

Effects of wilting grass on the efficacy with which fibrolytic enzymes applied at ensiling impact on specific methane yields.

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1. Introduction

- Wilting grass can improve total solids (TS) recovery during ensiling.
- Energy is left unexploited in cell walls of grass silage during anaerobic digestion (AD).
- Fibrolytic enzymes applied at ensiling could be an effective way of accessing this additional energy.
- This study investigated if the extent that grass is wilted alters the efficacy with which fibrolytic enzymes applied at ensiling impact on specific methane yields (SMY) during AD.

2. Materials and Methods

- Perennial ryegrass dominant sward (3 replicates).
- Grass wilted to obtain 200, 350 550, 630 g TS kg⁻¹
- Each subjected to 4 fibrolytic enzyme treatments (control; cellulase; xylanase; 50:50 mixture) and ensiled in laboratory pipe-silos.
- After 120 d ensilage, representative samples were taken for chemical analysis and subjected to a 35 d batch AD test.
- Data were analysed as a split-split plot design.



3. Results

- With progressive levels of wilting there was an increase in silage pH, while the digestibility, lactic acid and ammonia-N decreased (Table 1).
- Enzymes did not impact (P>0.05) silage composition.
- The SMYs were not affected by enzyme treatments at any level of wilting (Figure 1).

Table 1: Effects of wilting and enzymes on silage chemical composition.

Wilt	Enzyme	TSD (g kg ⁻¹)	Fibre (g kg ⁻¹ TS)	pH	Lactic acid (g kg ⁻¹ TS)	Ammonia-N (g kg ⁻¹ N)	TS recovery rate
200	Control	722	479	3.49	168	43	0.89
	Cellulase	708	476	3.39	154	39	0.99
	Xylanase	731	457	3.48	159	42	0.95
	Mixture	721	460	3.44	155	42	0.95
350	Control	729	470	3.77	34	16	0.95
	Cellulase	734	457	3.68	53	23	0.90
	Xylanase	727	462	3.68	36	16	0.90
	Mixture	747	447	3.70	45	20	0.94
550	Control	708	471	4.68	9	9	1.27
	Cellulase	715	460	4.55	10	9	1.02
	Xylanase	678	456	4.80	8	9	1.01
	Mixture	720	455	4.76	9	9	1.03
630	Control	680	489	5.26	2	4	0.97
	Cellulase	672	489	5.08	3	4	0.97
	Xylanase	676	488	5.20	2	4	1.00
	Mixture	669	490	5.25	2	4	0.99

Standard error mean

Wilt	7.1	6.7	0.067	1.90	1.00	0.041
Enzyme	6.7	20.5	0.046	2.40	1.00	0.041
Wilt*enzyme	15.9	24.0	0.103	4.80	3.00	0.096

Levels of significance

Wilt	**	NS	***	***	***	NS
Enzyme	NS	NS	NS	NS	NS	NS
Wilt*enzyme	NS	NS	NS	NS	NS	NS

Wilt = Silage total solids (TS) in g kg⁻¹, TSD = total solids digestibility, Fibre = neutral detergent fibre, TS recovery rate = (silage weight x silage DM)/(grass weight x grass DM) g g⁻¹. * = P<0.05, ** = P<0.01, *** = P<0.001, NS = not significant.

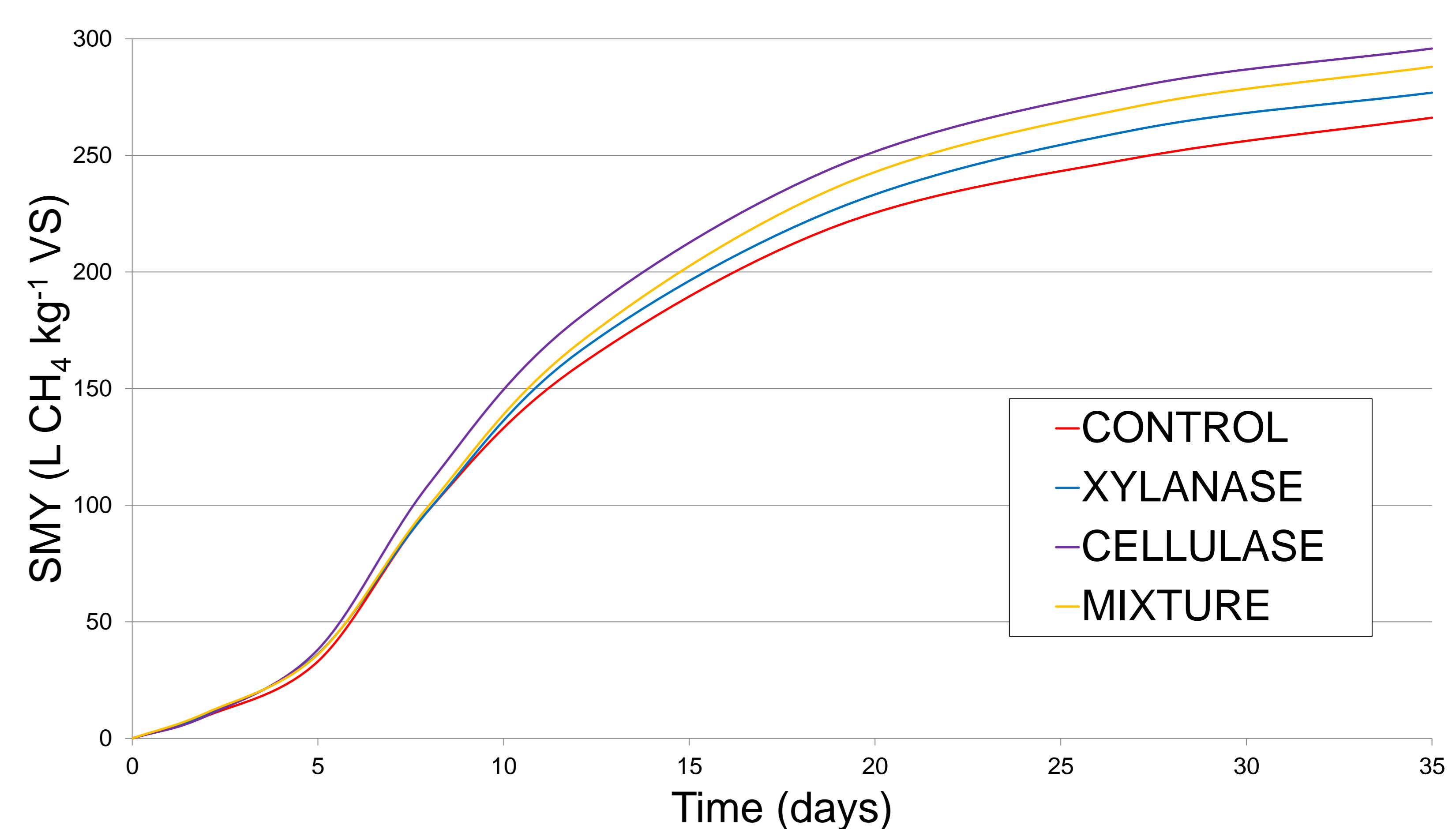


Figure 1: Effect of enzyme additives on SMY (L CH₄ kg⁻¹ VS) averaged across the four wilted silages (P>0.05)

4. Conclusions

- Relative to control silage, enzymes did not hydrolyse fibre at any wilt level, and thus **did not enhance** SMYs.
- Further research is required on fibrolytic enzyme efficacy when applied pre-ensiling and /or post-ensiling.