RAPESEED MEAL AS A PROTEIN SUPPLEMENT FOR GROWING BULLS

By Ingemar Olsson
Department of Animal Husbandry
Swedish University of Agricultural Sciences
Uppsala, Sweden

Rapeseed meal in minor quantities has been used in the feeding of cattle for many years in Sweden. The use of rapeseed meal in the feeding is limited, however, by its content of different toxic substances. The low palatability of rapeseed meal is also supposed to limit the ad lib. consumption of feeds containing rapeseed meal. Three feeding experiments are reported below where rapeseed meal was used as the sole protein supplement in the concentrate for intensively fed bulls (Experiment I-II) and young calves (Experiment III).

MATERIALS AND METHODS

The rapeseed meal used in all three experiments was made from winter-type rapeseed of Brassica napus. The content of oxazolidinethiones and isothiocyanates was 10.5 and 3.7 mg/g non-fat dry matter in the rapeseed meal used in Experiments I and II and 8.6 and 5.0 mg/g in Experiment III respectively.

Experiments I and II consisted of three treatments with 15 resp. 12 individually fed bull calves of the Swedish Red and White Breed in each treatment. Experiment I started when the calves had reached an average weight of 150 kg and continued until the animals were slaughtered. Three types of concentrate were used. They were all based on rolled oats and barley and dried molassed sugar-beet pulp (10 %) with the addition of a protein supplement which was either rapeseed meal (RSM) or soybean meal (SBM). The third concentrate did not contain any additional protein supplement (LP). The composition of the resp. concentrates is shown in Table 1. Experiment II started when the average weight of the calves was about 130 kg. The composition of the concentrates was nearly the same as in experiment I as is shown in Table 1. The concentrate was given ad lib. in both experiments, together with a daily allowance of up to 1,5 kg hay. Minerals and vitamins were given separately. In both experiments the bulls were slaughtered when they had got a sufficient degree of fatness as judged by palpation. The resp. thyroid glands were collected and weighed at slaughter.

In Experiment III rapeseed meal was used in concentrates for intensively fed young SRB bull calves from about 50 kg live weight. The calves were purchased and were on the average 4-weeks old at the start of the experiment. Three types of concentrate based on rolled oats and barley were used where the protein supplement was either soybean meal (SS), soybean meal and rapeseed meal (SR) or rapeseed meal (RR), as shown in Table 2. Concentrate was fed ad lib. together with a daily allowance of up to 0.5 kg hay. The calves were fed 2 kg of a commercial milk replacer twice daily during the first five weeks of the experiment.

For the first seven weeks 71 calves were individually fed concentrate SS while SR and RR type of concentrate were individually fed to 24 calves each. The calves were then fed in groups of four and the calves fed concentrate SS during the first 7 weeks were divided in three treatments fed concentrate SS, SR and RR respectively. The calves previously fed concentrate SR and RR continued on their original diet even after 7 weeks.

TABLE 1

COMPOSITION, CRUDE PROTEIN CONTENT AND CALCULATED AMOUNTS OF DIGESTIBLE CRUDE PROTEIN (DCP) AND METABOLIZABLE ENERGY (ME) IN THE CONCENTRATES, EXPERIMENTS I AND II

Experiment	I			II		
Treatment	LP	SBM	RSM	LP	SBM	RSM
Soybean meal, %	-	7.0	-	-	9.0	-
Rapeseed meal, %	-	-	10.0	-	-	12.0
Crude protein, %	12.1	14.2	14.2	12.6	14.8	14.8
ME, MJ/kg	11.3	11.5	11.3	11.0	11.1	10.9
g DCP/MJ ME	7.9	9.5	9.8	7.9	10.3	10.0

TABLE 2

COMPOSITION, CRUDE PROTEIN CONTENT AND CALCULATED AMOUNTS OF DIGESTIBLE CRUDE PROTEIN (DCP) AND METABOLIZABLE ENERGY (ME) IN THE CONCENTRATES, EXPERIMENT III

Type of concentrate	SS	SR	RR
Soybean meal, %	9.00	4.60	-
Rapeseed meal, %	-	6.50	13.25
Crude protein, %	13.7	13.6	13.5
ME, MJ/kg	11.2	11.1	11.0
g DCP/MJ ME	9.9	9.9	10.0

TABLE 3

WEIGHT, FEED INTAKE AND RATE OF GAIN, EXPERIMENT I

Treatments	LP	SMB	RSM
Number of bulls	15	15	14
Live weight at start, kg	153.5	156.3	150.3
Live weight at slaughter, kg	432.1	447.6	450.9
Carcass weight, kg	217.5	226.2	234.2
Days in experiment	224.1	233.0	251.3
ME intake, MJ/day	76.3	77.1	75.4
Average daily gain, g	1.23	1.23	1.24
Feed conversion MJ ME/kg Weight gain	61.6	61.9	63.3
Weight of thyroid gland, g	29.2	22.5	37.8

The calves were slaughtered at approximately 235 kg live weight and the resp. thyroid glands were collected and weighed.

RESULTS

Daily energy intake for the whole rearing period has not been significant-

ly affected by the feeding of RSM in Experiment I (Table 3). There is a tendency to a lower intake of the concentrate containing rapeseed meal during the last part of the rearing period. There are no differeces in the rate of gain between the resp. treatments. The differences in the weight at slaughter between the treatments are small and measurements of the fat content of the bulls at slaughter do not indicate any differences between the treatments. There are no differences in feed conversion between the treatments.

TABLE 4

WEIGHT, FEED INTAKE AND RATE OF GAIN, EXPERIMENT II

Treatments	LP	SBM	RSM
Number of bulls	12	12	12
Live weight at start, kg	128.8	127.7	130.1
Live weight at slaughter, kg	439.5	436.9	453.1
Carcass weight, kg	226.2	229.4	239.5
Days in experiment	258.0	255.9	279.6
ME intake, MJ/day	75.0	74.9	74.6
Average daily gain, g	1.22	1.22	1.16
Feed conversion MJ ME/kg Weight gain	61.7	61.5	64.4
Weight of thyroid glands, g	22,7	20.4	31.8

TABLE 5

WEIGHT, FEED INTAKE AND RATE OF GAIN, START - 7TH WEEK, EXPERIMENT III

Treatment	DEF	G	H
Type of concentrate	SS	SR	RR
Number of calves	71	24	24
Live weight at start, kg	49.1	48.9	49.0
Live weight after 7th week, kg	80.6	78.8	76.7
Concentrate intake, kg/day	0.89	0.84	0.80
Daily gain, kg	0.64	0.61	0.57
Feed conversion, MJ ME/kg Weight gain	25.2	25.4	26.6

In Experiment II the RSM ration did not seem to be consumed in a lower amount per day than the other concentrates (Table 4). A calculation of the daily concentrate intake for each bull during the last four weeks before slaughter, when the concentrate consumption is supposed to be maximal does not reveal any differences between the resp. treatments. There are greater differences in rate of gain between the treatments in this experiment than in the first one. The bulls fed RSM have grown 0.06 kg per day less in average than the bulls fed the SBM or the LP ration. The differences are not significant, however. The average live weight at slaughter is slightly higher for the bulls fed RSM but the measurements of the degree of fatness do not indicate a higher fat content in these bulls at slaughter.

The feeding of concentrate containing different amounts of rapeseed meal to the young calves in Experiment III has significantly ($p < 0.05$) depressed the daily concentrate intake during the first 7 weeks of the experiment (Table 5). These effects on feed consumption have resulted in a significantly lower daily gain for the group fed rapeseed meal ($p < 0.01$), while the feed conversion remains unaffected (Table 5).

There are no significant effects of the feeding of rapeseed meal on the performance from 8th week to slaughter (Table 6). The effect of rapeseed meal on animal performance from 8th week to slaughter has been calculated as the linear regression of daily concentrate intake, gain in weight and feed conversion on the content of rapeseed meal in the concentrate. Separate regressions have been calculated for calves fed the same type of concentrate for the whole rearing period, treatments D, G, H respectively and for calves, fed concentrate SS for the first 7 weeks, i.e. treatments D, E, F respectively.

TABLE 6

WEIGHT, FEED INTAKE AND RATE OF GAIN, 8TH WEEK - SLAUGHTER, EXPERIMENT III

Treatment	D	E	F	G	H
Type of conc. start-7th week	SS	SS	SS	SR	RR
Type of conc. 8th week-slaughter	SS	SR	RR	SR	RR
Number of calves	20	20	20	20	20
Live weight after 7th week, kg	79.9	81.4	80.8	79.4	77.5
Live weight at slaughter, kg	234.8	240.6	232.1	239.8	232.5
Days in experiment	131.7	124.0	131.0	126.8	128.2
Concentrate intake, kg/day	4.27	4.52	4.16	4.31	4.33
Daily gain, kg	1.18	1.29	1.16	1.27	1.22
Feed conversion, MJ ME/kg Weight gain	44.0	42.2	43.0	41.0	42.5
Weight of thyroid gland, g	16.2	23.2	26.0	20.2	26.7

The differences between the regression coefficients calculated for treatments D, G, H and D, E, F are in all cases small and not significant thus indicating that the feeding of rapeseed meal for the first 7 weeks of the experiment has not adversely affected the performance of the calves after the 8th week of the experiment.

DISCUSSION

It can be concluded that the amounts of protein in the LP concentrates were sufficient for a satisfactory rate of gain and feed conversion. It is not possible, therefore, to draw conclusions from these experiments on the value of protein from rapeseed meal in relation to protein from soybean meal. It is apparent from these experiments, however, that the rapeseed meal has considerably fewer negative effects on animal performance than is often assumed.

Up to about 12 % rapeseed meal in the concentrate has not markedly affected the performance of the bulls in Experiments I and II or of the calves from about 100 kg live weight in Experiment III. The amount of rapeseed meal in the concentrate represents a maximum daily intake of 0.20 and 0.30

kg/100 kg live weight for the bulls and the calves respectively. In contrast, the concentrate intake and daily gain have been significantly depressed when rapeseed meal was fed to calves below 100 kg live weight. Though the rapeseed meal did not affect the performance of the bulls, there was, however, a significant increase in the weight of the thyroid gland. As judged from the chemical analysis of blood samples collected before slaughter, the bulls fed rapeseed meal were euthyroid, indicating adequate compensatory growth of the thyroid gland (Iwarsson et al., 1974). This seems also to be true for the calves. The question remains as to whether a hypothyroid condition would appear during longer periods of feeding.

LITERATURE

Iwarsson, K. and L. Ekman 1974. The effect of rapeseed meal on the thyroid gland in cattle. 4. Internationaler Rapskongress, Giessen.