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Effects of increasing PEP-NS on nursery pig performance

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Effects of Increasing PEP-NS on Nursery Pig Performance¹

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Summary

A total of 180 nursery pigs (PIC 1050, initially 14.2 lb and 28 d of age) were used in a 24-d study to evaluate the effects of increasing PEP-NS on nursery pig performance. PEP-NS is a combination of porcine intestinal mucosa and by-products of corn wet-milling. There were 5 pigs per pen and 6 pens per treatment. There were 6 dietary treatments: a negative control containing no specialty proteins, the negative control diet with 3, 6, 9, or 12% PEP-NS, or the negative control with 6% select menhaden fish meal (SMFM). The diet with 6% SMFM contained the same amount of soybean meal as the diet with 6% PEP-NS. A common pretest diet was fed in pellet form for the first 7 d post weaning. Experimental diets were fed in meal form from d 0 to 14, and a common diet was fed from d 14 to 24. From d 0 to 14, increasing PEP-NS increased (quadratic, $P < 0.01$) ADG, ADFI, and F/G, with the greatest response observed in pigs fed 9% PEP-NS. There were no differences ($P > 0.10$) between pigs fed 6% PEP-NS or 6% SMFM. When pigs were fed a common diet from d 14 to 24, there were no differences in performance between treatments. Overall, from d 0 to 24, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG and F/G, with the greatest improvement seen as PEP-NS increased from 3 to 6%. These results suggest that feeding 6% to 9% PEP-NS in Phase 2 nursery pig diets is suitable replacement for 6% SMFM.

Key words: fish meal, PEP-NS, nursery pig

Introduction

Previous research conducted at Kansas State University (Myers et al., 2010⁵) found that diets containing Peptone products can be used as specialty protein sources to replace select menhaden fish meal in Phase 2 nursery pig diets. Previously tested mucosal products have utilized either enzymatically processed vegetable proteins or soy proteins as carriers. A new and more economical mucosal product, PEP-NS, has recently been developed. It uses by-products from corn wet-milling as its carrier. Despite the different carrier, PEP-NS has shown similar results to those of previously tested mucosal products, PEP2+ and Peptone 50 (Myers et al., 2010⁵). Because PEP-NS is a relatively new mucosal product, little is known about the ideal dietary level to optimize growth performance. Therefore, the objective of this study was to evaluate the effects of increasing PEP-NS on nursery pig performance.

¹ Appreciation is expressed to Tech Mix Inc, Stewart, MN, and Midwest Ag Enterprises, Marshall, MN, for providing the PEP products and partial financial support.

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⁴ Midwest Ag Enterprises, Marshall, MN.

⁵ Myers et al., Swine Day 2010, Report of Progress 1038, pp 35-43.

Procedures

The Kansas State University (K-State) International Animal Care and Use Committee approved the protocol used in this experiment. The study was conducted at the K-State Segregated Early Weaning Facility in Manhattan, KS.

Diets were formulated with NRC (1998⁶) values for the SMFM and values provided by the manufacturer for the PEP-NS (Table 1). Samples of the SMFM and PEP-NS were collected and analyzed for amino acid profile, and values were similar to formulated values.

A total of 180 nursery pigs (PIC 1050, initially 14.2 lb and 28 d of age) were used in a 24-d study to evaluate the effects of SMFM and PEP-NS on nursery pig performance. After arrival at the nursery facility, pigs were fed a common pretest diet (Table 2) for the first 7 d after weaning. Pigs were then allotted to 1 of 6 dietary treatments. There were 5 pigs per pen and 6 pens per treatment. Pigs were provided ad libitum access to feed and water via a 4-hole dry self-feeder and a cup waterer in each pen (4 × 4 ft).

The 6 dietary treatments included: negative control containing no specialty protein products, the negative control diet with 3, 6, 9, or 12% PEP-NS, or the negative control with 6% SMFM (Table 3). Treatment diets were fed in meal form from d 0 to 14. From d 14 to 24, all pigs were fed a common diet. Average daily gain, ADFI, and F/G were determined by weighing pigs and measuring feed disappearance on d 0, 7, 14, and 24.

Data were analyzed as a completely randomized design with pen as the experimental unit. Analysis of variance was performed using the MIXED procedure in SAS (SAS Institute, Inc., Cary, NC). Contrast statements used were: (1) linear and quadratic effects of increasing PEP-NS, and (2) 6% PEP-NS vs 6% SMFM.

Results and Discussion

From d 0 to 14, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG, ADFI, and F/G, with the greatest improvement observed in pigs fed 9% PEP-NS. There were no differences observed between pigs fed the diet with 6% SMFM and 6% PEP-NS. From d 14 to 24, there were no differences in ADG, ADFI, or F/G observed in pigs previously fed increasing PEP-NS.

Overall, pigs fed increasing PEP-NS had improved (quadratic; $P < 0.01$) ADG and F/G, with the greatest improvement observed in pigs fed 6% PEP-NS. Additionally, pigs fed increasing PEP-NS tended to have increased ($P < 0.10$) ADFI. There were no differences observed between pigs fed 6% PEP-NS and those fed 6% SMFM.

These results suggest that 6 to 9% PEP-NS is a suitable replacement for fish meal in Phase 2 nursery pig diets. The greatest improvement in ADG, feed intake, and F/G were seen as PEP-NS increased from 0 to 6% in the diet.

6 NRC. 1998. Nutrient Requirements of Swine, 10th Ed. Natl. Acad. Press, Washington, D.C.

Table 1. Analyzed nutrient composition of ingredients

Item	Fish meal		PEP-NS ¹	
	Formulated ^{2,3,5}	Analyzed	Formulated ⁴	Analyzed
CP, %	62.90	62.99	47.50	49.20
Amino Acids, %				
Cystine	0.50 (88)	0.49	0.62 (68)	0.49
Isoleucine	2.42 (94)	2.42	2.06 (83)	2.16
Leucine	4.27 (94)	4.28	3.44 (72)	3.78
Lysine	4.57 (95)	4.67	3.50 (83)	3.44
Methionine	1.66 (94)	1.55	0.97 (86)	0.95
Threonine	2.32 (88)	2.56	2.06 (77)	2.05
Tryptophan	0.59 (88)	0.56	0.59 (83)	0.67
Valine	2.82 (93)	2.78	2.56 (81)	2.60

¹ PEP-NS (Tech Mix, Stewart, MN, and Midwest Ag Enterprises, Marshall, MN).

² Diets were prepared using the formulated values.

³ Nutrient values from NRC (1998).

⁴ Nutrient values provided by the manufacturer.

⁵ () indicate standardized ileal digestible amino acid coefficients (%) used in diet formulation.

Table 2. Composition of diets (as-fed basis)^{1,2}

Ingredient, %	Pre-test diet	PEP-NS					6% SMFM	Common diet
		0%	3%	6%	9%	12%		
Corn	38.50	53.70	53.90	53.45	38.36	38.35	38.31	62.80
Soybean meal, (46.5% CP)	25.00	31.55	28.30	25.85	22.20	22.19	22.21	32.25
Spray-dried animal plasma	5.00	---	---	---	---	---	---	---
Select menhaden fish meal	---	---	---	---	---	---	6.00	---
PEP-NS ³	---	---	3.00	6.00	9.00	12.00	---	---
Spray-dried whey	25.00	10.00	10.00	10.00	10.00	10.00	10.00	---
Soybean oil	3.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Monocalcium P, (21% P)	1.18	1.20	1.18	1.15	1.10	1.08	0.43	1.25
Limestone	1.03	0.88	0.93	0.93	0.98	1.00	0.48	1.05
Salt	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Zinc oxide	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Trace mineral premix	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
L-lysine HCl	0.16	0.33	0.33	0.30	0.28	0.25	0.17	0.33
DL-methionine	0.13	1.6	0.16	0.15	0.15	0.14	0.09	0.14
L-threonine	0.03	0.13	0.14	0.13	0.12	0.11	0.08	0.13
Phytase ⁴	---	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Total		100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis								
Standardized ileal digestible amino acids, %								
Lysine	1.40	1.30	1.30	1.30	1.30	1.30	1.30	1.26
Isoleucine:lysine	59	61	60	60	60	61	64	61
Methionine:lysine	29	34	35	35	35	35	35	34
Met & Cys:lysine	58	58	58	58	58	58	58	59
Threonine:lysine	63	63	63	63	63	63	63	63
Tryptophan:lysine	18.9	17.4	17.1	17.1	17.1	17.1	17.6	17.5
Valine:lysine	69	66	66	67	68	69	71	68
Total lysine, %	1.55	1.44	1.45	1.46	1.46	1.47	1.44	1.39
CP, %	22.1	20.9	20.9	21.1	21.3	21.5	21.9	20.8
ME kcal/lb	1,551	1,512	1,512	1,511	1,511	1,510	1,529	1,519
Ca, %	0.90	0.75	0.76	0.75	0.75	0.75	0.75	0.76
P, %	0.79	0.69	0.69	0.68	0.68	0.67	0.68	0.66
Available P, %	0.55	0.47	0.47	0.47	0.47	0.47	0.47	0.34

¹ A total of 180 nursery pigs (initial BW 14.2 lb) were used in a 24-d trial to determine the effects of increasing PEP-NS on nursery pig growth performance.

² The pretest diet was a common diet fed the first 7 days post weaning.

³ Tech Mix, Stewart, MN, and Midwest Ag Enterprises, Marshall, MN.

⁴ Phyzyme 600 (Danisco Animal Nutrition, St. Louis, MO) provided 231 FTU/lb, with a release of 0.10% available P.

Table 3. Effects of increasing PEP-NS on nursery pig performance¹

Item	PEP-NS					6% SMFM	SEM	Probability, <i>P</i> <		
	0%	3%	6%	9%	12%			Linear	Quadratic	6% PEP-NS vs. 6% SMFM
d 0 to 14										
ADG, lb	0.44	0.64	0.78	0.82	0.72	0.77	0.026	<0.0001	<0.0001	0.91
ADFI, lb	0.79	0.88	0.96	1.00	0.90	0.99	0.030	0.01	0.01	0.52
F/G	1.83	1.39	1.24	1.22	1.26	1.28	0.035	<0.0001	<0.0001	0.38
d 14 to 24										
ADG, lb	1.18	1.12	1.19	1.12	1.12	1.20	0.049	0.44	0.95	0.89
ADFI, lb	1.67	1.59	1.68	1.63	1.61	1.73	0.052	0.61	0.95	0.63
F/G	1.42	1.44	1.41	1.46	1.44	1.44	0.040	0.64	0.99	0.51
d 0 to 24										
ADG, lb	0.81	0.88	0.99	0.97	0.92	0.99	0.030	0.01	0.01	0.95
ADFI, lb	1.23	1.24	1.32	1.32	1.26	1.36	0.036	0.27	0.10	0.46
F/G	1.52	1.42	1.35	1.36	1.37	1.38	0.029	0.01	0.01	0.41

¹ A total of 180 nursery pigs (initial BW 14.2 and 28 d of age) were used in a 24-d trial to determine the effects of increasing PEP-NS on nursery pig growth performance. There were 5 pigs per pen with 6 pens per treatment.