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Abstract

A growth study was conducted to evaluate the possibility of replacing dried skim milk (DSM) with select menhaden fish (SMFM) in a high nutrient density diet. A total of 210, 3wk- old weaned pigs was utilized. Diets were formulated by: 1) replacing 50 or 100% of the DSM with SMFM and maintaining the lactose content of the diet by increasing the dried whey inclusion or 2) by replacing 50 or 100% of the DSM with SMFM and corn. These formulations yielded three diets containing 24% lactose, one diet containing 19% lactose, and one containing 14% lactose. Growth performance was similar on diets containing 19 or 24% lactose, but was depressed (P<.05) on the diet containing 14% lactose. These results indicate that SMFM can be used to replace DSM, but the lactose content of the diet must be considered as well.; Swine Day, Manhattan, KS, November 17, 1988

Keywords

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REPLACING DRIED SKIM MILK WITH SELECT MENHADEN FISH MEAL IN A HIGH NUTRIENT DENSITY DIET

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Summary

A growth study was conducted to evaluate the possibility of replacing dried skim milk (DSM) with select menhaden fish (SMFM) in a high nutrient density diet. A total of 210, 3-wk-old weaned pigs was utilized. Diets were formulated by: 1) replacing 50 or 100% of the DSM with SMFM and maintaining the lactose content of the diet by increasing the dried whey inclusion or 2) by replacing 50 or 100% of the DSM with SMFM and corn. These formulations yielded three diets containing 24% lactose, one diet containing 19% lactose, and one containing 14% lactose. Growth performance was similar on diets containing 19 or 24% lactose, but was depressed ($P<.05$) on the diet containing 14% lactose. These results indicate that SMFM can be used to replace DSM, but the lactose content of the diet must be considered as well.

(Key Words: Pigs, Early Weaning, Fish Meal, Dried Skim Milk, Dried Whey, Lactose.)

Introduction

In the last few years, the cost of dried milk products in general and dried skim milk (DSM) in particular has skyrocketed. These increases, in turn, have increased the cost of starter rations containing dried milk products to the extent that their inclusion rate has had to be decreased in order to satisfy economic considerations. As a consequence of the decreased use of dried milk products, other ingredients are being investigated to replace them. This study was designed to investigate the effect of replacing the DSM in a high nutrient density starter diet with select menhaden fish meal (SMFM).

Procedures

Two hundred ten pigs averaging 3 wk of age and 11.09 lb were moved from a total confinement, farrowing facility to an environmentally controlled nursery. Pigs were housed in pens (4 ft x 5 ft) with woven wire floors over a Y-flush gutter, with one nipple waterer and one four-hole, self-feeder per pen.

A 2-phase starter program was used. Treatments were formulated by replacing DSM in the phase 1 diet (Table 1). The phase 1 diets were fed for 2 wk postweaning then all pigs were switched to the same phase-2 diet (Table 1) for the remaining 3 wk of the trial.

The compositions of the experimental diets are given in Table 1. Phase 1 diets were formulated to contain 19.2% crude protein, 1763 dical/lb digestible energy, 1.40% lysine, 1.0% calcium, and .9% phosphorus. The phase 2 diet was formulated to contain 19% crude protein, 1600 kcal/lb digestible energy, 1.25% lysine, 1.0% calcium and .9% phosphorus.

Diet A, the control diet, contained 20% dried whey (DW) and 20% DSM. Because this diet contained 40% dried milk product, the lactose content was 24%. In diet B, half the DSM was removed, and the DW content was increased to 27.28% to maintain a total of 24% lactose in the diet. To maintain 19.2% crude protein, 3.78% SMFM was added to diet B. In diet C,

all the DSM was removed, and DW inclusion was increased to maintain 24% lactose content, and 7.61% SMFM was added to maintain crude protein at 19.2% In diet D, half of the DSM was removed, but DW was held constant at 20% of the diet, thus, lactose content decreased to 19%. Crude protein content was maintained by addition of 4.43% SMFM. In diet E, all the DSM was removed, but DW content was again held constant at 20%. Consequently, the lactose content of diet E dropped to 14%. As with the other diets, SMFM was added to diet E to maintain 19.2% crude protein. Thus, diets A, B, and C all contained 24% lactose; diet D contained 19% lactose; and diet E contained 14% lactose.

Pigs were blocked by weight and randomly assigned to pens, with 7 pigs/pen and 6 pens/treatment. Each pen was randomly assigned to treatment. The study was conducted for 5 wk. Criteria measured were average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G). Pigs were fed ad libitum. Feeders were checked twice daily, and feed was weighed out and added or weighed back and recorded as necessary. Individual pig weights and feeder weights were collected weekly.

Results and Discussion

Results are given in Table 2. Average daily gains of pigs on diets B, C, and D for the first 2 wk postweaning, as well as for the full 5-wk period, were similar to those with the control diet (diet A). The ADG for pigs on diet E was less than that on the control diet ($P<.05$).

By the end of wk 2, there were no differences between treatment means in ADFI. By the end of wk 5, diets B, C, and D were not different from diet A. However, ADFI of pigs that received diet E for the first 2 wk postweaning was significantly lower than that of pigs on diet A by the end of wk 5.

Feed efficiency for the first 2 wk was similar for diets A, B, C and D, but diet E was significantly ($P<.05$) different from the control diet (diet A). By the end of the trial, there were no differences observed in F/G.

When DSM was partially or totally replaced by SMFM and DW and lactose level was held constant, growth performance was not different from that with the control diet (diet A). When 50% of the DSM was replaced by SMFM and corn and lactose content was reduced to 19%, growth performance was also similar to that with the control diet (diet A). However, when all the DSM was replaced by SMFM and corn and the lactose content of the diet was decreased to 14%, growth performance was depressed ($P<.05$).

It should be noted that the depression in ADG observed in the pigs on diet E by the end of wk 2 continued to be significant even after switching these pigs to the common phase 2 diet. These observations are indicative of the potential impact the phase 1 diet can have on subsequent growth performance.

The results of this study indicate that SMFM can be used in combination with DW to completely replace DSM or SMFM can be used to replace 50% of the DSM in a phase-1, high nutrient density diet. However, the lactose content of the diet must also be considered. In this study, when the lactose level was 14%, growth performance was significantly less than when lactose level was 19 or 24%. Although this study was not designed to evaluate this point, it would appear there is a minimum lactose level necessary to sustain growth performance similar to that with the control diet.

Although the final decision will be based on economic considerations, this study indicates that there are acceptable options available to decrease the amount of DSM in a high nutrient density, starter diet.

Table 1. Composition of Experimental Diets

Ingredient	Phase I					Phase II
	A	B	C	D	E	
Corn	31.09	30.78	30.93	37.43	43.79	56.90
Soybean meal	14.72	14.72	17.72	14.72	14.72	19.70
Dried whey	20.00	27.28	34.29	20.00	20.00	10.00
Dried skim milk	20.00	10.00		10.00		
Soy oil	10.00	9.87	9.62	9.76	9.45	2.40
Select menhaden fish meal		3.78	7.61	4.43	8.90	4.00
Limestone	.45	.32	.19	.35	.33	.32
Dicalcium phosphate	2.08	1.79	1.51	1.76	1.68	2.68
Lysine	.29	.27	.24	.24	.30	.25
Methionine	.10	.10	.10	.10	.10	
Selenium premix	.05	.05	.05	.05	.05	.15
Salt	.30	.26	.10	.30	.30	.25
Copper sulfate	.10	.10	.10	.10	.10	.10
Vitamin premix	.25	.25	.25	.25	.25	.25
Trace mineral premix	.10	.10	.10	.10	.10	.10
Antibiotic	.50	.50	.50	.50	.50	.25

Table 2. The Effects of Replacing Dried Skim Milk in a High Nutrient Density Diet on Growth Performance of Early Weaned Pigs

Item	Period	Unit	Diet				
			A	B	C	D	E
ADG	wk 0 - wk 2[1]	lb	.56[a]	.54[ab]	.53[ab]	.55[a]	.46b
	wk 0 - wk 5[1]	lb	.84[a]	.81[ab]	.81[ab]	.82[ab]	.77[b]
IDFI	wk 0 - wk 2	lb	.50	.53	.49	.53	.47
	wk 0 - wk 5[1]	lb	1.19[ab]	1.17[ab]	1.19[ab]	1.22[a]	1.10[b]
F/G	wk 0 - wk 2[1]	lb	.90[a]	1.00[ab]	.93[ab]	.97[ab]	1.07[b]
	wk 0 - wk 5	lb	1.41	1.45	1.47	1.43	1.43

[1]Means with unlike superscripts are different ($P \leq .05$).