

METASTUDY ON PRESERVING GRASS SILAGE DURING STORAGE AND AEROBIC CHALLENGE WITH AND WITHOUT SILOSOLVE® FC

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Introduction

Silage inoculants significantly enhance the fermentation process and improve stability during feed-out (Muck et al., 2018). These inoculants are specifically designed for various forage types and different dry matter ranges within those types. As the dairy industry consolidates, larger farm operations often begin harvesting when forage dry matter is below optimal levels, continue during optimal conditions, and conclude when crop dry matter exceeds the ideal range. This inflexibility in silage inoculants across varying dry matters complicates the transition as harvesting progresses from wet to optimal to dry conditions. Consequently, some farmers might choose not to use a silage inoculant, resulting in increased dry matter losses and diminished economic returns.

Objectives

The objective of this meta-study was to compile the results of trials conducted from 2019-2023 using a combination of *Lactococcus lactis* and *Lentilactobacillus buchneri* (SiloSolve® FC, Novonesis), focusing on DM loss and aerobic stability of grass over a variety of dry matters and anaerobic fermentation times.

Materials and methods

For the grass mixtures without legumes meta-study, six harvest times at three different sites between 2019 and 2023 have been included. Data of the time (hours) the temperature increases 3 °C above ambient temperature, percentage of weight loss of the silage during the full aerobic challenge, as well as the pH at the end of the aerobic challenge is listed in table 1.

The trial set up varied both in terms of wilting periods (0 to 4 days) and anaerobe fermentation time (7 to 90 days), as well as aerobic challenge time (7 to 35 days). The grasses were either inoculated with SiloSolve® FC (SS FC) or without any inoculant (ctrl).

SiloSolve® FC contains *Lactococcus lactis* (DSM11037) and *Lentilactobacillus buchneri* (DSM22501) at 150,000 CFU/g of fresh matter in all trials.

All aerobe challenge trials were conducted in mini silos with less than 1 kg silage. Ambient temperature during aerobic challenge: 20–25 °C

The statistical analysis based on comparison between the two treatments and shows the significant effect (P<0.05). Some studies did not have any statistical analysis done for percentage weight loss during aerobic challenge. Those results are written in *italic*.

Table 1. Results of aerobe challenge trials with grass with and without SiloSolve® FC inoculation (150.000 CFU/g).

Country	Harvest Date	Wilting Days	DM start of trial %	Anaerobe Days	Aerobic challenge Days	Aerobe Stability Hours		Loss (wet) at the end of aerobic challenge, %		pH at end of aerobic challenge		Trial
						Ctrl	SS FC	Ctrl	SS FC	Ctrl	SS FC	
Denmark	27.05.2019	0	28.0	7	7	34	159*	na	na	6.39	3.99*	1
Germany	18.05.2020	0	21.9	70	30	220	602*	12.9	6.2	8.49	5.94*	2_a
		1	22.6	70	30	679*	382	5.8	9.4	5.21*	8.79	2_b
		2	56.3	70	30	151	710*	18.4	4.2	9.09	4.63*	2_c
	29.05.2021	1	20.8	92	30	709	651	2.2	2.3	4.61	5.97	3_a
		2	46.0	65	30	462	710*	4.8	3.0	6.72	4.42*	3_b
	10.06.2022	4	72.6	68	35	838	838	9.9	8.5	8.06	7.86	4
Lithuania	11.08.2022	0	37.2	7	11	86	142*	5.4	4.5*	9.07	8.32*	5_a
				14	12	78	209*	7.0	3.0*	9.02	5.09*	5_b
				30	21	164	269*	6.8	5.4	9.28	8.99	5_c
				60	26	204	424*	9.8	4.7*	9.65	5.19*	5_d
	11.07.2023	0	29.4	7	10	228	218	2.9	3.1	7.37	7.64	6_a
				14	9	185	210*	2.5	1.6	6.98	4.65*	6_b
				30	13	222	286*	4.5	2.0	8.02	4.94*	6_c
				60	21	144	462*	7.1	3.7	9.53	4.72*	6_d
				90	23	125	527*	6.3	2.7	9.12	4.59*	6_e

Results written in *italic* do not have any statically analysis. Data in bold and with an asterisk are significantly different (P<0.05).

Results

Due to wilting for 0 to 4 days, dry matter content varied between 20.8% and 72.6%. The very high dry matter resulted in very high aerobic stability of the max 35 days aerobic challenge. While low dry matter of less than 25% had both increased, no effect and decreased effect by the silage inoculant.

The inoculated grass silages improved the aerobic stability in 12 of the 16 studies. In only one study a decreased aerobic stability was registered. There was one study (2_b) where opposite effect was registered.

The aerobic stability seemed first of all to be decreased by the days of anaerobe fermentation where the lowest aerobe stability for the control silage was as low as 34 hours (trial 1), 86 hours (5a) and 228 hours (6a). SiloSolve® FC was able to improve the stability significantly (P<0.05) of two of the studies with the lowest aerobic stability (trial 1 and 5a).

Discussion

The inoculation of SiloSolve® FC containing the strain combination of *Lactococcus lactis* (DSM11037) and *Lentilactobacillus buchneri* (DSM22501) reduced fresh matter loss and improved aerobic stability across different dry matter content and storage time of grass silage, demonstrating the versatility of the silage inoculant.

References

1. Muck, R.E.; Nadeau, E.M.G.; McAllister, T.A.; Contreras-Govea, F.E.; Santos, M.C.; Kung, L. Silage review: recent advances and future uses of silage additives. J. Dairy Sci. 2018, 101, 3980–4000.

