



EFFECT OF A SILAGE INOCULANT ON FERMENTATION QUALITY AND BIOGAS YIELD OF DIFFERENT GRASS SILAGE VARIETIES

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BACKGROUND & OBJECTIVE

- The increasing number of biogas plants has intensified the search for alternative substrates, as corn silage becomes less attractive due to rising costs and environmental concerns
- Grassland biomass emerges as a promising low-cost alternative, but its biogas yield (BY) is highly variable due to factors like plant species, maturity, harvest conditions, and fermentation quality
- Additionally, farmers face challenges in producing stable, high-quality grass silage due to fluctuating dry matter (DM) and changing weather conditions

Aim: to investigate the effect of a homo- and heterofermentative lactic acid bacteria (LAB) based inoculant on improving fermentation, aerobic stability and BY of two grass silages

RESULTS

- IR LAB-treated silages showed lower pH and higher lactic acid concentrations at all opening days, improving fermentation efficiency
- IR CON showed increased ethanol on day 14 and 90, likely caused by undesirable yeasts and/or ethanol producing bacteria
- Aerobic stability was significantly improved by LAB treatment, despite similar acetic acid levels; as well as BY, which indicates a more efficient fermentation for IR
- TF LAB-treated silages showed lower pH, higher lactic and no butyric acid formation, indicating effective activity of the homofermentative bacteria (*L. plantarum*, *L. coryniformis*, *E. lactis*)
- In contrast to IR, acetic acid was significantly improved on day 14 and 90 in TF LAB-treated silages, due to *L. buchneri*, therefore the aerobic stability was improved (see Table 1); also BY was significantly improved in the TF LAB-silages

Table 1. Silage parameters of grass silage variety Italian ryegrass (IR) and Tall fescue (TF) at different opening days (OD) for control (CON) and the treated LAB-mixture (LAB).

Parameter	Italian ryegrass silage						Tall fescue silage					
	OD6		OD14		OD90		OD6		OD14		OD90	
	CON	LAB	CON	LAB	CON	LAB	CON	LAB	CON	LAB	CON	LAB
DM _c (%)	28.7	28.6	28.4	28.7	26.6 ^a	27.5 ^b	31.9	31.8	31.6	31.5	31.8 ^a	30.4 ^b
LA (% DM)	6.12 ^a	8.86 ^b	7.20 ^a	10.05 ^b	9.87 ^a	14.18 ^b	3.07 ^a	7.61 ^b	5.27 ^a	10.43 ^b	5.66 ^a	9.97 ^b
AA (% DM)	0.80	0.83	0.93	1.14	3.05	3.24	0.89	0.84	0.87 ^a	1.25 ^b	0.94 ^a	3.62 ^b
BA (% DM)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35 ^a	0.00 ^b
Eth (% DM)	0.45	0.35	0.95 ^a	0.66 ^b	0.86 ^a	0.44 ^b	0.81 ^a	0.35 ^b	0.74 ^a	0.41 ^b	1.31 ^a	0.64 ^b
pH	4.57 ^a	4.20 ^b	4.29 ^a	3.94 ^b	4.13 ^a	3.84 ^b	5.08 ^a	4.13 ^b	4.70 ^a	3.91 ^b	4.53 ^a	3.86 ^b
WL (%)	-	-	-	-	1.56 ^a	0.97 ^b	-	-	-	-	2.23 ^a	1.10 ^b
AS (days)	-	-	-	-	8.6 ^a	10.0 ^b	-	-	-	-	6.3 ^a	10.0 ^b
BY (NI/ kg DM)	-	-	-	-	621 ^a	637 ^b	-	-	-	-	578 ^a	584 ^b

DM_c = DM corrected; LA=Lactic acid; AA= Acetic acid; BA= Butyric acid; Eth= Ethanol; WL= Weight losses in % FM; AS= Aerobic stability (max. length: 10 days); BY= Biogas yield; a,b symbolize significant differences (P < 0.05)

CONCLUSION

The tested LAB-mixture improved fermentation quality, aerobic stability, and biogas yield across grass varieties, offering a practical solution for optimizing grass silages with different quality due to variety, DM and crude nutrients for biogas production.

References:
Honig, H. 1990. Evaluation of aerobic stability. In: Lindgren, S. & Pettersson, K. (eds.), Proceedings of the EUROBAC Conference, Uppsala, Sweden, 1990, special issue, pp. 76-82