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## Responses to grass or red clover silages cut at two stages of growth in dairy cows

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**Keywords:** legume, maturity, D-value, plasma metabolite

**Introduction** Red clover has an important role in organic farming, and also potential to reduce dependence on N fertilisers in conventional farming. This experiment compared dairy cow responses to grass and red clover silages cut at two stages of growth.

**Materials and methods** Four silages were made from primary growth: two grass silages from timothy (*Phleum pratense*) and meadow fescue (*Festuca pratensis*) grass (G) and two red clover (*Trifolium pratense*) silages (R). G silages were harvested on 17 June at early (G<sub>E</sub>) and on 26 June at late (G<sub>L</sub>) growth stage and R silages on 2 July at early (R<sub>E</sub>) and on 16 July at late (R<sub>L</sub>) growth stage. The preparation and ensiling of G and R silages are further described in the companion paper (Kuoppala *et al.*, 2005). These four pure silages and a mix of G<sub>L</sub> and R<sub>E</sub> (G<sub>L</sub>R<sub>E</sub>, 1:1 on dry matter (DM) basis) were fed *ad libitum* with 9 kg/d concentrates to five rumen cannulated cows in a 5x5 Latin square experiment. During the collection period silage DM intake was restricted to 95% of the adaptation period intake. The *in vivo* D-values (digestible organic matter in feed DM) of the silages were measured with sheep. Feed intake and milk yield of cows were recorded daily. Blood from the tail vein was sampled three times during the feeding cycle on the last day of the experimental period.

**Results** The D-values and crude protein concentrations (g/kg DM) of the experimental silages were 714, 673, 678, 610 and 134, 111, 212 and 181 for G<sub>E</sub>, G<sub>L</sub>, R<sub>E</sub> and R<sub>L</sub>, respectively. The advancing growth stage tended to increase rather than decrease DM intake of R silages while opposite was true for G silages (Table 1). However, the highest DM intake was found with G<sub>L</sub>R<sub>E</sub> mix. Despite differences in silage DM intakes no significant differences in milk yields of cows between the treatments were observed. Milk fat and protein contents were lower but lactose content higher with R than with G silages. Plasma non-esterified fatty acids (NEFA), acetate, essential amino acids (EAA) and urea concentrations were higher for R than for G silages.

**Table 1** Feed intake, milk production and plasma metabolites

	G <sub>E</sub>	G <sub>L</sub>	R <sub>E</sub>	R <sub>L</sub>	Mix G <sub>L</sub> R <sub>E</sub>	SEM <sup>#</sup>	Statistical significance			
							C <sub>1</sub>	C <sub>2</sub>	C <sub>3</sub>	C <sub>4</sub>
Intake										
Silage DM (kg/d)	13.2	12.0	11.3	12.1	14.0	0.49	o		o	**
Total DM (kg/d)	21.2	20.1	18.8	20.2	21.5	0.59	o		o	*
Production										
Milk (kg/d)	27.1	25.6	27.7	27.4	27.8	0.94				
ECM (kg/d)	26.8	25.4	25.5	26.2	26.6	0.79				
Fat (g/kg)	40.9	41.2	37.4	39.4	38.6	0.76	**			
Protein (g/kg)	32.6	32.6	30.4	30.8	31.5	0.38	***			
Lactose (g/kg)	46.1	46.6	47.0	46.7	46.9	0.21	*			
Urea (mM)	2.38	2.32	6.15	5.94	4.15	0.186	***			
Milk N/Feed N	0.285	0.315	0.223	0.237	0.248	0.0077	***	*		o
Plasma metabolites (mM)										
Glucose	3.67	3.61	3.57	3.68	3.63	0.104				
NEFA	0.105	0.107	0.131	0.157	0.117	0.0121	*			
Acetate	1.34	1.03	1.30	1.48	1.20	0.08	*		*	
EAA	0.78	0.79	1.27	1.07	1.02	0.072	***			
Urea	3.02	2.84	7.10	6.93	5.10	0.301	***			

<sup>#</sup>SEM for diet G<sub>L</sub>R<sub>E</sub> should be multiplied by 1.19. Contrasts: C<sub>1</sub>=G vs. R; C<sub>2</sub>=E vs. L; C<sub>3</sub>=C<sub>1</sub> x C<sub>2</sub>; C<sub>4</sub>=G<sub>L</sub>, R<sub>E</sub> vs. Mix. Significance: \*\*\* = P<0.001, \*\* = P<0.01, \* = P<0.05, o = P<0.10

**Conclusions** Advancing maturity decreased DM intake with grass silage, whereas the opposite was true for red clover silage. In spite of tendency for lower DM intakes, R silages supported as high ECM yields as G silages. This was associated with higher plasma concentrations of NEFA, acetate and EAA with R rather than G silages. Lower feed N efficiencies with R silages were reflected in high plasma and milk urea concentrations.

### References

Kuoppala, K., S. Ahvenjärvi, M. Rinne & A. Vanhatalo (2005). NDF digestion in dairy cows fed grass or red clover silages cut at two stages of growth. *Proceedings of the XIV International Silage Conference*. Paper 1132.