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FISH MEAL AND RAPESEED MEAL IN GROWING-FINISHING PIG DIETS

BY

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SUMMARY

Preliminary results of four growth experiments with individually fed growing-finishing pigs are presented. The main objective of the experiments was to determine the degree to which double-zero rapeseed meal, (Canola) with or without fish meal, could meet the protein requirements for growing pigs compared with soyabean meal. Rapeseed meal was fed at levels of 0, 10 and 20% of the diet. In addition the vegetable protein mixes were tested with and without 2% herring meal. Rapeseed meal (20%) without herring meal, generally showed poorer performance (about 3%) than the all-soya ration, in spite of the higher dietary levels of lysine. The presence of 2% herring meal improved performance by about 5%, to levels equal to or greater than the all-soya diets. Levels of 10% rapeseed meal showed similar trends to the 20% levels, although the differences from the all-soya controls were less marked.

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INTRODUCTION

Herring meal and soyabean meal are the most important protein feeds in Norwegian pig diets. Actually, herring meal has been used for about 100 years, and in Norway, as in many other countries, soyabean meal has been the overall dominating vegetable protein feed in the period after World War II. However, the new double low qualities of rapeseed meal (low in glucosinolates and erucic acid) provide an interesting alternative, and the experiments reported here include a comparison of soyabean, herring and rapeseed (Canola) meal in the diets of growing-finishing pigs.

MATERIALS AND METHODS

The main intention of the experiment was to elucidate to what degree the double-low rapeseed meal (Canola meal), with and without herring fish meal, could meet the protein requirements for growing pigs in comparison with soyabean meal. The experiments had a factorial design, enabling rations to be tested with and without 2% herring meal. The experiments were carried out with bought-in pigs of the Norwegian Landrace, selected for growth rate and lean content of their carcasses. Piglets from the same litter made up one block. All pigs were individually fed from 25 kg to 100 kg liveweight. Following usual practice in Norway, a restricted feed level (standard) was used:

Liveweight:	20	30	40	50	60	70	80	90	100
FU (net energy 1kg barley (85% DM) per day:	0.91	1.27	1.60	1.93	2.25	2.56	2.87	3.13	3.13

In addition to the protein feeds in question, barley meal, minerals and vitamins made up the remaining part of the feed mixture.

The composition of the protein feeds used in experiments is given in Table 1, and the composition of the feed mixtures in Appendix Tables 1 and 2.

In all cases diets were formulated to contain 0.80% lysine, which is limiting in such rations. However, the analyses showed higher values for the rapeseed diets. In general the Lysine content was equalised between treatments with and without herring meal.

Between 6 and 7 pigs per treatment were used in experiments 1, 2 and 4 and between 15 and 16 pigs per treatment in experiment 3.

Statistical treatments were performed according to a two-way analyses of variance, and in order to test the significant differences between means, the Newman-Keul multiple range test was used.

RESULTS AND DISCUSSIONS

The most important parameters have been summarised in Table 2.

In general, the best results were for diets containing 20% rapeseed meal supplemented with herring meal. The diets containing 20% rapeseed meal without herring meal generally gave the poorest results. Levels of 10% rapeseed meal showed similar trends to the 20% level, although the difference from the all-soya controls were less marked. The differences between treatments were significant ($P < 0.05$) for feed conversion ratios both in experiments 1 and 2, and for corrected weight gain in experiment 2. No other differences were statistically significant (except for a carcass lean result in experiment 3).

The favourable results obtained with the combination of soyabean meal, herring meal, and rapeseed meal compared with those obtained with the soya control diets may partly be explained by the amino acid make up, particularly lysine. The results of these experiments suggest that satisfactory Norwegian feed mixtures for growing-finishing pigs can be made up of a combination of soyabean meal, rapeseed meal and herring meal in addition to feed grains plus a supplement of minerals and vitamins.

Twenty percent rapeseed meal in the ration has been reported to cause enlargement of thyroid glands and to a lesser degree increased weight of liver. The significance of these findings has not been elucidated in this study. Thus, 10% rapeseed meal may be indicated as an acceptable level for the growing-finishing pig in combination with herring meal.

TABLE 1

Analyses of Protein Feeds (as received)

		Herring Meal	Soybean Meal	Rapeseed Meal[1]
Dry Matter	%	93.3	88.4	89.3
Crude Protein	%	72.0	44.4	32.7
Ether Extract	%	8.4	1.5	2.5
Crude Fibre	%	-	5.9	11.4
Ash	%	12.7	5.9	6.6

1 The content of glucosinolates in the rapeseed meal was 27 µmd per g fat free dry matter. This was mainly progoitrin, gluconapin and glucobrassicanapin

TABLE 2

The More Important Results of Experiments 1—4

Experiment No/ Treatment No	% Rapeseed Meal in Diet	Presence (+)/ Absence (-) of Fish Meal in Diet	% Lysine in Diet	Fat % Lean in Cutlets	Corrected[1] Gain (G/D)	Fu Per[2] KG Corrected Gain	Fu Per KG Corrected Gain as %
(1/1)	0	-	0.79	56	768	2.84	97
(1/4)	0	-	0.79	52	760	2.87	98
(2/1)	0	-	0.75	42	766	2.84	97
(2/4)	0	-	0.76	46	721	3.01	103
(3/1)	0	-	0.82	48	707	3.00	103
(4/1)	0	-	0.79	48	729	2.96	101
Avg.	**0**		**0.78**	**49**	**742**	**2.92**	**100**
(3/4)	0	+	0.81	42	716	2.99	102
(4/4)	0	+	0.79	49	781	2.78	95
Avg.	**0**		**0.80**	**46**	**749**	**2.89**	**99**
(3/2)	10	-	0.84	55	716	3.09	106
(4/2)	10	-	0.81	43	781	2.79	96
Avg.	**10**		**0.83**	**49**	**749**	**2.94**	**101**
(3/5)	10	+	0.84	47	733	2.99	102
(4/5)	10	+	0.82	42	778	2.80	96
Avg.	**10**		**0.83**	**45**	**756**	**2.90**	**99**
(1/2)	20	-	0.86	59	730	3.01	103
(1/5)	20	-	0.86	45	760	2.91	100
(2/2)	20	-	0.81	60	721	3.01	103
(2/5)	20	-	0.81	53	686	3.10	106
(3/3)	20	-	0.88	43	711	3.07	105
(4/3)	20	-	0.84	64	761	2.88	99
Avg.	**20**		**0.84**	**54**	**728**	**3.00**	**103**
(1/3)	20	+	0.86	57	774	2.81	96
(1/6)	20	+	0.86	41	772	2.80	96
(2/3)	20	+	0.82	47	796	2.76	95
(2/6)	20	+	0.83	48	766	2.87	98
(3/6)	20	+	0.88	41	742	2.98	102
(4/6)	20	+	0.84	35	774	2.87	98
Avg.	**20**		**0.85**	**45**	**771**	**2.85**	**98**

1 Corrected to 73% carcass weight
2 1 FU = Net energy of 1kg barley

APPENDIX TABLE I

Composition of Diets used in Experiments 1 and 2

Treatment		**1**	**2**	**3**	**4**	**5**	**6**
Experiment 1:							
Herring Meal	%	-	-	2.0	-	-	2.0
Soybean Meal	%	17.3	7.0	3.0	17.5	7.2	3.2
Canola Meal	%	-	20.0	20.0	-	20.0	20.0
Barley Meal	%	80.2	70.5	72.5	79.0	69.3	71.3
Seaweed Meal	%	-	-	-	1.0	1.0	1.0
Minerals, Vitamins	%	2.5	2.5	2.5	2.5	2.5	2.5
Analyses of feed mixtures:							
Crude Protein	%	15.7	16.8	16.6	15.7	16.7	16.6
Lysine	%	0.79	0.86	0.86	0.79	0.86	0.86
Meth. + Cystin	%	0.57	0.68	0.68	0.57	0.68	0.68
FU per 100kg diet [1]		97.8	94.9	95.2	97.1	94.3	94.6
Experiment 2:							
Herring Meal	%	-	-	2.0	-	-	2.0
Soybean Meal	%	17.3	6.0	2.0	17.5	6.2	2.2
Canola Meal	%	-	20.0	20.0	-	20.0	20.0
Barley Meal	%	80.6	71.9	73.9	79.4	70.7	72.7
Seaweed Meal	%	-	-	-	1.0	1.0	1.0
Minerals, Vitamins	%	2.1	2.1	2.1	2.1	2.1	2.1
Analyses of feed mixtures:							
Crude Protein	%	15.2	16.0	16.0	15.2	16.0	16.0
Lysine	%	0.75	0.81	0.82	0.76	0.81	0.83
Meth. + Cystin	%	0.56	0.65	0.66	0.56	0.65	0.67
FU per 100kg diet [1]		98.1	95.2	95.5	97.5	94.6	94.9

1 The energy content of the mixtures were calculated based upon energy values of the feeds given in Norwegian feedstuffs tables, corrected for chemical analyses of the feeds.

APPENDIX TABLE 2

Composition of Diets used in Experiments 3 and 4

Treatment		1	2	3	4	5	6
Experiment 3:							
Herring Meal	%	-	-	-	2.0	2.0	2.0
Soybean Meal	%	17.3	12.0	7.0	13.0	8.0	3.0
Canola Meal	%	-	10.0	20.0	-	10.0	20.0
Barley Meal	%	80.2	75.5	70.5	82.5	77.5	72.5
Minerals, Vitamins	%	2.5	2.5	2.5	2.5	2.5	2.5
Analyses of feed mixtures:							
Crude Protein	%	16.4	16.8	17.2	16.2	16.6	17.0
Lysine	%	0.82	0.84	0.88	0.81	0.84	0.88
Meth. + Cystin	%	0.60	0.65	0.69	0.61	0.66	0.70
FU per 100kg diet	%	98.6	97.2	95.7	98.8	97.3	95.8
Experiment 4:							
Herring Meal	%	-	-	-	2.0	2.0	2.0
Soybean Meal	%	18.0	12.2	6.5	14.0	8.2	2.5
Canola Meal	%	-	10.0	20.0	-	10.0	20.0
Barley Meal	%	79.5	75.3	71.0	81.5	77.3	73.0
Minerals, Vitamins	%	2.5	2.5	2.5	2.5	2.5	2.5
Analyses of feed mixtures:							
Crude Protein	%	15.7	16.0	16.4	15.5	15.9	16.2
Lysine	%	0.79	0.81	0.84	0.79	0.82	0.84
Meth. + Cystin	%	0.57	0.62	0.66	0.58	0.62	0.67
FU per 100kg diet	%	97.2	95.5	94.5	97.6	96.2	94.8

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