

The Feeding Value of Canola Meal as a Protein Supplement for Starter Pigs.

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The nutritional value of canola meal (CM) (rapeseed meal containing less than 3 mg/g glucosinolates) in the diets of growing and finishing swine is well documented (Aherne and Kennelly 1982). The optimum replacement value of CM for soybean meal (SBM) in the diets of starter pigs, however, has not yet been clearly established. The objectives of the three experiments reported herein were: 1) to determine the replacement value of CM for SBM in the diet of 4 week weaned pigs and; 2) whether young pigs, when given a choice, would select a diet containing SBM in preference to diets containing varying levels of CM.

MATERIALS AND METHODS

In Experiment 1 (Exp. 1), CM replaced 0, 50 or 100% of the protein supplied by the SBM supplement (Table 1). In Exp. 2, CM replaced 0, 25, 50, 75 or 100% of the SBM protein (Table 1). In Exp. 3, CM was added to the diet at levels of either 0, 5, 10, 15 or 20% (Table 4). Diets were based on barley, wheat and oat groats and formulated to contain equal levels of digestible energy and protein. In Exp. 2 and 3, diets were supplemented with lysine-HCl to equal the levels of available (Exp. 2) or total lysine (Exp. 3) in the SBM control diet.

In Exp. 1, 72 crossbred pigs were equalized for sex and allotted in pairs to one of three diets on the basis of initial weight for a five week period. In Exp. 2, 130 pigs were similarly allotted to one of five diets for a four week period. Body weight gain and feed intake were recorded weekly. In Exp. 3, 16 pigs were equalized for sex and individually allotted to one of four groups in a replicated 4x4 Latin square design. Each of the four test periods lasted seven days. Each group was given a choice during each period between a SBM control diet and one of four experimental diets containing either 5, 10, 15 or 20% CM. Location of the two feeders in each pen was changed daily. Feed consumption (expressed as a percentage of the total intake) and weight gains were recorded daily.

The data for average daily gain (ADG), average daily feed intake (ADFI), feed conversion efficiency (FCE) and feed consumption (Exp. 3) were analyzed statistically by analysis of variance using the Student-Newman-Keuls (SNK) procedure for assessing significant ($p < 0.05$) differences between means (Steele and Torrie 1980).

RESULTS AND DISCUSSION

In both Exp. 1 and 2, CM replaced up to 50% of the protein supplied by the SBM supplement without significantly reducing ADG of the pigs, although ADFI was lower ($p < 0.05$) (Tables 2 & 3). When CM replaced 75 or 100% of the SBM protein, the ADG and ADFI were significantly reduced. The FCE of pigs fed the SBM and CM supplemented diets were similar. Digestibility coefficients for nitrogen and dry matter were not affected by the level of CM in the diet. Each 1% addition of CM to the diet resulted in a progressive decrease in ADF and ADG by 4 and 2g, respectively.

In Exp. 3, when given a choice, starter pigs preferred ($p < 0.01$) the SBM control diet more than any of the four CM supplemented diets. There was also a significant decrease in the consumption of the CM diets as the level of CM in the diet increased from 5 to 20% (Table 5).

SUMMARY

The results of the first two studies suggested that CM (18% in the diet) can replace up to 50% of the SBM supplement without significantly reducing starter pig performance. The results of Exp. 3 indicated that, when given a choice, young pigs consumed two and one-half to seven times more of a SBM control diet than diets containing 5 to 20% CM, respectively. It appears from these studies that CM is unpalatable to starter pigs.

ACKNOWLEDGEMENTS

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REFERENCES

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TABLE 1. COMPOSITION OF SOYBEAN MEAL AND CANOLA MEAL SUPPLEMENTED DIETS (EXP. 1 & 2)

DIETS:	EXP. 1		EXP. 2					
	100% SBM	50% SBM 50% CM	100% CM	100%SMB	75%SMB 50%CM	50%SBM 50%CM	25%SBM 75%CM	100%CM
INGREDIENTS (%):								
Wheat	25.0	25.0	25.0	25.0	25.0	25.0	25.0	25.0
Barley	22.6	16.8	10.5	19.9	16.1	12.6	8.9	4.6
Oat Groats	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Soybean Meal (47% CP)	25.4	13.6	--	25.2	18.7	12.0	5.7	--
Canola Meal (36% CP)	--	16.6	35.5	--	9.0	18.0	27.0	36.0
Stabilized Fat	3.0	4.0	5.0	1.5	2.8	4.0	5.0	6.0
L-Lysine HCL	-	-	-	+	+	+	+	+
Premix	4.0	4.0	4.0	9.4	9.4	9.4	9.4	9.4
CHEMICAL ANALYSIS²								
Dry Matter (%)	89.8	90.2	90.1	89.7	89.9	90.5	90.4	90.4
Crude Protein (%)	21.4	21.9	22.0	19.8	20.2	20.5	21.3	20.8
Lysine (%)	1.06	1.03	0.99	0.99	1.04	1.07	1.12	1.08
Digestible Energy (MJ/kg) ³	14.6	14.4	14.0	14.4	14.4	14.4	14.3	14.3

¹Supplied the following levels per kg of diet: 5 g iodized salt, 15 g calcium phosphate, 10 g ground limestone, 120.0 mg zinc, 12.0 mg manganese, 150.0 mg iron, 12.0 mg copper, 0.1 mg selenium, 5000 IU vitamin A, 700 IU vitamin D-3, 23 IU vitamin E, 12 mg riboflavin, 45 mg niacin, 25 mg calcium pantothenate, 30 ug vitamin B-12, 500 mg choline chloride, 275 mg ASP250.

²Determined values reported on an as-fed basis unless otherwise indicated.

³Calculated according to NAS-NRC (1979) recommendations for the digestible energy of feed ingredients commonly used in starter pig rations.

TABLE 2. AVERAGE PERFORMANCE OF PIGS FED SOYBEAN MEAL AND CANOLA MEAL SUPPLEMENTED DIETS (EXP. 1)¹

DIETS:	100% SBM	50% SBM 50% CM	100% CM
PERFORMANCE:			
Initial Weight (kg)	8.4	8.4	8.4
Final Weight (kg)	26.0 a	24.4 a	21.8 b
Daily Gain (g)	503 a	459 a	383 b
Daily Feed (g)	997 a	899 b	786 c
Feed: Gain	1.99	1.96	2.06

¹ a-c, means within the same row with the same or no letter are not significantly different ($P < 0.05$).

TABLE 3. AVERAGE PERFORMANCE OF PIGS FED SOYBEAN MEAL AND CANOLA MEAL SUPPLEMENTED DIETS (EXP. 2)

DIETS:	100% SBM	75% SBM 25% CM	50% SBM 50% CM	25% SBM 75% CM	100% CM
PERFORMANCE:					
Initial Weight (kg)	6.9	6.9	6.9	6.9	6.9
Final Weight (kg)	15.2 a	15.3 a	14.4 ab	13.5 bc	13.1 c
Daily Gain (g)	295 a	301 a	269 ab	238 bc	223 c
Daily Feed (g)	570 a	537 ab	492 bc	447 c	433 c
Feed: Gain	1.94	1.79	1.85	1.89	1.98

¹ a-c, means within the same row with the same or no letter are not significantly different ($P < 0.05$).

TABLE 4. FORMULATION AND CHEMICAL COMPOSITION OF DIETS CONTAINING SOYBEAN MEAL (SBM) AND CANOLA MEAL (CM). (EXP. 3)

DIETS:	SBM CONTROL	5% CM	10% CM	15% CM	20% CM
<u>INGREDIENTS (%)</u>					
Wheat	25.0	25.0	25.0	25.0	25.0
Barley	21.5	20.5	18.5	16.5	15.5
Oat Groats	20.0	20.0	20.0	20.0	20.0
Soybean Meal (44%CP)	26.5	22.5	19.0	15.5	11.5
Canola Meal (37%CP)	--	5.0	10.0	15.0	20.0
Stabilized Fat	3.0	3.0	3.5	4.0	4.0
L-Lysine HCL	-	+	+	+	+
Premix ¹	4.0	4.0	4.0	4.0	4.0
<u>CHEMICAL ANALYSIS¹</u>					
Dry Matter (%)	89.1	89.4	89.3	89.3	89.1
Crude Protein (%)	20.6	20.8	21.5	21.1	21.0
Lysine (%)	1.16	1.21	1.26	1.28	1.26
Digestible Energy (MJ/kg) ¹	14.2	14.1	14.1	14.2	14.1

¹See Table 1

TABLE 5. AVERAGE PERFORMANCE OF PIGS WHEN GIVEN A CHOICE BETWEEN A SOYBEAN MEAL (SBM) CONTROL DIET AND ONE OF FOUR DIETS CONTAINING 5, 10, 15 OR 20% CANOLA MEAL (CM) (EXP. 3):

DIET CHOICES:	SBM vs 5%CM	SBM vs 10%CM	SBM vs 15%CM	SBM vs 20%CM
<u>PERFORMANCE:</u>				
Initial wt.(kg)	9.1	10.2	9.0	9.9
Final wt.(kg)	26.6	26.9	25.4	26.8
Daily Gain (g)	627	597	586	606
Daily Feed (g)	1139	1122	1089	1117
Feed: Gain	1.82	1.88	1.86	1.83
<u>DIET PREFERENCE²:</u>	(71.6%)a	(75.6%)a	(84.9%)b	(87.5%)b
	vs.	vs.	vs.	vs.
	(28.4%)b	(24.4%)b	(15.1%)c	(12.5%)c

¹a,b,c, means within the same row or column with the same or no letter are not significantly different (P<0.05).

²Expressed as a percentage of the total intake of the two diets offered.