

Cutting herbage PM or AM and subsequent effects on silage quality

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Introduction Cutting time influences the contents of water soluble carbohydrates (WSC), where herbage cut in the evening normally has higher WSC contents than herbage cut in the morning (Berthiaume et al. 2012; Pelletier et al. 2010). An experiment was conducted to investigate the effect of cutting time on the fermentation quality and aerobic stability of silage.

Material and Methods Part of the first growth of a grass-dominated ley (A) and a grass–clover-mixture ley (B) was cut in the evening (7 p.m.) and the rest on the following morning (9 a.m.) on 16 and 17 May 2017, respectively. The forage was wilted to 40% dry matter (DM), chopped and ensiled during the afternoon of 17 May 2017 in laboratory silos with a capacity of 1.5 L. For each treatment, three samples were taken and analysed. After a storage time of 93 days, the silos were opened. The DM content was determined by oven drying (15 h at 60°C and 3 h at 105°C), and the nutrient contents were analysed by near-infrared spectroscopy. Additionally, in the silages, the fermentation parameters (pH, acids, ethanol and ammonia) were analysed, and the aerobic stability was investigated. Data were analysed using analysis of variance (Systat 13).

Results and Discussion The DM contents of herbage cut in the evening from leys A and B were higher than that of the herbage cut on the following morning from the same ley (Table 1). For ley A, the WSC contents of the herbage decreased during the night, but this was not the case for the herbage of ley B. The herbage of ley A had less ash and crude protein and more fibres (neutral detergent fibre [NDF] and acid detergent fibre [ADF]) compared to that of ley B, which had a higher proportion of clover.

Table 1. Dry matter (DM) content and nutrients in the herbage before cutting

		Ley A		Ley B		SE	Significance		
		PM	AM	PM	AM		Ley	Time	L x T
DM	%	23.0	21.1	18.6	17.9	0.15	***	***	*
Ash	g/kg DM	77	77	91	95	1.7	***	ns	ns
CP	g/kg DM	106	99	144	139	2.3	***	ns	ns
NDF	g/kg DM	458	493	414	433	5.5	***	**	ns
ADF	g/kg DM	237	262	224	234	3.3	**	**	ns
WSC	g/kg DM	242	214	179	191	5.6	**	ns	*

SE: standard error; PM: evening; AM: morning; CP: crude protein; NDF: neutral detergent fibre; ADF: acid detergent fibre; WSC: water soluble carbohydrates

Table 2. Dry matter (DM) content and nutrients in the herbage at ensiling

		Ley A		Ley B		SE	Significance		
		PM	AM	PM	AM		Ley	Time	L x T
DM	%	45.2	40.4	40.8	37.2	0.98	*	*	ns
Ash	g/kg DM	74	75	88	86	1.4	***	ns	ns
CP	g/kg DM	104	101	144	142	0.9	***	ns	ns
NDF	g/kg DM	459	464	413	412	1.9	***	**	ns
ADF	g/kg DM	244	249	228	232	1.2	***	*	ns
WSC	g/kg DM	277	254	213	203	2.9	***	**	ns

SE: standard error; PM: evening; AM: morning; CP: crude protein; NDF: neutral detergent fibre; ADF: acid detergent fibre; WSC: water soluble carbohydrates

At ensiling, the DM contents were higher in the herbage of ley A than that of ley B. In addition, the nutrient contents were influenced by the type of ley (Table 2). For the cutting time, WSC, NDF and ADF were influenced significantly.

The pH, lactic acid, acetic acid and ethanol in the silages were influenced by the type of ley and the cutting time (Table 3). Higher pH values and lower volatile fatty acid contents in the silages cut in the afternoon were also found by Berthiaume et al. (2012). All silages showed a good fermentation quality. The Deutsche Landwirtschafts-Gesellschaft (DLG) points varied between 90 and 93, and they were influenced by the cutting time.

The silage of the morning cuts had a better aerobic stability than the silage of the evening cuts (Table 3). The reasons for these differences could be the lower DM content and higher acetic acid content. The extent to which the microbiological quality of the silage was responsible for the aerobic stability was not investigated.

Table 3. Dry matter (DM), fermentation parameters and aerobic stability of the silages

		Ley A		Ley B		SE	Significance		L x T
		PM	AM	PM	AM		Ley	Time	
DM	%	43.6	39.6	39.5	34.8	0.77	**	**	ns
pH	g/kg DM	5.5	4.8	5.2	4.7	0.04	*	***	ns
Lactic acid.	g/kg DM	23	46	48	76	2.0	***	***	ns
Acetic acid	g/kg DM	7	14	13	22	0.8	***	***	ns
Butyric acid	g/kg DM	1	2	2	2	0.1	**	ns	ns
Ethanol	g/kg DM	29	7	9	8	1.5	**	**	**
NH ₃ -N/N	%	5.8	6.9	11.2	11.1	0.27	***	ns	ns
DLG	points	90	91	90	93	0.5	ns	*	ns
Aerobic stability	days	4.9	10.4	5.9	13.3	0.70	ns	***	ns

SE: standard error; PM: evening; AM: morning; NH₃-N/N: ammonia-N content of total N; DLG: Deutsche Landwirtschafts-Gesellschaft

Conclusion In the fresh herbage, the WSC contents of the herbage were higher in the evening than in the morning for the grass-dominated, but not for the grass-clover-mixture ley. At ensiling, both leys demonstrated higher WSC contents in the herbage cut in the evening. The pH, lactic acid and acetic acid were influenced by the cutting time and type of ley, but only the cutting time influenced aerobic stability. The lower DM-content and higher acetic acid content were partly responsible for this results.

References

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