The effects of wilting time and dry matter on proteolysis and lipolysis in silage

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Introduction The wilting phase of the crop will influence the chemical composition of the silage. Protein fractions and long chain fatty acids will undergo changes during wilting and further ensiling partially by similar mechanisms (Lee et al., 2006). Our experiment was performed to separate the effects of wilting time and ensiling dry matter (DM), by arriving at certain DM levels at different lengths of wilting.

Material and Methods Pure stands of timothy grass (cv Grindstad) and red clover (cv Vivi) were manually cut and subjected to ten different wilting treatments per crop (n=3), including watering, shadowing and wide-spreading to estimate the separate effects of wilting time (0-52 h) and dry matter content (15-78%). After ensiling without additives in silos with 4.5 L capacity for 115 d, silages as well as wilted green material was analyzed for N fractions and for the content of individual long chain fatty acids (only fatty acid results from wilted material presented in this abstract).

Results and Discussion Both wilting time length and DM affected N fractionation and long chain fatty acid content in the wilted green material (Table 1). Effects of wilting time were to a large extent evened out during ensiling, so that DM was the main determinant of N fractionation in the silage, with less soluble N but more NDF-bound N formed with increasing DM (Figure 1). The NDF-bound N fraction in red clover was lower than most published values (Broderick et al., 2007). The reason could be that the crop was not mowed or conditioned in any way before wilting, so polyphenol oxidase and substrate interaction may have been limited. The water soluble N proportion in the red clover silage declined linearly with a slope of 0.8 with increasing DM, consistent with previous results at our laboratory (Slottner, 2004).

Conclusions Ensiling DM is much more important than the wilting time for N degradation within the relatively short wilting intervals studied here. Both wilting time length and higher DM increase pre-ensiling losses of total LCFA, linoleic and linolenic acids in red clover.

References

Broderick, G. A. Brito, A. F. Colmenero, and J. J. Olmos. 2007. Effects of Feeding Formate-Treated Alfalfa Silage or Red Clover Silage on the Production of Lactating Dairy Cows. J. Dairy. Sci. 90:1378-1391.

Lee, M.R.F., J. J. Colmenero, A. L. Winters, N. D. Scollan, and F. R. Minchin. 2006. Polyphenol oxidase activity in grass and its effect on plant-mediated lipolysis and proteolysis of Dactylis glomerata (cocksfoot) in a simulated rumen environment. J. Sci. Food Agric. 86:1503-1511.

Slottner, D. 2004. Protein degradation during ensilage. Doctoral diss. Dept. of Animal Nutrition and Management, SLU. Acta Universitatis agriculturae Suecia. Agraria vol. 484.

Table 1. Effects[a] of wilting time (0-52 h) and dry matter content (15-78%) on N fractionation and long chain fatty acid (LCFA) content in the wilted green material and the silage after 115 d in silo

	Wilted red clover		Red clover silage		Wilted timothy		Timothy silage	
	Time	DM	Time	DM	Time	DM	Time	DM
Soluble N/g kg N	†	*	NS	***	NS	†	NS	***
NH3-N/g kg N	NS	†	NS	*	†	†	†	***
aa-N/g kg N	*	*	NS	**	NS	†	*	***
NDF-N/g kg N	NS	NS	NS	*	NS	**	*	***
LCFA, g/kg DM	†	†			NS	NS		
C18:2$_{cis,}$ g/kg DM	**	*			NS	†		
C18:3, g/kg DM	NS	†			NS	NS		

[a](† = P < 0.10 * = P < 0.05; ** = P < 0.01; *** = P < 0.001)

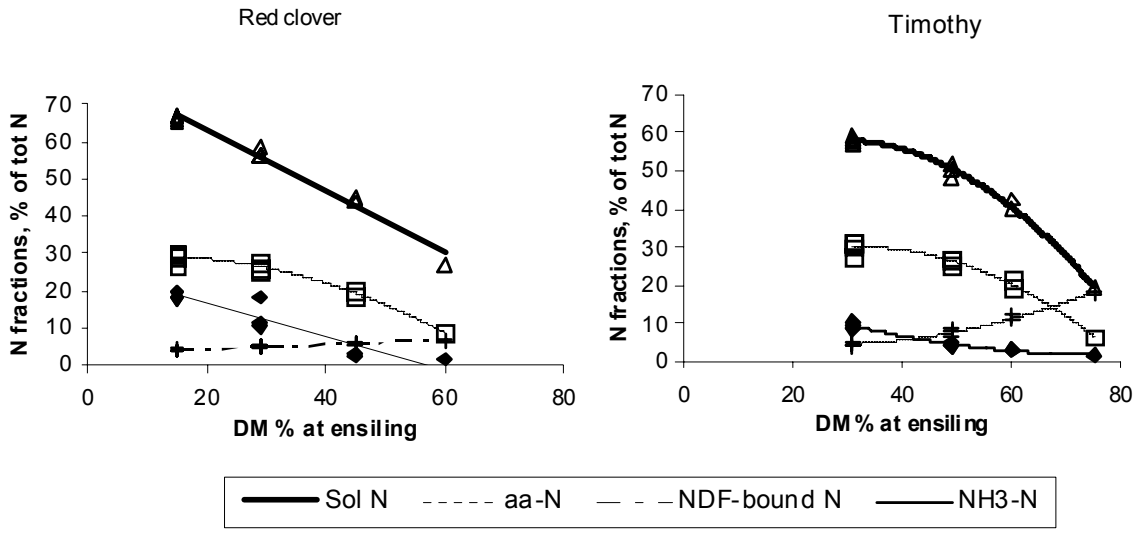

Figure 1. N fractions in silage of red clover and timothy ensiled at ten combinations of DM and wilting time per crop (Sol N = Water soluble N, aa-N = a-amino-N). Each marker within a DM level represents a certain wilting time and is the mean of three replicates (SE for each mean ≤ 2 % of tot N). Fitted lines indicate quadratic or linear responses to DM levels.