

AN EVALUATION OF LOW GLUCOSINOLATE (TOWER) RAPESEED MEAL IN SWINE DIETS

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Several experiments have demonstrated that partial or complete replacement of SBM by Tower RSM did not significantly reduce the performance of growing-finishing pigs (Moody *et al.*, 1977, McKinnon and Bowland, 1977, Grandhi *et al.*, 1977, McCuaig *et al.*, 1977). In several of these experiments growth rate and efficiency of feed conversion tended to decrease as the level of RSM in the diet decreased. Castell 1977, reported that the addition of 7.5% Tower RSM to the diets of swine in the starter period or 12.5% subsequently resulted in a significant ( $P < 0.05$ ) decrease in growth rate and feed conversion efficiency. This reduction in performance of growing pigs fed Tower RSM could be due to the lower energy content or higher glucosinolate level of the diet (Castell, 1977), lower availability of the lysine of RSM compared to that of SBM (Bayley, 1974). Because gilts may have a higher requirement for lysine than castrated male pigs (Henry *et al.*, 1971; Tanksley and Escobosa, 1971; Meade *et al.*, 1974), two experiments were designed to determine the effects of (1) partial and complete replacement of SBM by Tower RSM in the diets of growing and finishing gilts, and (2) lysine supplementation of RSM diets on gilt performance and carcass quality.

MATERIALS AND METHODS

Two experiments involving 144 Yorkshire x Lacombe gilts with an average initial weight of 20 kg were conducted. In experiment 1 the gilts were allotted within litter mate outcome groups to the three dietary treatments shown in Table 1. The control diet contained SBM as the supplementary protein source. In rations 2 and 3, respectively, either 50% or all of the supplementary protein was provided by Tower RSM. All these diets were formulated to contain 16.5% crude protein, to be isocaloric and to meet or exceed National Academy of Sciences-National Research Council (NAS-NRC 1973) recommendations for all other nutrients. During the growing period (20 to 60 kg) gilts were housed in pairs in 1.2 x 1.2 m partially slotted floor pens. For the finisher period (60 to 100 kg) the gilts were transferred to 1.5 x 3.9 m solid floor pens and maintained in groups of four. The gilts were allowed ad libitum access to feed and water and the environmental temperature was kept at 21 to 22°C throughout the experiment. Gilts were bled by vena cava puncture when they reached 100 kg liveweight and serum was analyzed for triiodothyronine (T3) and thyroxine (T4).

In experiment 2 seventy-two gilts were allotted to three dietary treatments. Diets 1 and 2 were similar to diets 1 and 3 in Table 1. Diet 3 was similar to diet 2 except that 0.065% lysine HCl (0.05% lysine) was added to equal the calculated available lysine level of the SBM control diet. Environmental conditions and feeding methods were similar to those described for experiment 1. At 60 kg liveweight, serum from each gilt for T3 and T4 assays was collected as described previously. Eight pigs from each treatment group were continued from 60 kg to slaughter at 90 kg. The carcasses of all pigs slaughtered at 90 kg were graded according to Canadian Hog Carcass.

## VALUATION SYSTEM

The data from both experiments were analyzed using analysis of variance procedures. In each experiment the two treatment degrees of freedom were partitioned into two orthogonal comparisons; a SBM control versus diets containing RSM comparison and a within RSM comparison.

## RESULTS AND DISCUSSION

The results of experiment 1 are presented in Table 2. During the growing period partial or complete replacement of SBM by Tower RSM did not ( $P < 0.05$ ) affect the feed intake of the gilts. Pigs fed the Tower RSM supplemented diets had lower ( $P < 0.05$ ) growth rates and feed conversion efficiencies than pigs fed the SBM diet. The growth rate and feed conversion efficiency of pigs fed the SBM/RSM diet was greater ( $P < 0.05$ ) than that of pigs fed the diet in which Tower RSM was the only protein source. The non-orthogonal comparison (SBM vs SBM/RSM) indicated that there was no significant difference in the growth rate of pigs fed the SBM and SBM/RSM diets but that feed conversion efficiency of pigs fed the SBM diet was better ( $P < 0.05$ ). Partial or total replacement of SBM by Tower RSM did not significantly affect the feed intake or performance of the gilts during the period 60 to 100 kg liveweight.

The serum T3 and T4 concentrations of the gilts at 100 kg were lower in pigs fed the RSM diets but the differences were not significant (Table 3). The lower levels of T3 and T4 in pigs fed the RSM diets indicate that, although the glucosinolate content of the Tower RSM used in this experiment was only 0.98 mg/g, thyroid hormone synthesis may have been impaired.

As in experiment 1, the inclusion of Tower RSM as the only protein supplement in the growing swine diet did not significantly affect feed intake in experiment 2 (Table 3). Addition of lysine to the RSM supplemented diet did not significantly influence the feed intake of the swine. Performance of gilts fed the Tower RSM diets during the growing period was lower ( $P < 0.01$ ) than that of pigs fed SBM, but there was no response to the added lysine. The lack of a response to lysine supplementation of the RSM diets is consistent with the data reported by Moody *et al.* (1977).

Because: (1) the total lysine content of the RSM supplemented diet contained exactly the level of lysine recommended by the NAS-NRC (1973) for the 20 to 35 kg weight range and (2) gilts seem to be more susceptible to a lysine deficiency than barrows (Henry *et al.*, 1971) and (3) the lysine of RSM may be less available than that of SBM (Cho and Bayley, 1972) the clear lack of response in the performance of the gilts fed the lysine supplemented RSM in this experiment is somewhat surprising. Possibly, the glucosinolate level of the diet was responsible for the reduced performance and the level of lysine was not a limiting factor. For the finishing period (60 to 90 kg), there were no significant differences in the feed intake, daily weight gain or feed conversion efficiency of pigs fed the SBM or the RSM plus lysine diets. None of the carcass parameters studied were significantly affected by the addition of Tower RSM to the diets or by supplementation of the RSM with lysine. Castell, (1977) also reported no significant differences in the carcass quality of pigs fed RSM and SBM diets.

Serum T3 concentration of pigs at 60 kg liveweight was not significantly affected by the addition of Tower RSM to the diet, but T4 concentrations were significantly ( $P < 0.01$ ) reduced (Table 3). The T4 concentrations were lower in the 60 kg pigs than were observed with the 100 kg pigs in experiment 1. A significant decrease in T4 level of RSM fed pigs has also been reported by Bowland (1974), and is consistent with the observations of Slinger (1977) that the relative thyroid weight (mg thyroid/kg body weight) of pigs fed Tower RSM was greater than that of control pigs fed a SBM diet.

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TABLE 1. FORMULATION AND COMPOSITION OF DIETS

Diets	1	2	3
Protein supplement	SBM+	SBM/RSM§	RSMϕ
Ingredients (%)			
Barley	40.0	40.0	40.0
Wheat	41.5	38.5	36.2
Soybean meal	13.7	7.4	0
Rapeseed meal (Tower)	0	9.0	19.0
Tallow	1.0	1.3	1.0
Iodized salt	0.4	0.4	0.4
Ground limestone	1.2	1.2	1.2
Calcium phosphate	1.2	1.2	1.2
Mineral vitamin premix	1.0	1.0	1.0
Calculated analysis			
Crude protein (%)	16.4	16.5	16.7
Gross energy (kcal/kg)	2986	3001	3010
Lysine (%)	0.76	0.73	0.7

+ Soybean meal

§ Soybean meal/rapeseed meal

ϕ Rapeseed meal

TABLE 2. PERFORMANCE OF GILTS FED DIETS CONTAINING SOYBEAN MEAL OR TWO LEVELS OF TOWER RAPESEED MEAL: EXPERIMENT 1

Diets	SBM	SBM/RSM	RSM	Sig	Pooled SE
Number of pigs	24	24	24		
Grower period (20-60 kg)					
Daily feed (kg)	2.05	2.15	2.19	NS	0.04
Daily gain (kg)	0.73	0.71	0.67	**	0.01
Feed/gain	2.80	3.05	3.27	**	0.09
Finisher period (60-100 kg)					
Daily feed (kg)	3.33	3.28	3.26	NS	0.11
Daily gain (kg)	0.79	0.76	0.75	NS	0.02
Feed/gain	4.17	4.32	4.33	NS	0.14
T3 (ng/100 ml)	94.9	85.8	89.3	NS	5.30
T4 (µg/100 ml)	3.25	2.67	2.92	NS	0.24

TABLE 3. PERFORMANCE OF PIGS FED DIETS CONTAINING SOYBEAN MEAL OR TOWER RAPESEED MEAL WITH OR WITHOUT LYSINE SUPPLEMENTATION: EXPERIMENT 2

Diets	SBM	RSM	RSM + Lysine	Sig	Pooled SE
Grower period (20-60 kg)					
Number of pigs	24	24	24		
Daily feed intake (kg)	2.04	2.06	2.06	NS	0.04
Daily gain (kg)	0.72	0.66	0.64	***	0.01
Feed/gain	2.83	3.13	3.18	***	0.06
Finisher period (60-90 kg)					
Number of pigs	8	8	8		
Daily feed intake (kg)	2.70	2.71	2.46	NS	0.12
Daily gain (kg)	0.68	0.69	0.63	NS	0.03
Feed/gain	3.97	3.92	3.91	NS	0.09
Number of pigs	12	12	12		
T3 (ng/100 ml)	78.5	88.1	78.2	NS	5.18
T4 (µg/100 ml)	2.88	1.76	1.71	**	0.22

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