

Total replacement of fish meal by meat and bone meal and poultry byproduct meal in growth performance of growing - finishing hogs.

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Abstract

A total of 264 hogs (60 days of age mixed sex) were fed grower / finisher diets containing 5% fish meal (FM), 6% meat and bone meal (MBM) or 5% poultry byproduct meal (PBM) for 112 days. All diets were formulated to similar nutrient specifications, and were fed in meal form ad lib. There was an outbreak of diarrhea during the grower phase, which slowed the growth particularly for the MBM group. However, the overall performance (weight gain, feed intake, feed conversion) was not different among diets. Results from the present study indicated that fish meal in grower and finisher diets can be totally of replaced by MBM and PBM without any negative effect on growth performance. Substitution showed result in 5-10% reduction in feed cost.

	Protein Source		
	FM ¹	MBM ²	PBM ³
<u>Formulation</u>			
FM ¹	5	-	-
MBM ²	-	6	-
PBM ³	-	-	5
SBM ⁴	16	16.7	16
<u>Analysis</u>			
C. Protein(%)	17	17	17
ME	3200	3200	3200
Dig lysine (%)	.95	.95	.95
<u>112 Days Performance</u>			
Avg. daily gain (g)	660	646	653
Feed /gain	2.8	2.86	2.83
Diarrhea (%)	2.15	3.37	2.68
¹ Fish meal	² Meat and bone meal	³ Poultry byproduct meal	
⁴ Soybean meal			

Introduction

Fax most Asian countries, fish meal has long been regarded as the most preferred protein ingredient in hog diets. However, the uncertainty about cost, a supply and quality of fish meal (FM) has gently encouraged feed industry to explore FM

alternatives. Meat and bone meal (MBM) and PBM are high quality animal proteins and are suitable for replacing FM in hog feeds. Although feeding trials designed to illustrate the feasibility of replacing FM with MBM and PBM have been conducted in Western countries, using MBM and PBM in hog diets is novel to Vietnamese feed industry. The purpose of the present study is to demonstrate the feasibility of P replacing FM with US MBM and PBM in hog grower and finisher feeds under Vietnamese farming condition.

Materials and Methods

Diets

Three Growers and three Finishers (Tables 1 and 2) were formulated to their common nutrient specifications but varying in the source of animal protein ingredients (FM, MBM and PBM). Fish meal was substituted with MBM and PBM on an equal protein basis. Nutrients levels for all feeds met pigs requirements and recommended by NRC (1998). Diets were fed I meal form three times daily ad lib.

Pigs

A total of 264 cross bred (DxYxL) of 60 days old with an average initial weight of 21 kg were randomly allocated to 12 pens (11 barrows and 11 gilts/pens). Four pens were randomly assigned to each treatment.

Performance measurements

Pigs were weighed individually at beginning, and end of grower phase (8 wks) and the end of finisher phase (16 wks). Feed consumption was measured on a per pen basis weekly. Health related problems (e.g. diarrhea) was recorded daily. All data were analyzed statistically for difference between dietary treatments.

Table 1. Formulation and analysis of hog grower diets

INGREDIENTS	Protein Source		
	FM ¹	MBM ²	PBM ³
Rice bran	100	70	100
Cassava	80	80	80
Premix	3	3	3
Soybean meal 47% CP	159	167	159
L-Lysine	0.5	1.2	1.4
Salt	4.1	4.8	5.2
Limestone	15	11.6	13.9
Enzyme	1	1	1
DCP	2.3	1.3	3.4
Corn	585	600	583
Colistine 10%	0.1	0.1	0.1
FM¹ 63% CP	50	-	-
MBM²	-	60	-
PBM³	-	-	50
Total	1000	1000	1000
NUTRIENT COMPOSITION			
Dry matter (%)	88	88	88
ME (Kcal/kg)	3200	3200	3200
Protein (%)	17	17	17
Fat (%)	4.46	4.62	4.76
Fibre (%)	3.68	3.67	3.79
Ca (%)	1	1	1
P Total (%)	0.6	0.6	0.6
Lysine (%)	0.95	0.95	0.95
Met + Cys (%)	0.61	0.60	0.60
Threonine (%)	0.64	0.62	0.61
Tryptophan (%)	0.18	0.18	0.18
NaCl (%)	0.5	0.5	0.5
P Avail (%)	0.35	0.33	0.33
Methionine (%)	0.32	0.30	0.30

¹Fish meal

²Meat and bone meal

³Poultry byproduct meal

Table 2. Formulation and analysis of hog finisher diets

INGREDIENTS	Protein Source		
	FM ¹	MBM ²	PBM ³
Rice bran	199	114	220
Cassava	200	200	200
Premix	3	3	3
Soybean meal 47% CP	105	118	102
L-Lysine	0.6	1.2	1.6
Salt	3	4.7	5.3
Limestone	16	12	15
Enzyme	1	1	1
DCP	1.3	1	1
Corn	421	485	401
Colistine 10%	0.1	0.1	0.1
FM¹ 63% CP	50	-	-
MBM²	-	60	-
PBM³	-	-	50
Total	1000	1000	1000
NUTRIENT COMPOSITION			
Dry matter (%)	88	88	88
ME (Kcal/kg)	3100	3100	3100
Protein (%)	14.5	14.5	14.5
Fat (%)	5.18	4.84	5.68
Fibre (%)	4.26	3.81	4.55
Ca (%)	1	1	1
P Total (%)	0.6	0.6	0.6
Lysine (%)	0.8	0.8	0.8
Met + Cys (%)	0.53	0.52	0.51
Threonine (%)	0.53	0.52	0.5
Tryptophan (%)	0.15	0.14	0.14
NaCl (%)	0.5	0.5	0.5
P Avail (%)	0.32	0.33	0.30
Methionine (%)	0.29	0.28	0.27

¹Fish meal²Meat and bone meal³Poultry byproduct meal

Results

Performance data are presented in Table 3. It was apparent that feed consumption and weight gain were greatly reduced for the MBM group during the grower phase resulting from diarrhea problem. However, after treatments of proper medications (Norfloxacin by injection), hogs recovered satisfactorily as evidenced by compensatory performance during the finishing phase. The overall growth performance was not different ($P>.05$) among the three protein sources. Total feed

consumed and feed conversion ratios were also not affected by protein sources which would suggest that there was no apparent palatability problems associated with MBM or PBM.

For reasons not associated with source of protein, MBM group had greater incidence of diarrhea. However, there was no mortality reported from any of the treatments.

Table 3. Growth performance data from pigs fed FM, MBM or PBM grower/finisher diets

INGREDIENTS	Protein Source			
	FM ¹	MBM ²	PBM ³	P
Number of pigs	88	88	88	
Initial Weight (kg)	21.15 ± 0.2	21.13 ± 0.2	21.18 ± 0.2	0.982
At grower stage				
Weight at Grower (kg)	53.89 ± 0.4 ^a	50.85 ± 0.2 ^c	52.05 ± 0.4 ^b	0.001
WG Grower (kg)	32.74 ± 0.3 ^a	29.72 ± 0.1 ^c	30.87 ± 0.2 ^b	0.001
Daily Grower period (gr)	584.5 ± 4.7 ^a	530.6 ± 2.4 ^c	551.3 ± 4.0 ^b	0.001
FC Grower period (kg)	83.75 ± 2.99	81.25 ± 0.65	82.63 ± 0.48	0.194
FCR Grower period (kg)	2.56 ± 0.08 ^b	2.73 ± 0.01 ^a	2.68 ± 0.04 ^{ab}	0.003
Daily feed intake (gr.)	1496 ± 53	1451 ± 11	1475 ± 9	0.191
Diarrhea (days)	40.0 ± 8.0 ^b	69.3 ± 7.8 ^a	52.5 ± 7.8 ^{ab}	0.002
Diarrhea (%)	3.25 ± 0.65 ^b	5.62 ± 0.63 ^a	4.26 ± 0.63 ^{ab}	0.002
At Finisher stage				
Weight at final (kg)	95.06 ± 0.9 ^a	93.52 ± 0.4 ^b	94.28 ± 0.8 ^{ab}	0.038
WG finisher (kg)	41.17 ± 0.9	42.67 ± 0.2	42.23 ± 0.9	0.064
DWG finisher (gr)	735.2 ± 17.3	761.9 ± 4.4	754.1 ± 16.8	0.064
FC finisher (kg)	122.9 ± 0.0 ^c	125.5 ± 0.58 ^a	124.5 ± 0.58 ^a	0.001
FCR finisher (kg)	2.99 ± 0.07	2.94 ± 0.02	2.95 ± 0.08	0.535
Daily feed intake (gr.)	2196 ± 0.0 ^c	2241 ± 10 ^a	2223 ± 10 ^b	0.001
Diarrhea (days)	13.0 ± 2.6	13.8 ± 1.3	13.5 ± 1.9	0.865
Diarrhea (%)	1.06 ± 0.21	1.11 ± 0.11	1.09 ± 0.16	0.864
Overall result				
WG Total (kg)	73.90 ± 1.0	72.39 ± 0.4	73.13 ± 0.8	0.062
FC Total (kg)	206.6 ± 3.5	206.8 ± 0.9	207.1 ± 0.3	0.940
Daily feed intake (gr.)	1846 ± 27	1846 ± 8	1849 ± 3	0.947
Average FCR (kg)	2.80 ± 0.06	2.86 ± 0.01	2.83 ± 0.04	0.254
Total diarrhea (days)	53.0 ± 7.6 ^b	83.0 ± 7.2 ^a	66.0 ± 8.8 ^{ab}	0.001
Diarrhea (%)	2.15 ± 0.31 ^b	3.37 ± 0.29 ^a	2.68 ± 0.36 ^{ab}	0.002

¹Fish meal

²Meat and bone meal

³Poultry byproduct meal

a, b, c Means in the same row not sharing a superscript differ significantly (P<0.05)

Discussion

Although exact cause of diarrhea experienced by the MBM group could not be determined, it is highly unlikely related to the protein source since MBM used in finisher was from the same batch used for the grower, and yet no diarrhea was observed during the finisher phase. The growth rate from the present trial is considered adequate realizing that pigs were under commercial farm management and also typical Vietnamese heat stress condition.

Similarity in overall weight gain among the three protein sources was not unexpected since diets were balanced to equal nutrients specifications, which are also quite adequate for the genetics used according the recommendations from NRC (1998). Feed conversion averaged about 2.8 for all pigs, and must be considered above average in light of negative factors of diarrhea and also the physical form of the feed (meal).

The purpose of the trial is to demonstrate that US MBM and PBM can support a growth performance of growing hogs similar to that of fish meal. However, in practice, feed industry does not use FM or other animal proteins frequently in diets after starter phase, particularly in finishing phase. It is simply a cost consideration. Nonetheless, trials results are generally consistent with data reported from US and EU.

Substitution of FM with US MBM or PBM in hog grower/finisher diets did not affect growth performance but should reduce the feed cost by 5-10%.

Conclusions

When diets were formulated to a common nutrient specifications in accordance with requirements, US MBM and PBM can totally replace FM (5%) in hog grower and finisher diets. Results from this Vietnamese study are consistent with those reported from US and EU. Substitution should lower the feed cost by 5-10%.