Yield and digestibility of grasses grown for silage under two contrasting harvest schedules

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Introduction

The economic viability of grass silage is significantly influenced by the dry matter (DM) yield and digestibility (DMD) of the crop harvested. The optimal balance between DM yield and DMD will vary depending on individual farm circumstances. This experiment determined the DM yield and DMD of permanent grassland swards managed for silage under two different cutting frequency schedules.

Materials and Methods

Experimental plots were repositioned within a *Lolium perenne* (cv. Talbot) sward in 5 successive years (years 1-5), an old permanent grassland (OPG1) sward in 6 successive years (years 1-6) and an alternative old sward (OPG2) in 2 successive years (years 5-6). On each of these 13 occasions, a split-plot design with 4 replicate blocks was used. The main (primary and regrowth) plots were randomly positioned within each block, as were sub-plots (8m x 2m; for weekly sampling) within main plots. Under harvest schedule A, a primary growth and three regrowths were taken on mean dates of 22 May (H1), 3 July (H2), 14 Aug. (H3) and 16 Oct. (H4), respectively, while under schedule B a primary growth and 2 regrowths were taken on 12 June (H1), 14 Aug. (H2) and 16 Oct. (H3), respectively. On these designated harvesting dates, the main plots allocated to the subsequent regrowths were cleared of herbage (5cm stubble). Sub-plots within appropriate main plots were harvested at weekly intervals - the latter results are not reported here. N was applied at 126, 114, 101 and 77 kg/ha for H1 to H4 in schedule A and at 126, 114 and 77 kg/ha for H1 to H3 in schedule B. The DM concentrations were determined following drying in an oven with forced-air circulation (98^0C; 16 h), while *in vitro* DMD was determined on samples dried at 40^0C (48h) by a modification of Tilley and Terry (1963). Data were analysed as a randomised complete block design using models with harvest (n=7), crop (n=13) and block (n=4) and, when combining data across harvests, models with schedule (n=2), crop and block.

Results and Discussion

The proportion of tillers contributed by different plant types in OPG1 was *Poa trivialis* 0.501, *Agrostis spp.* 0.220, *L. perenne* 0.193, *Alopecuris pratensis* 0.033, *Poa pratensis* 0.029, *Holcus lanatus* 0.015, Festuca rubra 0.003, *Trifolium repens* 0.004 and others 0.002. The corresponding values in OPG2 were 0.350, 0.269, 0.035, 0, 0.002, 0.070, 0.017, 0.018 and 0.041, together with *Bromis mollis* 0.147, *Cynosurus cristatus* 0.019 and *Juncus spp.* 0.019. The mean annual yield of harvested DM was 15717 and 16354 (s.e. 100.8; P<0.001) kg/ha in schedule A and B, respectively. Yields of harvested DM were highest (P<0.001) for H1 in both harvest schedules, and were higher (P<0.001) when H1 was harvested on 12 June rather than 22 May (Table 1). In both schedules, DM yield for H3<H2<H1 (P<0.05). The combined DM yield for H1+H2 in schedule A was greater than the yield for H1 in schedule B (s.e. 76.5; P<0.001), whereas H1+H2+H3 in schedule A was lower than H1+H2 in schedule B (s.e. 96.3; P<0.001). In schedule A, H1 through to H4 accounted for 0.38, 0.23, 0.19 and 0.20 of the annual DM yield, while in schedule B, H1 to H3 accounted for 0.52, 0.30 and 0.19. Grass DMD in schedule A was in the order H1>H2>H3 or H4 (P<0.05) and for schedule B was in the order H1<H2<H3 (P<0.05). Neither H3 nor H4 in schedule A differed from H3 in schedule B (P>0.05).

Table 1. Grass yield, DMD and DM content for each harvest within the two harvest schedules

	Yield (t/ha)			
	Dry matter (DM)		Digestible DM	
Schedule	A	B	A	B
H1	5955	8483	4537	5754
H2	3642	4828	2751	3371
H3	2926	3043	2168	2257
H4	3194		2380	
s.e.	54.4		40.5	
Signif.	***		***	
	DM digestib. (g/kg)		DM (g/kg)	
Schedule	A	B	A	B
H1	766	679	164	173
H2	756	701	157	148
H3	740	744	136	142
H4	747		144	
s.e.	2.7		1.3	
Signif.	***		***	

The mean weighted DMD for H1+H2 in schedule A (761g/kg) was higher than for H1 in schedule B (679g/kg; P<0.001), while the mean for H1+H2+H3 in schedule A (756g/kg) was higher than for H1+H2 in schedule B (685g/kg; P<0.001), and the annual mean for schedule A (754g/kg) was greater than for schedule B (696g/kg; P<0.001). The corresponding values for the yield of digestible DM were 7288 and 5754 (s.e. 59.3; P<0.001) kg/ha, 9456 and 9125 (s.e. 73.3; P<0.001) kg/ha and 11836 and 11382 (s.e. 75.8; P<0.001) kg/ha. Grass DM concentrations for H1>H2>H3 (P<0.05) in both schedules. The lower values later in the season reflected the more vegetative nature of that herbage. Across years 1-5, annual DM yields were 16620 and 15250 (s.e. 109.4; P<0.001) kg/ha for *Lolium perenne* and OPG1, respectively, with corresponding values for the yield of digestible DM of 12220 and 11030 (s.e. 82.8; P<0.001) kg/ha and for the weighted annual DMD of 737 and 724 (s.e. 2.2; P<0.001) g/kg.

Conclusions

High yields of harvested grass were achieved. Harvest schedule influenced grass digestibility, particularly for H1 and H2. Grass DMD of at least 740g/kg was achieved at a range of stages during the season using schedule A. Even though schedule A resulted in a lower total annual yield of DM than schedule B, it had a 0.04 higher yield of digestible DM.

References

Tilley, J.M.A. and Terry, R.A. (1963). *Journal of the British Grassland Society, 18: 104-111.*