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Comparison of spray-dried blood meal and fish by-products in the phase II starter pig diet

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COMPARISON OF SPRAY-DRIED BLOOD MEAL AND FISH BY-PRODUCTS IN THE PHASE II STARTER PIG DIET¹

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Summary

A total of 311 weanling pigs (initially 10.9 lb and 17 d of age) was used to compare fish by-products, spray-dried blood meal and combinations of spray-dried blood meal and fish by-products in the phase II (d 7 to 25) diet. Pigs were allotted by weight to one of five experimental treatments with 8 to 11 pigs/pen and seven replications. Pigs were placed on a common phase I diet (d 0 to 7 postweaning) that contained 7.5% spray-dried porcine plasma, 1.75% spray-dried blood meal, and 20% dried whey. The phase I diet was formulated to contain 1.5% lysine, .9% Ca, and .8% P. Pigs were then randomly assigned to one of five dietary treatments. All phase II diets (d 7 to 25 postweaning) contained 10% dried whey and were formulated to contain 1.25% lysine and .36% methionine. The control diet contained 2.5% spray-dried blood meal (SDBM) and 10% dried whey. Select menhaden fish meal (SMFM) and spray-dried fish hydrolysate (SDFH) replaced SDBM on an equal lysine basis at 5% and 4.8%, respectively, and 2.5% SMFM + 1.25% SDBM and 2.0% SDFH + 1.25% SDBM were used in combinations to form the other four dietary treatments. Average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G) were improved with the addition of SDBM in the first week (d 7 to 14) of phase II. No differences were observed in ADG and ADFI for the overall phase II period.

Pigs fed SDBM had poorer F/G (d 7 to 25) compared to pigs fed either SMFM or SDFH. However, SDBM was the most cost effective protein source in this experiment.

(Key Words: Starter Pig, Fish By-Products, Blood Meal.)

Introduction

Previous research has shown that spray-dried blood meal is a cost effective replacement for select menhaden fish meal in the nursery diet for the early-weaned pig. However, other fish by-products are also available. One such product is spray-dried fish protein hydrolysate, which is a by-product derived from fish filleting plants. The fish meal by-product is processed, all bones are removed, and then it is spray-dried. This product is high in lysine and offers an alternative to select menhaden fish meal in the nursery diet. Therefore, the objective of this trial was to compare spray-dried blood meal (SDBM), select menhaden fish meal (SMFM), spray-dried fish hydrolysate (SDFH), and combinations of spray-dried blood meal and the fish by-products in the phase II diet.

Procedures

A total of 311 weanling pigs (initially 10.9 lb and 17 d of age) was allotted by weight to one of five experimental treatments

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with 8 to 11 pigs per pen with seven replications per treatment. Pigs were placed on a common phase I diet (d 0 to 7 postweaning) that contained 7.5% spray-dried porcine plasma, 1.75% spray-dried blood meal, and 20% dried whey (Table 1). The phase I diet was formulated to contain 1.5% lysine, .9% Ca, and .8% P. On d 7, pigs were randomly assigned to one of five dietary treatments. All phase II diets (d 7 to 25 postweaning) contained 10% dried whey and were formulated to contain 1.25% lysine and .36% methionine. The various protein sources were added on an equal lysine basis with inclusion rates of 2.5% SDBM, 5.0% SMFM, 4.18% SDFH, 2.5% SMFM + 1.25% SDBM, and 2.0% SDFH + 1.25% SDBM to form the five treatments. Pigs were fed these diets from d 7 to 25 postweaning. Pigs were housed in an environmentally controlled nursery with metal flooring and were allowed ad libitum access to feed and water. Pigs were weighed and feed disappearance was measured on d 7, 14, and 25 to evaluate average daily gain (ADG), average daily feed intake (ADFI), and feed efficiency (F/G).

Results and Discussion

During phase I (d 0 to 7 postweaning), ADG, ADFI, and F/G were .40 lb, .49 lb, and 1.20, respectively. During the first week of phase II (d 7 to 14 postweaning), pigs fed

the SDBM diet gained faster than pigs fed diets containing SMFM ($P < .01$), SDFH ($P < .03$), and SMFM + SDBM ($P < .06$). Average daily feed intake also was improved ($P < .01$) in the first week of phase II, with pigs receiving SDBM having greater feed intake than those receiving SDFH. Pigs fed SDBM also were more efficient ($P < .02$) during the first week of phase II compared to those receiving SMFM. Spray-dried blood meal appears to a superior protein source in the transition from a phase I diet containing spray-dried porcine plasma and SDBM.

For the overall phase II period (d 7 to 25 postweaning), there were no differences in ADG. Average daily feed intake was improved for pigs receiving SDBM compared to those receiving SDFH ($P < .01$) and SMFM + SDBM ($P < .03$). However, when comparing feed efficiency, pigs receiving SDBM were less efficient than those receiving SMFM ($P < .05$), SDFH ($P < .01$), and SMFM + SDBM ($P < .02$) for the phase II period. In conclusion, spray-dried fish hydrolysate and combinations of fish by-products and spray-dried blood meal appear to be effective protein sources in the phase II diet. However, because of the lower inclusion rate, SDBM is still the most cost effective protein source in the phase II starter diet.

Table 1. Diet Composition^a

Item, %	Phase I ^b	Phase II treatment ^c				
		SDBM	SMFM	SDFH	SMFM + SDBM	SDFH + SDBM
Corn	45.47	58.94	57.46	57.33	58.21	58.13
Soybean meal (48% CP)	15.96	21.03	21.03	21.03	21.03	21.03
Dried whey	20.00	10.00	10.00	10.00	10.00	10.00
Soybean oil	5.00	3.00	3.00	3.00	3.00	3.00
Spray-dried blood meal	1.75	2.50	-	-	1.25	1.25
Select menhaden fish meal	-	-	5.02	-	2.51	-
Spray-dried fish hydrolysate	-	-	-	4.18	-	2.09
Spray-dried porcine plasma	7.50	-	-	-	-	-
Monocalcium phosphate (21% P)	1.91	1.97	1.34	1.93	1.65	1.95
Limestone	.69	.83	.48	.86	.65	.85
Antibiotic ^d	1.00	1.00	1.00	1.00	1.00	1.00
Vitamin premix	.25	.25	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15	.15	.15
L-Lysine HCl	.10	.15	.15	.15	.15	.15
Copper sulfate	.075	.075	.075	.075	.075	.075
DL-methionine	.1	.061	-	.002	.031	.032
Selenium premix	.05	.05	.05	.05	.05	.05
Total	100.00	100.00	100.00	100.00	100.00	100.00

^aDiets were formulated to contain 1.5% lysine, .9% Ca and .8% P in phase I (d 0 to 7) and 1.25% lysine, .9% Ca, .8% P, and .36% methionine in phase II (d 7 to 25).

^bPigs received a common phase I (d 0 to 7) diet.

^cSDBM = spray-dried blood meal, SMFM = select menhaden fish meal, and SDFH = spray-dried fish hydrolysate.

^dProvided 150 g/ton Apramycin in phase I and 50 g/ton Carbadox in phase II.

Table 2. Growth Performance of Pigs Fed Spray-dried Blood Meal and Fish By-products during Phase II (d 7 to 25 Postweaning)^a

Item	Phase II treatment ^b					CV
	SDBM	SMFM	SDFH	SMFM + SDBM	SDFH + SDBM	
<u>d 7 - 14</u>						
ADG, lb ^{cde}	.59	.51	.52	.53	.55	10.80
ADFI, lb ^f	.90	.86	.80	.85	.89	7.94
F/G ^e	1.53	1.76	1.59	1.64	1.69	10.46
<u>d 7 - 25</u>						
ADG, lb	.90	.91	.88	.89	.91	5.53
ADFI, lb ^{fg}	1.12	1.09	1.04	1.05	1.11	5.02
F/G ^{gh}	1.47	1.41	1.38	1.39	1.45	4.42

^aThree hundred and eleven weanling pigs (initially 10.9 lb and 17 days of age), 8 to 11 pigs/pen, 5 pens/treatment.

^bSDBM = spray-dried blood meal, SMFM = select menhaden fish meal, and SDFH = spray-dried fish hydrolysate.

^cSDBM vs SMFM ($P < .02$).

^dSDBM vs SDFH ($P < .03$).

^eSDBM vs SMFM + SDBM ($P < .06$).

^fSDBM vs SDFH ($P < .01$).

^gSDBM vs SMFM + SDBM ($P < .02$).

^hSDBM vs SMFM ($P < .05$).