RAPESEED AS A SOURCE OF FAT FOR DAIRY COWS

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INTRODUCTION

It is well known that a concentrate with a high fat content is better utilized in milk production than low-fat concentrates, especially in combination with low-quality roughage (3,4,6). The positive effect of dietary fat on milk yield is often accompanied, however, by negative effects on milk fat and protein content (1,2). It is assumed that there is an optimum of 25-28 g digestible crude fat/kg 4 % fat-corrected milk (FCM) (5,7), where a maximum milk yield is attained without depressions of fat and protein percentage.

The addition of animal fat to the concentrate mixture of a dairy cow diet based on straw will increase milk yield and improve the feed efficiency (5). However, the supply of animal fat is limited in Sweden and, furthermore, the product must be industrially processed. On the other hand, rape seed could be available in sufficient amounts and if suitable for feeding no processing but crushing would be necessary.

EXPERIMENTAL DESIGN

An experiment with rape seed was carried out in 1976/77 with 28 first-calf heifers of Swedish Friesian Breed. The experimental design followed a change-over model with a pre-period (Lactation weeks 1-8), two experimental periods (Lactation weeks 9-20 and 21-32, respectively) and a post-period (Lactation weeks 33-40). The basic ration, 4 kg barley straw, 1 kg hay, 2.5 kg DM of sugar-beet tops silage, minerals and vitamins, was the same for all cows during the whole lactation.

During the pre- and post-periods a concentrate mixture (C), containing no rape product, was fed to all animals. As of week 9 the cows were allocated into two groups (I and II) according to performance during the pre-period. Two concentrate mixtures were compared during the experimental periods, one (A) containing 5.7 % rape seed meal (RSM) and the other (B) 8.4 % crushed rape seed (RS). The RSM was of an ordinary quality with 4.3 % glucosinolates, while the RS was a variety from Svalöf (Sv 71/6) with 1.5 % glucosinolates in the fat-free dry matter and 24.5 % erucic acid ($C_{22:1}$) in the oil. The composition of the concentrate mixtures is given in Table 1. The feeding plan is presented in Table 2 together with total amounts of digestible crude fat fed per kg FCM.

The approved Swedish minimum standard is 15 g digestible crude fat per kg FCM. This level was kept with Mixtures A and C, while another 10 g of fat was supplied with Mixture B, containing the RS. The energy supply was isocaloric for all rations, i.e. 5 MJ metabolizable energy per kg FCM above maintenance.

The cows were kept in a tie-stall and handled individually. All feeds and feed refusals were weighed daily, and the milk yields were recorded

5 days weekly. The amounts of concentrate were adjusted once a week according to individual milk yields during the previous week and to actual body weights.

TABLE 1

COMPOSITION OF CONCENTRATE MIXTURES

Ingredients	Mixtures A %	B %	C %
Barley	30.0	25.4	30.0
Oats	30.0	28.5	30.0
Dried molassed beet pulp	18.7	19.0	19.0
Cotton seed expeller	10.6	11.1	14.0
Soybean meal	5.0	7.6	7.0
Rape seed meal (RSM)	5.7	-	-
Rape seed (RS)	-	8.4	-
	100.0	100.0	100.0

TABLE 2

FEEDING PLAN FOR CONCENTRATE MIXTURES AND AMOUNTS OF FAT

	Group I		Group II	
	Mixture	Digest. fat g/kg FCM	Mixture	Digest. fat g/kg FCM
Pre-period	C	14	C	14
Experimental period I	A	16	B	26
Experimental period II	B	29	A	17
Post-period	C	19	C	18

RESULTS

Fig. 1 shows that the daily yield of FCM declined faster during period I in the low-fat group I (RSM) than in group II (RS). The difference was 1.9 kg FCM at the end of the period. The concentrate mixtures were then switched between the groups resulting in an altered slope of the curves. The difference in milk yield had disappeared at the end of experimental period II. The faster decline in milk yield and FCM when feeding Mixture A was statistically significant ($P<0.01$).

The addition of rape seed oil at the actual fat level in the diet had no depressing effects on milk fat or milk protein percentage. The present investigation thus supports earlier assumptions of an optimum fat level at 25-28 g digestible crude fat per kg FCM (5,7).

The content of unsaturated fatty acids in the milk fat, especially $C_{18:1}$ and $C_{18:3}$, increased on consumption of RS. This is illustrated by the iodine number in Fig. 2. The addition of rape seed to the concentrate mixture thus increased the iodine number by 4.5 units, and in consequence the softness of the butter was improved. Only slight traces of erucic acid were recovered in the milk fat.

Feeding heated RSM with 4.3 % glucosinolates or unheated RS with 1.5 % glucosinolates in the fat-free DM did not effect the animal health as determined by analyses of blood profiles. However, no long-term effects from feeding RSM or RS could be included in this change-over model.

The use of rape seed as a source of fat for dairy cows seems to be highly justified from an economical standpoint. The studies will be continued on older cows having a higher milk yield than the heifers used in this experiment.

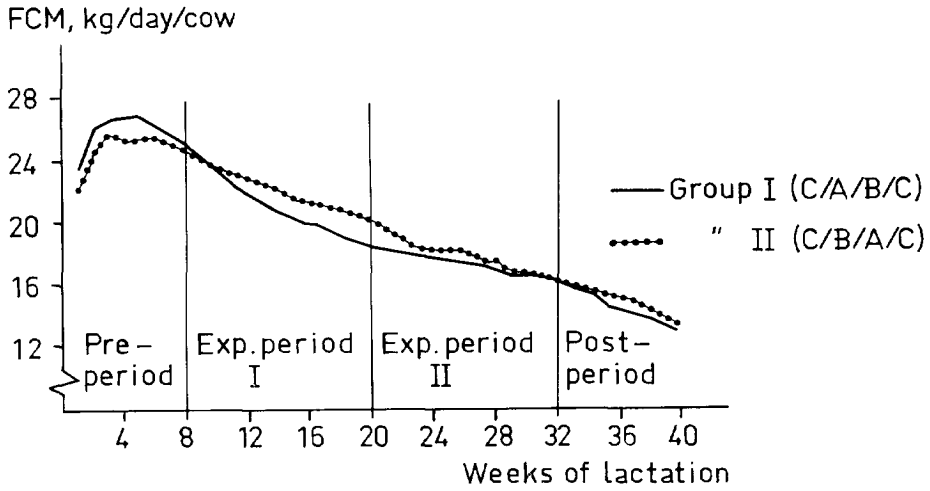

Figure 1. Average daily yield of 4 % fat-corrected milk

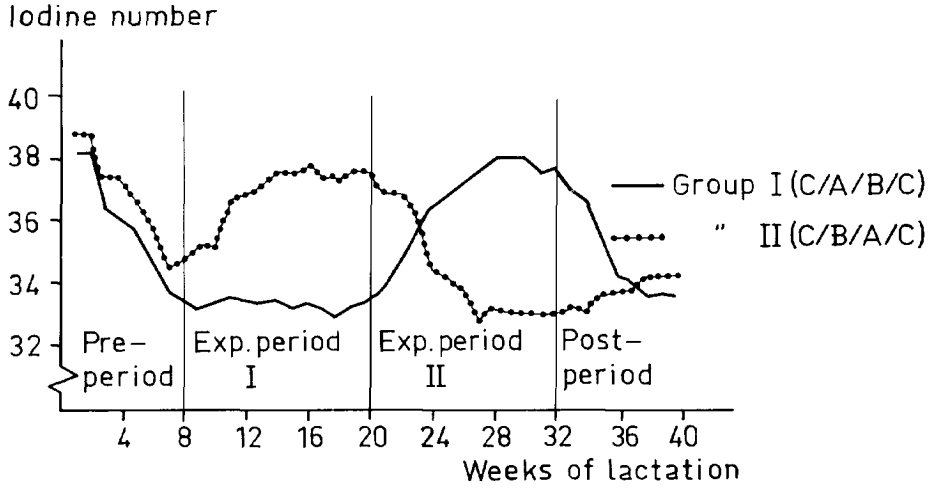

Figure 2. Iodine number of milk fat

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