EFFECT OF DIFFERENT SILAGE INOCULANTS ON DIGESTIBILITY PARAMETERS AND METABOLIZABLE ENERGY *IN VIVO* – A META-ANALYSIS

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BACKGROUND & OBJECTIVE

- Livestock production significantly contributes to global GHG emissions, with cattle as the main source via enteric fermentation
- A promising strategy for mitigation emissions is to improve the forage quality and digestibility of silages by using lactic acid bacteria (LAB) based inoculants

Aim: to assess the effect of different LAB-inoculants on digestibility and the derived energy in a meta- analysis compiled from *in vivo* digestibility studies in sheep

RESULTS

- All three LAB inoculants showed significant higher estimated marginal means of the ME (INO1: 10.59 vs. 10.37; INO2: 10.20 vs. 9.77; INO3: 11.57 vs. 11.18), compared to untreated controls, see Figure 1
- Results align with previous studies showing improved fermentation, digestibility, and ME intake from LAB-treated silages
- The positive effects of inoculants on silage digestibility are reinforced by the revised GfE system (2023), which reflects the new ME prediction of highly digestible silages more realistically; these results support their potential role in strategies to reduce emissions through improved feed conversion

MATERIAL & METHODS

- This meta-analysis includes 14 *in vivo* digestibility studies performed between 1996-2002 in Germany using three LAB inoculant mixtures (INO) vs. untreated control (CON)
  - INO1: Mixture of homofermentative LAB (*L. rhamnosus* DSM 7133 and *E. lactis* DSM 7134, application rate: 100,000 CFU/g FM)
  - INO2: Mixture of homo- and heterofermentative LAB (*L. rhamnosus* DSM 7133, *L. plantarum* DSM 12836, *P. pentosaceus* DSM 12834, *L. buchneri* DSM 12856 and *L. brevis* DSM 12835, application rate: 100,000 CFU/g FM)
  - INO3: Mixture of homo- and heterofermentative LAB (*L. buchneri* DSM 12856, *L. plantarum* DSM 12837 and *P. pentosaceus* DSM 12834, application rate: 250,000 CFU/g FM)
- Silages differ in type (alfalfa, grass, maize), number of cut, DM and maturity (defined as crude fiber (CF)), see Table 1 and were ensiled for 90 days; digestibility and metabolized energy (ME) were determined via standardized guidelines (GfE 1991/2001)
- Statistical analysis: linear mixed models including the random effect 'study' and the fixed effect 'silage type' were created to evaluate the effect of the silage inoculant (INO1/INO2/INO3) on the ME in contrast to the CON; the significance level was 5 %

Table 1. Overview of the used silages regarding dry matter (DM), crude fiber (CF) range and silage inoculant (INO1/INO2/INO3)

	n studies	DM range (%)	CF range (% DM)	Silage inoculant
Grass 1st cut	6	22-50	21.7-27.4	INO1; INO2
Grass 2nd cut	1	51	27.7	INO2
Alfalfa 1st cut	2	35-56	26.6-27.2	INO1
Alfalfa 2nd cut	1	40	28.0	INO2
Maize	4	25-40	17.7-25.6	INO1; INO2; INO3

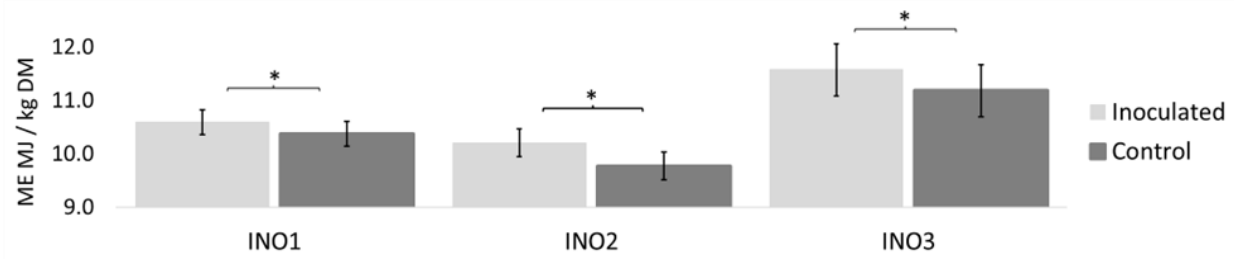

Figure 1. Estimated marginal means and standard error of the metabolizable energy (ME) of the three silage inoculants (INO1, used in alfalfa (A), grass (G), maize (M); INO2, used in A,G,M; INO3, used in M) and their controls (P<0.05).

CONCLUSION

This meta-analysis of 14 studies confirms that all three tested silage LAB-inoculants improved digestibility and metabolizable energy across forage types, supporting more efficient and sustainable milk production.

References: GfE (Gesellschaft für Ernährungsphysiologie – Ausschuss für Bedarfsnormen). (1991). Leitlinien für die Bestimmung der Verdaulichkeit von Rohnährstoffen an Wiederkäuern. J. Anim. Physiol. Anim. Nutr. 65, 229-234.
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