EFFECT OF SELECT MENHADEN FISH MEAL AND DRIED WHEY IN STARTER DIETS FOR PIGS[1]

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Summary

A growth trial was conducted to examine the effects of select menhaden fish meal (SMFM) and dried whey (DW) in starter diets for pigs. A total of 240, 3-wk-old, weaned pigs averaging 12.1 lb were utilized. Pigs did not receive creep feed and were introduced to the experimental diets immediately upon weaning. The trial was conducted for 4 wk. A factorial design with 3 levels of SMFM (0, 4, and 8%) and 2 levels of DW (10 and 20%) was employed. Analysis of the data indicated no SMFM x DW interaction by the end of wk 4. Inclusion of SMFM resulted in a linear response ($P<.01$), improving average daily gain (ADG) and feed efficiency (F/G) by the end of wk 4. Although SMFM increased average daily feed intake (ADFI) ($P<.10$) by the end of wk 2, this effect had dissipated by the end of wk 4. Dried whey had an effect ($P<.01$) on ADG and ADFI, but no effect on F/G by the end of wk 4. These results show that SMFM and DW work well together in starter diets for the early-weaned pig.

Introduction

Weaning pigs at 3 to 4 wk of age has become commonplace in today's intensive-production swine operations. This practice increases the overall production efficiency of the sow herd by increasing the number of litters per sow per year, but it has also resulted in new problems for the producer. The digestive system of a pig weaned at 3 wk of age has not matured. Consequently, some dietary components are not utilized as efficiently as in an older pig. This results in a lag in growth immediately postweaning, which, in turn, may result in less vigorous pigs and increased susceptibility to disease. The challenge is to find nutrient sources that are economical, acceptable to the pig, and compatible with the developmental stage of the digestive system of the early-weaned pig.

Many studies have indicated that fish meal is a good source of protein for the early-weaned pig. Although most studies have demonstrated beneficial results from including fish meal in the diet, some studies have found no differences in performance of pigs fed either fish meal or plant protein sources. It has been suggested that inconsistencies in response are a result of variation in the quality of different fish meals. Acknowledging this as a problem, an effort is being made by manufacturers to identify high quality fish meal through chemical analysis and market a select product of consistent quality. Previous studies have demonstrated a significant improvement in the performance of early-weaned pigs fed diets

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containing a select menhaden fish meal (SMFM). The objective of this study was to examine the effect of SMFM and dried whey (DW) used together in starter diets for early-weaned pigs.

Procedure

The analysis of SMFM used in this study is given in table 1. Experimental diet compositions are given in table 2. All diets were formulated to contain the same level of crude protein, fat, lysine, calcium, phosphorus, and salt.

Two hundred forty pigs averaging 3 wk of age and 12.1 lb were moved from a total confinement, environmentally controlled, farrowing facility into one room of an environmentally controlled nursery. Pigs were not allowed access to creep feed during the lactation period. Pigs were housed in pens 4 ft x 5 ft with woven wire floors over a Y flush gutter and one nipple waterer and one four-hole self feeder per pen. The trial was conducted for 4 wk postweaning. It was terminated because of an outbreak of transmissable gastroenteritis in the adjacent farrowing facility.

Pigs were blocked by weight, litter, and sex and randomly assigned to treatments. Pigs were fed ad libitum. Feeders were checked twice daily. Individual pig weights were collected weekly.

Results and Discussion

Results are given in table 3 (treatment means), table 4 (SMFM main effect means), and table 5 (DW main effect means). With the exception of F/G at the end of week 2, there was no SMFM x DW interaction ($P>.10$); therefore, only the main effects are discussed.

Addition of SMFM resulted in a linear improvement ($P<.01$) in ADG by the end of wk 2, and this effect was maintained through wk 4. Increasing DW from 10 to 20% also improved ADG at wk 2 and wk 4.

SMFM elicited a linear improvement ($P<.10$) in ADFI through the end of wk 2. However, this effect had dissipated by the end of wk 4. Dried whey addition also increased ADFI through the end of wk 2 and this effect was sustained through week 4 ($P<.01$).

Feed efficiency was improved linearly through the end of wk 4 by addition of SMFM to the diet. Dried whey had no effect on F/G.

Results indicate that the SMFM used in this study is an excellent protein source for the early-weaned pig. Addition of 4% SMFM to the 10% DW diet resulted in considerable improvement in starter pig performance, with further additions of SMFM and DW resulting in improvements of diminishing magnitude. Dried whey and SMFM work well together to improve starter pig performance, but economic considerations will determine the levels of each to include in a diet for practical application.

Table 1. Select Menhaden Fish Meal Analysis

Item	Amount
Protein	61.6%
Oil	11.9%
Lysine	4.7%
Methionine	1.9%
Methionine + cystine	2.5%
Calcium	5.4%
Phosphorus	3.2%
Salt	1.0%

Calculated digestible energy = 1872 kcal/lb.

$$\text{Kcal/lb digestible energy} = \frac{[3.06 + (.171)(\%\text{ crude protein}) + (.306)(\%\text{ fat})]}{2.2} \times 239.$$

Table 2. Composition of Experimental Diets[a]

Ingredients	% Dried whey % SMFM	10 0	10 4	10 8	20 0	20 4	20 8
Corn		51.04	54.43	57.74	41.86	45.86	49.50
Soybean meal (44%)		62.50	26.44	20.35	32.60	25.70	19.25
SMFM			4.00	8.00		4.00	8.00
Dried whey		10.00	10.00	10.00	20.00	20.00	20.00
Fat (Soybean Oil)		3.00	2.50	2.00	3.00	2.50	2.00
L-Lysine HCL (Feed grade 98%)		.13	.10	.07			
Selenium		.15	.15	.15	.15	.15	.15
Copper sulfate		.10	.10	.10	.10	.10	.10
Dicalcium phosphate		1.38	.90	.52	.86	.67	.24
Limestone		.79	.52	.21	.83	.42	.16
Trace mineral premix[b]		.10	.10	.10	.10	.10	.10
Salt		.30	.25	.25			
Antibiotic[d]		.25	.25	.25	.25	.25	.25

[a]All diets were formulated to contain: 19.50% crude protein, 1.25% lysine, 1.30% calcium, 1.00% phosphorus.

[b]Containing 5.5% Mn, 10% Fe, 1.1% CU, 20% Zn, 0.15% I, and 0.1% Co.

[c]Each lb of premix contains the following: vitamin A 400,000 IU, Vitamin D 30,000 IU, vitamin E 2,000 IU, riboflavin 450 mg d-pantothenic acid 1,200 mg, choline 40 g, niacin 2,500 mg, B_{12} 2.2 mg, menadione dymethylpyrimidinol bisulfite 250 mg.

[d]110 chlortetracycline; 110 sulphamethazine; 55 g/penicilliln.

Table 3. Effect of SMFM and DW Additions to Starter Diets for Pigs

Item	% Dried Whey % SMFM		10 0	10 4	10 8	20 0	20 4	20 8	SE
ADG,[ab]	lb	wk 0-2	.50	.62	.62	.61	.65	.68	.020
ADG,[ab]	lb	wk 0-4	.73	.85	.86	.86	.88	.90	.018
ADFI[cd]	lb	wk 0-2	.58	.64	.63	.63	.70	.69.	.029
ADFI[a]	lb	wk 0-4	1.03	1.11	1.10	1.15	1.13	1.18	.026
F/G[e]		wk 0-2	1.17	1.02	1.01	1.03	1.06	1.02	.04
F/G[b]		wk 0-4	1.41	1.30	1.27	1.34	1.28	1.30	.02

[a]Dried whey effect P<.01.
[b]SMFM effect P<.01.
[c]Dried whey effect P=.2
[d]SMFM effect P<.10.
[e]Dried whey x SMFM interaction P<.10.

Table 4. Effect of SMFM Additions to Starter Diets for Pigs (SMFM Main Effect Means)

Item			SMFM % 0	 4	 8	SE
ADG,[a]	lb	wk 0-2	.56	.64	.65	.013
ADG,[a]	lb	wk 0-4	.80	.87	.88	.013
ADFI,[b]	lb	wk 0-2	.61	.67	.66	.020
ADFI,	lb	wk 0-4	1.09	1.12	1.14	.018
F/G		wk 0-2	1.10	1.04	1.02	.03
F/G		wk 0-4	1.38	1.29	1.29	.02

[a]SMFM effect P<.01.
[b]SMFM effect P<.10.

Table 5. Effect of DW Additions to Starter Diets for Pigs (DW Main Effect Means)

Item			DW % 10	DW % 20	SE
ADG,[a]	lb	wk 0-2	.58	.65	.011
ADG,[a]	lb	wk 0-4	.81	.88	.011
ADFI,[b]	lb	wk 0-2	.62	.67	.015
ADFI,[a]	lb	wk 0-4	1.08	1.15	.015
F/G		wk 0-2	1.06	1.04	.02
F/G		wk 0-4	1.33	1.31	.01

[a]DW effect P<.01.
[b]DW effect P<.10.

Jim Vawter, right, animal caretaker, and Owen Watowa, student employee, process pigs in the KSU farrowing house.