COMPARISON OF LOW GLUCOSINOLATE (TOWER) RAPESEED MEAL AND SOYBEAN MEAL AS PROTEIN SUPPLEMENTS FOR SWINE DURING GESTATION AND LACTATION

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INTRODUCTION

Several Canadian experiments with sows fed high glucosinolate rapeseed meal (RSM) have demonstrated that conception rates and litter size may be reduced when RSM constitutes more than 7 to 8% of the diet of pregnant gilts or sows (Manns and Bowland 1963; Bell and Belzile 1965; Schuld and Bowland 1968). A report by Saben and Bowland (1971), using RSM with somewhat lower glucosinolate levels (5 mg/g), suggested that a dietary RSM level of 8% may be satisfactory, but there was still a trend toward smaller litters from gilts and sows fed diets containing this level of RSM. The most recent research on this topic (Bowland and Hardin 1973), indicates that up to 6% RSM may be fed throughout three reproductive cycles without any reduction in sow performance.

In all of the experiments discussed above, RSMs containing relatively high levels (5 to 11 mg/g) of glucosinolates have been used, and it has been assumed that products derived from the glucosinolates have been responsible for the reduced performance. If this is correct, then the recent licensing and commercial production of the low glucosinolate (Brassica napus) cultivar, Tower, may afford significant improvements for breeding sow nutrition. It should be possible to feed substantially higher amounts of Tower RSM without any depression in reproductive performance.

The objective of the present experiment was to examine the reproductive performance of sows fed diets in which either half or all of the supplementary protein was provided by Tower RSM.

MATERIALS AND METHODS

The solvent-extracted Tower RSM used in this experiment contained on an as-fed basis 92.3% dry matter, 39.9% crude protein, 12.0% crude fiber, 6.2% ash and 2.2% ether extract. The glucosinolate content was as follows: butenyl isothiocyanate 0.25 mg/g; pentenyl isothiocyanate 0.02 mg/g; and oxasolidinethione 0.71 mg/g.

Three diets containing 0, 6.1% and 12.6% Tower RSM respectively were formulated to meet all nutrient requirements of gestating and lactating swine. The three diets, which were based on barley and wheat, contained the following sources of supplementary protein: (1) soybean meal (SBM) alone; (2) a 1:1 mixture (on an isonitrogenous basis) of SBM and Tower RSM; and (3) Tower RSM alone. The diets were essentially isonitrogenous (15% crude protein) and isoenergetic (16.2 MJ/kg).

Seventy-two crossbred gilts, with an initial weight of 60 kg, were allotted to the three diets and fed in groups of four until they reached 100 kg. They were then checked for estrus daily, and bred as soon as estrus was detected.

For the remainder of the experiment, which was continued throughout two complete reproductive cycles, the gilts were individually housed and fed their assigned diets. They received 2 kg/day during gestation, 5 kg/day during lactation, and 3 kg /day between weaning and rebreeding. Litters were weaned at 21 days of age, and were not given creep feed.

Traits were analyzed according to least-squares procedures for unequal subclass numbers, using a model that included litter (n=24) and treatment (n=3).

RESULTS AND DISCUSSION

During the growth period (60 kg to 100 kg) there were no differences in either feed intake, weight gain, or efficiency of feed conversion attributable to dietary treatment ($P<0.10$).

The details of the reproductive performance of the sows are presented in Table 1. Overall performance during the first parity was normal for young gilts. Average farrowing rate (gilts farrowing/gilts bred) was 0.80. Average litter size was 9.4 pigs born per litter and 7.8 pigs weaned per litter. Individual average weaning weight at 21 days was 4.58 kg. None of the treatment differences observed during the first parity were statistically significant at the ($P<0.10$) level. Evidently, the partial or complete replacement of SBM by Tower RSM in this experiment did not affect the performance of young gilts during the first reproductive cycle.

TABLE 1

REPRODUCTIVE PERFORMANCE OF SOWS FED SOYBEAN MEAL, TOWER RAPESEED MEAL, OR A MIXTURE OF THE TWO PROTEIN SUPPLEMENTS[x/]

	Supplementary Protein Source		
	SBM	SBM/RSM	RSM
First parity			
Number farrowing	18	19	20
Gestation wt gain (kg)	39.5	40.2	37.0
Number of pigs born/litter	9.5	9.3	9.3
Number of pigs born alive/litter	9.2	9.2	9.2
Avg birth wt of pigs (kg)	1.14	1.06	1.10
Avg birth wt of living pigs (kg)	1.14	1.06	1.11
Number of pigs weaned/litter	7.1	8.3	8.0
Avg weaning wt of pigs (kg)	4.71	4.59	4.44
Sow wt loss in lactation (kg)	3.1	7.5	5.6
Second Parity			
Number farrowing	16	16	19
Gestation wt gain (kg)	41.8	41.5	41.0
Number of pigs born/litter	10.0	10.5	10.1
Number of pigs born alive/litter	9.6	10.1	9.8
Avg birth wt of pigs (kg)	1.23	1.17	1.15
Avg birth wt of living pigs (kg)	1.26	1.19	1.17
Number of pigs weaned/litter	8.3	9.6	9.0
Avg weaning wt of pigs (kg)	5.03	5.14	4.62
Sow wt loss in lactation (kg)	11.0	12.6	7.1

[x/] Values represent least-squares means adjusted for unequal subclass numbers. None of the differences were statistically different at the ($P<0.10$) level.

The overall performance during the second parity was also normal. Of the 51 sows that completed two reproductive cycles, 38 (or 75%) conceived at the first post-weaning estrus (4 to 11 days after weaning), and the mean weaning

to estrus interval for all sows was 12.8 days. Average litter size at birth and weaning, 10.2 and 9.0 respectively, was normal. Weaning weight at 21 days was 4.93 kg. Average birth weight (1.18 kg) was somewhat low, but this was true for all three dietary treatments.

None of the treatment means presented in Table 1 for the second parity were statistically significant ($P<0.10$). Thus, as was observed for the first parity, reproductive performance during the second cycle was essentially unaffected by the substitution of Tower RSM for SBM.

The main reasons for removing sows from the experiment (72 started experiment; 51 completed two reproductive cycles) were failure to conceive during the first parity, and weak legs during the second parity. There was no apparent connection between sow removal and dietary treatment.

In this experiment, therefore, there was no evidence of detrimental effects on reproductive performance when female swine were fed diets in which either half or all of the supplemental protein was provided by Tower RSM from 60 kg throughout two reproductive cycles. In fact, although not significantly different, in both parities the greatest numbers of pigs were weaned by sows fed the SBM/RSM ration (6.1 % Tower RSM), and the least by those fed SBM alone. These results with Tower RSM are in contrast to earlier results obtained when high glucosinolate RSMs have been fed. This adds support to the hypothesis (Aherne et al. 1977) that the detrimental effects observed with the older meals were indeed due to their high glucosinolate content.

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