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Abstract

Pellet durability index was greatest when animal protein products (dried whey, fish meal, spray-dried blood cells, and a porcine coproduct) were used in place of soybean meal. However, no differences occurred in ADG, ADFI, or F/G among segregated early-weaned piglets (10.1 lb) fed the various protein sources.; Swine Day, Manhattan, KS, November 19, 1998

Keywords

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EVALUATION OF A PORCINE COPRODUCT (PRO-BLEND 75®) FROM SLAUGHTER PLANTS AS A PROTEIN SOURCE FOR STARTER PIG DIETS[1]

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Summary

Pellet durability index was greatest when animal protein products (dried whey, fish meal, spray-dried blood cells, and a porcine coproduct) were used in place of soybean meal. However, no differences occurred in ADG, ADFI, or F/G among segregated early-weaned piglets (10.1 lb) fed the various protein sources.

(Key Words: Animal Protein, Soybean Meal, Nursery Pigs.)

Introduction

Diets with high quality protein sources are important parts of maximized growth performance in weanling pigs. Farmland Industries has developed a blended protein source (Pro-Blend 75®) composed of red blood cells, hydrolyzed tissues, and other highly digestible proteins from their porcine slaughter facilities. The objective of the experiment reported herein was to compare this new coproduct with other commonly used protein sources (e.g., dried whey, select menhaden fish meal, and spray-dried blood cells) in diets for weanling pigs.

Procedures

A total of 150 (average initial weight of 10.1 lb) weanling pigs (PIC 327 x C22) was blocked by weight and sex and assigned to pens. There were six pigs/pen and five pens/treatment. Treatments were: 1) corn-soybean meal-based control; 2) dried whey; 3) fish meal; 4) blood cells; and 5) porcine coproduct. The animal protein sources were substituted for soybean meal on a lysine basis (Table 1) and fed for d 0 to 14 of the 28-d growth assay. Total dietary lysine was 1.30 % (i.e., deficient) and the formulations were simple, thus accentuating the effects of differences among the protein sources. All diets had 14.4% lactose and 3% choice white grease. A corn-soybean meal-based diet (formulated to 1.25 % lysine) was fed from d 14 to 28 to see if the Phase I protein sources had carryover effects on growth performance to the end of the nursery period.

The pigs were housed in an environmentally controlled nursery facility. Room temperature was initially 90°F, and the temperature was decreased by .4°F each day thereafter. The pens were 3 ft × 6 ft and equipped with woven wire floors. Each pen had a four-hole self-feeder and a nipple waterer to allow ad libitum intake of feed and water.

The diets were pelleted at 143°F using a 1in.-thick die with 1/8 in.-diameter holes. The diets were conditioned for 10 seconds prior to pelleting and cooled after pelleting in a counter-flow cooler. One-pound samples of the pellets were collected and subsampled to determine pellet durability index (PDI). For the PDI determination, a tumbling box pellet tester was used. Briefly, 500 grams of

[1]Appreciation is extended to the Farmland Research and Development Farm for use of facilities and pigs.

[2]Farmland Industries, Inc.

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the screened pellets were weighed into each of the four compartments of the pellet tester. In two of the boxes, five hexagonal nuts (1/2 in.) were added to further distress the pellets. The box was tumbled for 10 min, and the percentage of the original pellets that would not pass through a No. 8 sieve was used as the expression for pellet durability.

All growth data were analyzed as a randomized complete block design with pen as the experimental unit. Orthogonal contrasts were used to separate treatment means. Response criteria were ADG, ADFI, and F/G.

Results and Discussion

Concentrations of amino acids (Table 2) in the soybean meal, whey, fish meal, and blood cells were similar to values published in the NRC (1998). Also, the analyzed values for the porcine coproduct were similar to the values published by Farmland Industries.

Pellet durability index was improved ($P<.001$) when animal protein products were added to the diet (Table 3). Among the animal protein products, the ranking (from best to worst) for pellet durability index was whey > porcine coproduct > blood cells > fish meal ($P<.001$).

For d 0 to 14, 14 to 29, and overall (d 0 to 29), no differences ($P>.15$) were observed in ADG, ADFI or F/G among pigs fed the various protein sources. However, numerical advantages occurred when animal protein products were used to replace soybean meal. The lack of significant response to animal protein products likely resulted from the very small initial weight of the pigs used in this experiment. An average initial weight of 12 lb was anticipated; however, upon arrival the segregated early-weaned piglets had an average initial weight of only 10.1 lb. Thus, the extremely simple formulations and low lysine concentrations in the diets severely restricted growth performance and may have prevented expression of the superior performance generally associated with use of animal products.

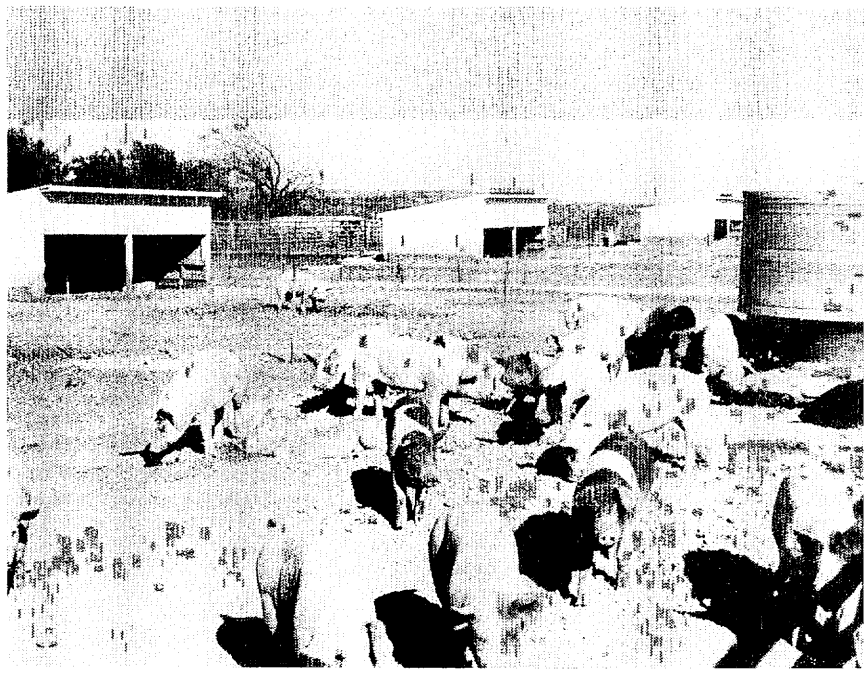

Table 1. Diet Composition[a]

Item	Treatments[b]					
	Soybean meal	Whey	Fish meal	Blood cells	Porcine coproduct	Phase II
Ingredient, %						
Corn	43.53	45.00	46.96	47.83	47.79	61.28
Soybean meal	34.65	28.18	28.18	28.19	28.19	32.16
Whey	-	20.00	-	-	-	-
Fish meal	-	-	3.69	-	-	-
Blood cells	-	-	-	2.07	-	-
Porcine coproduct	-	-	-	-	3.06	-
Lactose[c]	14.40	-	14.40	14.40	14.40	-
Choice white grease	3.00	3.00	3.00	3.00	3.00	3.00
Monocalcium phosphate	1.95	1.45	1.55	2.05	2.05	1.55
Limestone	1.00	.90	.75	.95	1.00	.95
Salt	.35	.35	.35	.35	.35	.35
Vitamin premix	.25	.25	.25	.25	.25	.25
Trace mineral premix	.15	.15	.15	.15	.15	.15
Zinc oxide	.25	.25	.25	.25	.25	-
Lysine HCl	.15	.15	.15	.15	.15	.15
DL-methionine	.07	.07	.07	.11	.11	.03
Antibiotic[d]	.25	.25	.25	.25	.25	.13
Calculated lysine, %	1.30	1.30	1.30	1.30	1.30	1.25
Analyzed lysine, %	1.28	1.26	1.27	1.27	1.29	1.26

[a]Calcium and P were .85% and .75% in phase I and .75% and .70% in Phase II.
[b]Dehulled soybean meal was supplied by Archer Daniels Midland Company, Kansas City, MO; edible dried whey was supplied by Beatrice Cheese, Inc., Waukasha, WI; Select Menhaden Fish Meal was supplied by Zapata Protein USA, Mandeville, LA; blood cells (AP 301) were supplied by American Protein Corporation, Manning, IA; porcine coproduct (Pro-Blend 75®) were supplied by Farmland Industries, Inc., Kansas City, MO.
[c]International Ingredient Corporation, St. Louis, MO.
[d]Provided 50 g/ton carbadox.

Table 2. Amino Acid Compositions of the Protein Sources (As-Fed Basis)[a]

Amino Acid	Soybean Meal	Whey	Fish Meal	Blood Cells	Porcine Coproduct
Essential					
Arginine	3.39	.24	3.73	3.69	4.01
Histidine	1.28	.19	1.52	7.02	3.01
Isoleucine	2.15	.59	2.44	.39	1.79
Leucine	3.69	1.02	4.27	12.21	6.63
Lysine	2.96	.84	4.73	7.95	6.15
Methionine	.68	.14	1.65	.69	.84
Phenylalanine	2.43	.33	2.36	6.25	3.44
Threonine	1.86	.62	2.44	2.75	2.49
Tryptophan	.70	.16	.64	1.53	.38
Valine	2.26	.56	2.94	8.37	4.59
Nonessential					
Alanine	2.05	.48	3.77	7.29	5.32
Aspartic acid	5.29	1.01	5.31	10.32	6.67
Cysteine	.74	.23	.55	.71	.71
Glutamic acid	8.51	1.70	7.40	7.10	8.35
Glycine	1.96	.21	4.23	4.25	6.61
Hydroxyproline	.05	.00	.81	.00	1.87
Proline	2.38	.58	2.72	3.24	4.60
Serine	2.18	.42	1.97	3.24	2.73
Taurine	.03	.09	.59	.03	.19
Tyrosine	1.73	.29	1.89	1.98	1.87

[a]Dehulled soybean meal was supplied by Archer Daniels Midland Company, Kansas City, MO; edible dried whey was supplied by Beatrice Cheese, Inc., Waukasha, WI; Select Menhaden Fish Meal was supplied by Zapata Protein USA, Mandeville, LA; blood cells (AP 301) were supplied by American Protein Corporation, Manning, IA; porcine coproduct (Pro-Blend 75®) were supplied by Farmland Industries, Inc., Kansas City, MO.

Table 3. Growth Performance of Weanling Pigs Fed Starter Diets with Various Protein Sources[a]

	Treatments						Contrast, P < [b]			
Item	Soybean meal	Whey	Fish meal	Blood cells	Porcine coproduct	SE	1	2	3	4
Pellet durability index, %[c]										
w/o nuts	78.3	98.3	73.7	85.0	91.0	.31	.001	.001	.001	.001
w/nuts	55.2	96.2	49.4	65.2	81.0	1.09	.001	.001	.001	.001
Phase I (d 0 to 14)										
ADG, lb	.31	.34	.30	.32	.29	.21	-[e]	-	-	-
ADFI, lb	.47	.48	.46	.46	.44	.02	-	-	-	-
F/G	1.55	1.44	1.54	1.42	1.51	.06	-	-	-	-
Phase II (d 14 to 29)[d]										
ADG, lb	.75	.83	.79	.81	.79	.04	-	-	-	-
ADFI, lb	1.13	1.17	1.19	1.19	1.15	.04	-	-	-	-
F/G	1.50	1.42	1.51	1.46	1.46	.05	-	-	-	-
Overall (d 0 to 29)										
ADG, lb	.54	.59	.55	.58	.55	.02	-	-	-	-
ADFI, lb	.81	.84	.84	.83	.80	.03	-	-	-	-
F/G	1.52	1.43	1.52	1.45	1.47	.04	-	-	-	-

[a]A total of 150 barrows and gilts (avg initial wt of 10.1 lb) were allotted with six pigs/pen and five pens/trt.
[b]Contrasts were: 1) SBM vs others; 2) whey vs others; 3) fish meal vs blood products; and 4) blood cells vs porcine coproduct.
[c]Pellet durability index was determined with 500 g samples of screened pellets placed in tumbling boxes with or without 5 hexagonal nuts.
[d]The Phase II diet was fed to all pigs for d 14 to 29.
[e]Dashes indicate P>.15.