

The effect of harvesting strategy of grass silage on milk production

K. Kuoppala¹, M. Rinne¹, J. Nousiainen² and P. Huhtanen¹

¹MTT Agrifood Research Finland, Animal Production Research, FI-31600 Jokioinen, Finland, Email: kaisa.kuoppala@mtt.fi, ²Valio Ltd, Farm Services, P.O. Box 10, FI-00039 Valio, Finland

Keywords: primary growth, regrowth, digestibility, maturity, milk production response

Introduction Timing of harvest in primary growth of grass is a major factor affecting D-value (digestible organic matter, g/kg DM) of silage and dry matter (DM) consumption and milk production of dairy cows (Rinne, 2000). The objective of this research was to investigate whether there is a similar pattern in regrowths of grass.

Materials and methods Six grass silages, two from primary growth (PG) and four from regrowth (RG), were prepared from a mixed timothy (*Phleum pratense*) meadow fescue (*Festuca pratensis*) sward in 2002 at Jokioinen (61°N). The silages were slightly wilted (on average 4 h), precision chopped and ensiled in bunker silos with a formic acid based additive (4.1 l formic acid/t). Silages from PG were cut on 5 June at early (E) and on 17 June at late (L) stage of growth. Regrowths from both PG cuts were harvested on 29 July at early (EE and LE) and on 12 Aug. at late (EL, LL) stage of growth. These six silages were fed to 24 Finnish Ayrshire cows in a cyclic change-over design supplemented with 12 or 8 kg concentrate daily. The results presented are pooled over concentrate treatments. Silages were fed *ad libitum* and concentrates in three equal meals per day. Indigestible NDF (INDF) content of the silages was measured with a 12-day rumen incubation in a nylon bag. The *in vivo* D-value of the silages was determined with sheep fed at maintenance level by total collection of faeces.

Results D-value declined by 5.0 g/d with advancing growth stage in PG while the decline in RG was 3.6 (EE→EL) and 2.5 (LE→LL) g/d (Table 1). Silage and total DM intake of PG silages was higher (P<0.001) than that of RG silages (Table 2), as could be expected based on higher average D-value. Progressing maturity in PG decreased silage intake by 0.48 kg and energy corrected milk (ECM) production by 0.60 kg per 10 g decline in D-value. In RG, the decline in D-value did not decrease silage intake but ECM production decreased by 0.14 (EE→EL) or 0.46 (LE→LL) kg per 10 g decline in D-value. The results suggest, that milk production potential of RG silages was lower than PG silages as silage intake and milk production of EE and LE were not higher than L although D-value was. The confounding effect of silage DM content, which was clearly lower in RG silages, may have contributed to this.

Table 1 Description of the silages

	E	L	EE	EL	LE	LL
Date of harvest	5Jun	17Jun	29Jul	12Aug	29Jul	12Aug
Leaves in timothy, g/kg DM	489	340	503	390	639	529
DM yield, t/ha	3.3	5.1	4.2	4.9	3.1	3.8
DM content, g/kg	270	278	224	319	209	308
Chemical composition, g/kg DM						
Ash	74	62	87	88	91	84
Crude protein	151	115	129	118	153	126
NDF	513	598	566	562	549	549
INDF	50.3	97.2	70.5	93.3	59.8	79.1
-D-value, g/kg DM	704	644	659	609	664	629

Table 2 Dry matter (DM) intake and milk production (kg/day) of dairy cows

	E	L	EE	EL	LE	LL	SEM	C ₁	C ₂	C ₃	C ₄	C ₅
Silage DM intake	16.2	13.3	12.2	12.2	12.8	12.9	0.13	***	***	***		
Total DM intake	24.8	22.0	20.8	20.8	21.5	21.5	0.13	***	***	***		
Milk	33.3	30.7	29.5	29.2	31.6	29.9	0.38	***	***	**		*
ECM#	36.2	32.6	30.6	30.0	32.6	31.0	0.39	***	***	*		*

Energy corrected milk. Orthogonal contrasts: C₁= E vs. L; C₂= PG vs. RG; C₃= EE+EL vs. LE+LL; C₄=EE vs. EL; C₅=LE vs. LL. Statistical significance: *** P<0.001, ** P<0.01, * P<0.05, o P<0.10.

Conclusions Harvesting at a more advanced growth stage decreased D-value and milk production potential in PG of grass. In general, all RG silages were of moderate quality and variation of quality was smaller than in PG. The production responses to changes in D-value were greater in PG silages than in RG silages. It seems that at comparable D-value, the milk production potential of PG silages is slightly higher than that of RG silages.

References

Rinne, M. (2000). Influence of the timing of the harvest of primary grass growth on herbage quality and subsequent digestion and performance in the ruminant animal. Academic Dissertation, University of Helsinki, Department of Animal Science, Publications 54: 42 p. + 5 encl., <http://ethesis.helsinki.fi/julkaisut/maa/kotie/vk/rinne/>.