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CONFIDENTIAL

THE USE OF 00 RAPESEED MEAL PLUS FISH MEAL IN GROWING-FINISHING PIG DIETS- REPORT OF TRIAL AT HARPER ADAMS COLLEGE SHROPSHIRE UK

SUMMARY

A new variety of rapeseed meal containing approximately one quarter of the toxins in the older varieties was tested in combination with fish meal as a partial replacement for soyabean meal in growing/finishing pig diets. It was believed that by including fish meal with the rapeseed meal the quality of the resultant protein combination would equal, or be superior to that of soyabean meal and offer a cheaper alternative.

Forty eight Large White x Landrace pigs were allocated to three treatment diets in which the main protein source was either soyabean meal(S), soyabean meal/rapeseed meal (S/R) or soyabean meal/rapeseed meal/fish meal (S/R/F). Diets were equated for protein, lysine and energy content. Pigs were group fed these diets from an average liveweight of 34kg up to slaughter when they reached a liveweight of 86kg to 98kg.

No differences were found in either liveweight gain or feed conversion, the latter being based on group feed intake. It is suggested that the absence of differences between diets was a result of both protein and the more critical amino acids, lysine, threonine and methionine plus cystine being fed in excess of requirement after the first week of the trial.

In conclusion, these results indicate that if the above amino acids were fed in excess, low toxin rapeseed meal can replace some soyabean meal without performance being affected. However, in practice, these amino acids may not be fed in excess of requirement, particularly with pigs up to 34kg liveweight. It is recommended that the trial is repeated, starting with younger pigs and feeding the above amino acids at or slightly below requirement.

Three treatment diets were used in which the main protein source was soyabean meal(S), or soyabean meal, rapeseed meal (SR) or soyabean meal, rapeseed meal and fish meal (S/R/F).

Methods

Forty eight Large x Landrance White pigs, 24 gilts and 24 castrates, which had been weaned at the same time (about five

weeks of age) were blocked in threes according to sex, litter and liveweight. Each block was randomly allocated to a pen with provision for individual feeding. Pigs within a pen were allocated to treatment diets (S,S/R, S/R/F) so that the average weight of the pigs on each treatment was equal for each sex. They received a standard diet for two weeks at the end of which they were expected to weigh 25kg. Thereafter they received the treatment diets continuing on treatment until they reached a liveweight of 86kg to 98kg, when they went for slaughter.

The diets used (S,S/R, S/R/F) were taken from the diets mixed for the ileal digestibility trial at AGRI Shinfield. Details of the diets are given in appendix table 1a. They were formulated to contain similar concentrations of energy and lysine and pigs were fed restricted amounts of feed up to a maximum of 2.6kg per pig per day from 73kg liveweight onwards. (Appendix table 2).

Individual liveweights were recorded weekly. At slaughter commercial gradings of carcasses were recorded. These indivicated the content of fat (backfat thickness- P_2), and killing out percentage (carcass weight as percentage of liveweight prior to slaughter).

Results

Analysis of the proteins (see appendix table 1b) indicated that the total lysine content was lower than expected from feedstuff composition tables:

	Crude protein	Total lysine (determined)	Total lysine (Feedstuff tables)
Fish meal	67.8	4.6	5.3[1]
Soyabean meal	40.9	2.5	2.9[1]
Rapeseed meal	34.5	1.8	2.0[2]

[1] From IAFMM UK Nutrient Analysis Tables

[2] From 'In Facts - Feed Formulation Data, BP Nutrition.

However, animo acid analysis of the mixed diets by two laboratories (Shinfield and Torry) gave values which agreed with the values calculated from ingredient composition.

There were no significant differences between treatments in liveweight gain or feed conversion (see table 1) over the whole trial. There was an indication that the P2 measurement was significantly greater for the diet containing soyabean meal, rapeseed meal and fish meal (S/F/R) compared with that for the soyabean meal diet (S). There were no differences in performance of carcass measurements between castrates and gilts.

Liveweight gain during the first six weeks of the trial did not differ between treatment.

Discussion

The absence of an effect of protein source on growth and feed conversion appears surprising in view of the differences between these proteins, especially the ileal digestibility values for their essential amino acids. These were shown by the AGRI Shinfield to be 75% for soyabean meal, 71% for rapeseed meal and 77% for fish meal.

The diets were designed to be limiting in the content of the more critical essential amino acids, lysine, threonine and methionine plus cystine, in theearly stages of growth, according to the Agricultural Research Council's Nutrient Requirements of Pigs (See appendix tables 3a, 3b). However because pigs had to start the trial at heavier weights than originally intended (25kg), with the exception of lysine intake which may have been marginal in the first week, intake of these amino acids would have exceeded requirement. As a result, differences in quality of dietary proteins in terms of availability of these amino acids may not have affected growth.

The results of this trial contrast with those of the Norwegian Trials with growing - finishing pigs. finishing pigs. (See IAFMM Technical Bulletin No. 18).

In these trials a diet of rapeseed meal plus fish meal resulted in bettwr growth than all soya diets, which in turn gave better growth than the rapeseed diets (overall growth rates were similar in both trials - 0.7kg to 0.8kg. A possible explanation for the difference these results and those of the present trial is that pigs were heavier (34kg) starting the Harper Adams trial than those starting the Norwegian Trials (25kg).

Analysis of the proteins used in the Harper Adams trial indicated that they were normal in terms of available (FDNB) lysine in the fish meal and trypsin inhibitor content of the soyabean meal. The toxin content (thiocynates produced from glucosinolinates) of the rapeseed meal was lower than normal European varieties (toxin content about one quarter of normal rapeseed meal) though not as low as that in Canadian double zero rapeseed (canola meal).

Conclusion

The results of this trial indicate that growing-finishing pigs (34kg to finish) grow equally well on diets based on either soyabean meal as the main protein source or with part of the soyabean meal replaced with 00 rapeseed meal or 00 rapeseed meal plus fish meal, when fed diets which were not limiting with respect to the supply of lysine, threonine and methionine plus cystine.

With the likelihood of lower cereal prices in the EEC in the future, protein prices relative to cereal prices could increase. This would encourage feed formulators to reduce amounts of protein and amino acids in pig feeds. Consequently there may be a need in the future to repeat this trial using diets which provide lower amounts of lysine, threonine and methionine plus cystine.

TABLE 1

SUMMARY OF RESULTS

Treatment Diet

	Soya	Soya/ Rape	Soya/ Rape/ Fish	Mean		SED
Initial weight (kg)						
Castrates	33.6	33.4	31.6	32.9	)	*2.04*
Gilts	32.2	31.0	34.7	32.6	)	
Mean	32.9	32.2	33.2	32.6		
SED		*1.33*				
Liveweight gain (kg per day)						
Castrates	0.69	0.72	0.71	0.71	)	*0.022*
Gilts	0.69	0.70	0.69	0.69	)	
Mean	0.69	0.71	0.70			
SED		*0.018*				
Feed conversion (kg feed per kg liveweight gain) :						
Castrates	2.74	2.70	2.66	2.70	)	*0.106*
Gilts	2.74	2.68	2.81	2.74	)	
Mean	2.74	2.69	2.73			
SED		*0.069*				

Carcass Measurements

P_2 (mm) back fat thickness						
Castrates	11.5	11.9	12.4	11.9	)	*0.74*
Gilts	11.1	12.3	14.2	12.5	)	
Mean	11.3[1]	12.1	13.3[1]			
SED		*0.79*				
Dressing percentage						
Castrates	71.9	72.2	72.2	72.1	)	*0.81*
Gilts	73.2	73.1	72.6	73.0	)	
Mean	72.6	72.7	72.4			
SED		*0.93*				

[1] *Differ significantly* $P < 0.05$

Appendix
Table 1a

COMPOSITION OF THE DIETS

Ingredients (g/kg	Soya (S)	Soya Rape (S/R)	Soya Rape Fishmeal (S/R/F)
Barley	70.23	63.23	70.74
Soyabean meal	25.00	12.50	8.33
Chilean fish meal	-	-	4.17
Rapeseed meal	-	18.75	12.50
Soyabean Oil	1.0	2.05	1.37
Salt	0.25	0.26	0.17
Limestone	0.37	0.48	0.32
Dicalcium phosphate	1.40	0.98	0.65
Min/vit supplement	1.25	1.25	1.25
Chromic oxide	0.50	0.50	0.50
Calculated Nutrient Content based on ingredient analysis			
Digestible energy MJ/kg	13.1	13.1	13.1
Crude protein	180	186	183
Lysine '	8.8	8.8	8.8
Threonine	6.3	6.8	6.5
Methionine + cystine	5.3	6.3	6.0
Crude fibre	51	61	55
Oil	26	39	39

' Diets were formulated based on lysine analysis of ingredients and not total protein.

Appendix

Table 1b

ANALYSIS OF PROTEINS (AS RECEIVED)

Chilean fish meal:	%
Crude protein	67.8
Oil	6.1
Lysine	4.56
FDNB lysine	5.1
Soyabean meal:	
Crude protein	40.9
Lysine (total)	2.51
Trypsin inhibitor (expressed as trypsin inhibited per g sample)	4.2mg
Rapeseed meal	
Crude protein	34.5
Lysine (total	1.81
Oil	2.2
Crude fibre	11.5

Isothiocyanates expressed as allyl isothiocyanate	1240 mg/kg (12.4µm/g)
Vinyl-5-thio-oxazolidone	2275 mg/kg (24.7µm/g)

Appendix

Table 2

FEEDING SCALE FOR TRIAL

	Liveweight (kg) Up to:	Daily Feed Allowance kg:
	22.7	1.14
	27.2	1.29
	31.8	1.50
	36.3	1.71
	40.9	1.86
	45.4	1.93
	54.5	2.11
	63.6	2.18
	72.7	2.29
Over	73	2.57

Appendix

Table 3a

PROTEIN & AMINO ACID REQUIREMENTS[1] AND DIETARY SUPPLY

	Protein and amino acid requirements of pigs: liveweight 15kg to 50kg	Protein and amino acid requirements of pigs: liveweight 50kg to 90kg	Protein and amino acids supplied by diet:
	g/MJ of DE	g/MJ of DE	g/MJ of DE
Protein[2]	12	8.6	14
Lysine	0.84	0.60	0.69 (0.73)[3]
Threonine	0.50	0.36	0.52 (0.54)[3]
Methionine + cystine	0.42	0.30	0.44 (0.38)[3]

[1] Agricultural Research Council 1981. Nutrient Requirements of Pigs. CAB Farnham Royal

[2] Expressed as 'ideal protein'

[3] Determined Values - Figures in brackets determined by Torry Research Institute, Aberdeen.

Appendix

Table 3b

AMINO ACID REQUIREMENTS & DIETARY SUPPLY

Intake of Lysine, Threonine and Methionine plus Cystine

Liveweight (kg) up to:	Intake of: Lysine (g/day)	Threonine (g/day)	Methionine + Cystine (g/day)
36.3	15.5 (16.1)'	11.6 (9.7)	9.9 (8.1)
40.9	16.8 (16.1)	12.7 (9.7)	10.7 (8.1)
45.4	17.4 (16.1)	13.1 (9.7)	11.1 (8.1)
54.5	19.1	14.4	12.2
63.6	19.7	14.9	12.6
72.7	20.7	15.6	13.2
Over 73	23.2	17.5	14.8

' Figures in brackets are requirements given by the ARC (1981)