

NUTRITIVE VALUE OF RAPE-SEED MEAL MEASURED IN A FATTENING DIET FOR BULLS.

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Introduction

Rape-seed production increased over the last years for industrial purposes such as production of diester. Small industrial plants were set up for both oil extraction from the seeds and oil processing. The oil is extracted by pressure so that the ether extract content of rape-seed meal is quite high (8-12%). Rape-seed meal is a protein source of interest as compared with other vegetable by-products. It is well balanced in amino acids for animal nutrition (Baudet et al, 1987) with, however in some circumstances, antinutritional factors (Jurgens, 1978; Ribailier and de la Taille, 1981; Bell, 1984).

The aim of the present study was to compare with growing fattening bulls 4 diets with increased incorporation rates of rape-seed meals on intakes, apparent digestibility, degradation rate and fermentations patterns in the rumen.

Materials and methods

Diets formulations.

Four diets were used. The control diet was a classical fattening diet based on sugar beet pulp (42%), cereals (36%), soja bean meal (8.5%), linseed meal (8.5%), molasses (4%) and minerals+vitamins (1%). In the other 3 diets, the proteins from soja bean meal and linseed meal were substituted at a rate of 1/3, 2/3 and 3/3 by protein from rape-seed meal. The concentrate was mixed with straw at a rate of 10 parts concentrate-1 part straw in a mixer trailer.

Animals.

A total of 8 bulls from the Belgian Blue breed-double muscle type were used. The average live weight was 530kg; they were fitted with a rumen canula. The experimental design was as two 4x4 latin squares with 42 days periods and a 7 days transition between each period. Food intakes were close to ad libitum by frequent adjustments according to refusals.

Measurements.

Food intakes were recorded individually and daily. Apparent digestibility of the diet was measured by total collection of the feces and digestibility of rape-seed meal was calculated by differences. Rumen degradability of 8 feedstuffs : rape-seed meal, linseed meal, soja bean meal, protected soja bean meal, barley, maize, sugar beet pulp and straw was assessed with the nylon bag technique after incubation for 4, 8, 16, 24 and 48 hours (Mehrez and Orskov, 1977). The patterns of the fermentation in the rumen were characterized from samples obtained every 2 hours over a 14 hours period starting from the morning meal.

Results and Discussion

Food intakes.

Food intakes expressed either as total intakes, intakes in 100 kg body weight or in metabolic live weight are given in Table 1. Intakes were high at 10.80 kg/d, 1.95 kg/100 kg BW/d or 94.3g/ kg BW^{0.75}/d for the control diet. The intakes were not affected by inclusion of rape-seed meal.

Apparent digestibility.

The apparent digestibility coefficients of the control fattening diet (Table 1) were 75.4% for DM, 77.9% for OM, 73.2% for CP, 73.6% for EE and 60.9% for ADF. The

incorporation of 1/3 protein from rape-seed meal increased the digestibility; the difference was significant from the control diet for DM($p<0,001$), from the diet with 2/3 rape-seed meal for DM($p<0,05$) and OM($p<0,05$) and from the diet with 3/3 rape-seed meal for DM($p<0,05$), OM($p<0,01$), ADF($p<0,05$) and CP($p<0,001$). The apparent digestibility of rape-seed meal was 79.4% for DM, 82.1% for OM, 65.9% for ADF and 86.2% for CP. Such data are close to the corresponding figures reported by INRA (1988) for linseed meal (78, 86, 35 and 93% respectively)

Patterns of fermentation.

With the control diet, the concentration of total volatile fatty acids was 129.5 mmol/l and pH 6.41. There were 65.4% of acetic acid, 18.7% of propionic acid and 14.7% of butyric acid. Glucose concentration was 165.9 mg/l, ammoniac concentration 59.4 mgN/l and alpha amino nitrogen 53.7 mgN/l. There were no significant effects of increased proportions of rape-seed meal on the characteristics of the fermentations. It should be noted however that 3/3 rape-seed meal tended to reduce ammoniac concentration (48.2 vs 59.4 mgN/l; $p>0.10$).

Degradability in the rumen.

The theoretical degradability of DM calculated at an outflow rate of 6% with the parameters obtained from degradation curves was with the control diet 56.0% for rape-seed meal, 60.3% for linseed meal, 66.9% for soja bean meal, 44.4% for protected soja bean meal, 72.2% for barley, 39.5% for maize, 58.1% for sugar beet pulp and 18.5% for straw. On the whole, it was with the diet 1/3 rape-seed meal that the degradability was the largest and with 3/3 rape-seed meal the lowest; the differences between diets were significant for soja bean meal ($p<0.05$ or 0.01), for maize ($p<0.05$), for sugar beet pulp ($p<0.01$) and for straw ($p<0.05$ or 0.001). The degradation curves for protein and ether extract of rape-seed meal, untreated and treated soja bean meal and linseed meal are given in Figure 1. The extent of protein degradation was reduced for rape-seed meal as compared with soja bean meal and linseed meal. Similarly, when compared with linseed meal a cake with also a high content in ether extract, the degradability of ether extract was lower for rape-seed meal. The fatty acids composition of rape-seed meal was characterized by 58.4% of C18:1, 23.1% of C18:2, 7.3% of C18:3 and 7.1% of C16:0. After a 48 h incubation in the rumen, the corresponding proportions were: 46.8; 17.8; 2.9 and 21.7% indicating that fatty acids of rape-seed meal were rather well protected against saturation in the rumen.

Conclusion

It appeared from the present trial that rape-seed meal obtained from a small scale industrial plant and with a high concentration in ether extract was well utilized when incorporated in a fattening diet for finishing bulls. It was the diet with 1/3 of protein from the cakes supplied by rape-seed meal which improved the fermentation in rumen and the degradability of the different feedstuffs incubated in nylon bags. Protein, ether extract and fatty acids of rape-seed meal were well protected against fermentation by the microflora.

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Table1

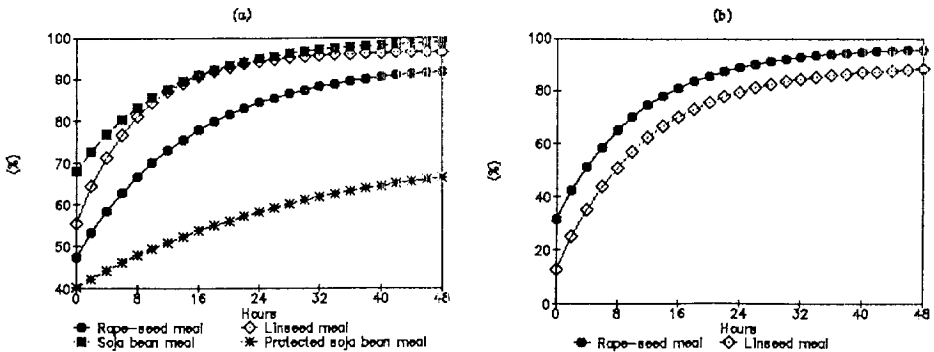
Food intakes and apparent digestibility coefficients of a concentrate diet containing increasing proportions of rape-seed meal.

	Control	Rape-seed meal			
		1/3	2/3	3/3	SED
<i>Food intakes</i>					
Total (kg/d)	10.80±1.67	10.73±1.97	10.69±1.22	10.61±1.23	0.39
Pcr 100 kg BW (kg/d)	1.95±0.17	1.93±0.11	1.92±0.11	1.93±0.20	0.05
Pcr kg BW ^{0.75} (g/d)	94.3±7.29	93.5±7.73	93.0±5.00	93.3±8.63	0.003
<i>Apparent digestibility</i> (%)					
DM	75.4±1.78bc	77.0±1.28a	75.7±1.22b	75.0±1.75c	0.64
OM	77.9±1.68ab	78.8±1.27a	77.6±1.12b	76.5±1.99c	0.67
ADF	60.9±3.27ab	63.1±1.38a	61.6±1.67ab	59.1±4.46b	1.34
CP	73.2±2.38ab	73.7±2.34a	71.4±1.57ab	69.9±3.63c	1.22
EE	73.6±0.03a	74.6±0.05a	76.8±0.03a	74.6±0.07a	1.72

a, b, c : means with a similar letter in a row are not significantly different ($p < 0.05$, 0.01 or 0.001)

Figure1

Nitrogen (a) and ether extract (b) disappearance from nylon bag.



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