COMPARISON OF INTERNATIONAL PROTEIN CORPORATION 740 FISH MEAL AND SPECIAL SELECT™ MENHADEN FISH MEAL IN NURSERY PIG DIETS

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Summary

One hundred and seventy five pigs (initially weighing 14.1 lb and 17 ± 2 d of age) were used in a 21-d growth assay to compare performance of pigs fed two sources of Menhaden fish meal. Overall, there was no difference in growth performance between the two fish meal sources. For the first 14 days ADG and F/G were improved by including fish meal in the diet and as the level increased from 2.5 to 5%. However, in the third week (day 14 to 21) of the trial there was no benefit in adding fish meal to the diet. These results indicate that IPC 740 fish meal can be an effective replacement for Special Select™ Menhaden fish meal in nursery diets.

(Key Words: Starter Pigs, Fish Meal, Performance.)

Introduction

Switching nutrient sources from milk to complex carbohydrates, proteins, and fats often causes a reduction in performance as a result of low food intake and poor digestion. Fish meal is traditionally recognized as a digestible protein source with a high content of amino acids that help stimulate feed intake. However, the quality of fish meal varies depending on the type and species of fish, the freshness of the fish before processing, and the processing of the meal. Evaluation of the nutritional value of the fish meal from different sources and different processing will improve the accuracy with which fish meal is added to young pigs' diets.

Select Menhaden fish meal is currently considered a high quality protein source for nursery pig diets. "Special Select™" menhaden fish meal is a common source used in starter diets in the U.S. If additional sources of fish meal were found to be as effective as Special Select™, this would provide other options for feed manufacturers and producers in diet formulations. Therefore, our objective was to compare the effects of increasing levels of IPC 740 (International Proteins Corporation, St. Paul, MN) and Special Select™ Menhaden (Omega Proteins, Hammond, LA) fish meals in starter diets.

Procedures

A total of 175 pigs (initially 14.1 lb and 17 ± 2 d of age) were blocked by weight and allotted to one of five dietary treatments. There were five pigs/pen and seven pens/treatment. Pigs were housed at the Kansas State University Segregated Early Weaning Facility. Each pen was 4 × 4 ft and contained one self-feeder and one nipple waterer to provide ad libitum access to feed and water.

All pigs were fed a common segregated early weaning (SEW) diet in pellet form, for four days after weaning before going on dietary treatments. Dietary treatments were fed in meal form. Diets were formulated to contain 1.40% lysine, 0.84% Ca and 0.49% available phosphorous. In addition, 10% spray dried whey, 3% soybean oil and 0.13% crystalline lysine were added to all treatment diets. The ratio of methionine & cysteine and threonine to lysine were held constant at 57 and 63%, respectively. There were 5 experimental diets with a control diet and increasing fish meal (2.5 or 5%) from two fish meal sources (International Proteins Corporation and Omega). The fish meal partially replaced

soybean meal as a protein source in the diets. Samples of both fish meal sources were analyzed for protein, amino acids, calcium and phosphorous (Table 2). Average daily gain (ADG), ADFI and feed efficiency were determined by weighing pigs and measuring feed disappearance on day 7, 14 and 21 of the trial (Table 3).

Data were analyzed as a randomized complete block design with pen as the experimental unit. Pigs were blocked based on weaning weight, and analysis of variance was done using the GLM procedure of SAS.

Table 1. Composition of Experimental Diets (As-Fed Basis)

	Fish Meal, %		
Ingredient, %	0	2.5	5.0
Corn	46.25	48.40	50.56
Soybean meal (46.5%)	36.14	31.98	27.81
Soybean oil	3.00	3.00	3.00
Monocalcium phosphate (21% P)	1.65	1.33	1.00
Limestone	0.85	0.70	0.55
Salt	0.25	0.25	0.25
Vitamin premix	0.25	0.25	0.25
Trace mineral premix	0.15	0.15	0.15
Mecadox	1.00	1.00	1.00
Zinc oxide	0.25	0.25	0.25
Lysine HCl	0.13	0.13	0.13
DL-methionine	0.08	0.07	0.06
Fish meal[a]	0.00	2.50	5.00
Spray dried whey	10.00	10.00	10.00
Total	100.00	100.00	100.00
Calculated Analysis			
Lysine, %	1.40	1.40	1.40
Isoleucine:lysine ration, %	68	66	65
Leucine:lysine ratio, %	135	134	132
Methionine:lysine ratio, %	30	31	31
Met & Cys:lysine ratio, %	57	57	57
Threoine:lysine ratio, %	62	62	62
Tryptophan:lysine ratio, %	20	19	19
Valine:lysine ratio, %	76	75	74
ME, kcal/lb	1525	1532	1540
Protein, %	21.9	21.8	21.6
Calcium, %	0.84	0.84	0.84
Phosphorus, %	0.80	0.78	0.77
Available phosphorus, %	0.49	0.49	0.49
Lysine:calorie ratio, g/mcal	4.17	4.14	4.12

[a]IPC 740 or Special Select™ fish meal.

Results and Discussion

The analyzed essential amino acids were slightly higher in the IPC fish meal compared to the Special Select™ Menhaden fish meal (Table 2). Expected lysine concentrations for Menhaden fish meals as listed in the NRC (1998) is 4.81%. The higher essential amino acid content in the IPC fish meal did not increase performance over the Special Select™ Menhaden. This may be due to diet formulations being at or above the pigs' nutrient requirements for the feeding period.

For day 0 to 7, there were no differences ($P>0.10$) between treatments in ADG, ADFI and F/G. There was a numerical trend ($P<0.06$) for increased ADG when adding fish meal to the diet. From day 7 to 14, there was an improvement ($P<0.05$) in ADG when adding fish meal to the diet. Pigs fed diets containing fish meal had numerically higher ADFI and better feed efficiency. From day 0 to 14, ADG improved linearly ($P<0.05$) as the level of fish meal in the diet increased. There was no difference in performance between the two sources of fish meal (IPC 740 or Special Select™ Menhaden) for the duration of the trial.

In the third week (day 14 to 21) of the trial, there was no benefit in adding fish meal to the diet, as pigs on the control diet had similar ADG and better F/G ($P<0.04$) than those fed the diets containing fish meal. For the overall trial, there was no difference ($P>0.10$) in ADG, ADFI, or F/G. At the end of week 2, pigs fed the diets containing 5% fish meal had a one pound advantage in weight over the control-fed pigs, which they maintained to the end of the experiment on day 21.

The best response to adding fish meal to the diet was obtained for the first 14 days of the test. This is as expected and coincides with the time when fish meal would be used in diets in commercial production. There was no benefit to adding fish meal during the last week of the experiment. This is not surprising as the response to specialty protein sources declines with time postweaning. The response illustrates the importance of phase feeding in the nursery. Once the benefit to complex protein sources is no longer evident, they should be removed from the diet. The results of this trial agree with the work conducted by Land O'Lakes (Webster City, IA). They found no difference in performance during the first two weeks after weaning when they compared three sources of fish meal—Special Select™, IPC 790 and IPC 700 included at 6% of the diet. Based on the performance data from this study, IPC and Special Select™ can be used interchangeably in diet formulation.

Table 2. Chemical Analysis of Two Fish Meals (As-Fed Basis)[a]

Item, %	Special Select™	IPC
Crude protein	64.25	65.2
Calcium	4.56	3.14
Phosphorus	2.82	2.11
Amino acids		
Alanine	3.81	3.82
Arginine	3.63	3.65
Aspartic acid	5.35	5.54
Cysteine	0.51	0.54
Glutamic acid	8.20	7.84
Glycine	4.51	3.92
Histidine	1.41	1.71
Hydroxylysine	0.22	0.26
Hydroxyproline	1.10	0.71
Isoleucine	2.37	2.43
Leucine	4.21	4.59
Lysine	4.48	4.95
Methionine	1.62	1.74
Ornithine	0.10	0.09
Phenylalanine	2.29	2.41
Proline	3.01	2.71
Serine	2.20	2.08
Taurine	0.49	0.51
Threonine	2.43	2.56
Tryptophan	0.66	0.74
Tryosine	1.81	1.94
Valine	2.85	2.84

[a]As fed values represent a single analysis of one batch of each fish meal.

Table 3. Effect of Source and Level of Fish meal on Performance of Early Weaned Pigs[a]

							Probability, P<					
		IPC		Special Select™			IPC		Special Select		Control vs.	IPC vs.
Item	Control	2.5%	5%	2.5%	5%	SEM	Linear	Quadratic	Linear	Quadratic	Fish Meal	Select
D 0 to 7												
ADG, lb	0.38	0.42	0.42	0.34	0.43	0.03	0.31	0.51	0.22	0.06	0.47	0.19
ADFI, lb	0.51	0.57	0.57	0.49	0.55	0.03	0.22	0.41	0.43	0.34	0.35	0.13
F/G	1.37	1.36	1.37	1.50	1.36	0.06	0.97	0.94	0.91	0.10	0.69	0.36
D 7 to 14												
ADG, lb	0.47	0.54	0.58	0.56	0.57	0.03	0.03	0.87	0.05	0.38	0.03	0.86
ADFI, lb	0.76	0.84	0.81	0.83	0.87	0.05	0.46	0.31	0.10	0.84	0.14	0.61
F/G	1.63	1.61	1.43	1.50	1.53	0.09	0.11	0.47	0.41	0.49	0.25	0.99
D 0 to 14												
ADG, lb	0.43	0.48	0.50	0.45	0.50	0.03	0.04	0.63	0.04	0.63	0.05	0.53
ADFI, lb	0.63	0.71	0.69	0.66	0.71	0.04	0.31	0.30	0.15	0.78	0.18	0.73
F/G	1.50	1.49	1.39	1.48	1.43	0.06	0.18	0.51	0.42	0.82	0.44	0.76
D 14 to 21												
ADG, lb	1.12	1.09	1.08	1.07	1.12	0.05	0.55	0.79	0.99	0.36	0.54	0.80
ADFI, lb	1.40	1.40	1.46	1.39	1.48	0.06	0.48	0.72	0.35	0.52	0.61	0.93
F/G	1.25	1.29	1.36	1.31	1.32	0.03	0.01	0.72	0.10	0.49	0.04	0.62
D 0 to 21												
ADG, lb	0.66	0.68	0.70	0.65	0.71	0.03	0.33	0.89	0.19	0.38	0.37	0.81
ADFI, lb	0.89	0.94	0.95	0.90	0.97	0.04	0.35	0.67	0.19	0.63	0.29	0.88
F/G	1.35	1.38	1.37	1.38	1.37	0.03	0.71	0.54	0.74	0.53	0.50	0.98
Weight, lb												
D 0	14.13	14.13	14.14	14.16	14.14	0.02	0.87	0.92	0.87	0.38	0.71	0.55
D 7	16.78	17.09	17.08	16.51	17.14	0.21	0.32	0.53	0.23	0.08	0.46	0.22
D 14	20.09	20.83	21.17	20.43	21.15	0.36	0.04	0.64	0.05	0.68	0.06	0.56
D 21	27.94	28.43	28.73	27.89	29.01	0.56	0.33	0.90	0.19	0.40	0.37	0.83

[a]Means represent a total of 175 pigs, 5 pigs/pen and 7 pens/treatment.