91.3 ^e	91.1 ^e

^aValues are means of 12 pigs per treatment.

^bValues are means of 4 replications.

^cValues are means of 6 observations.

^{def}Means on the same line without a common superscript are significantly different (P<.05). No superscripts indicate lack of significance among means.