

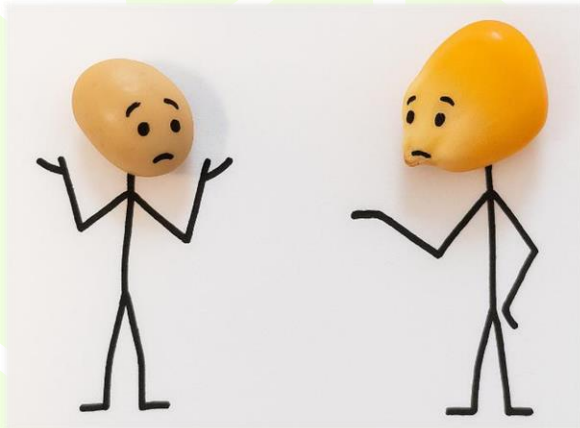
Investigation on Trypsin Inhibitor Activity Reduction During Ensiling of Freshly Harvested Soybeans With High-Moisture Corn

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Introduction

🥵 Soybeans – high-value but challenging

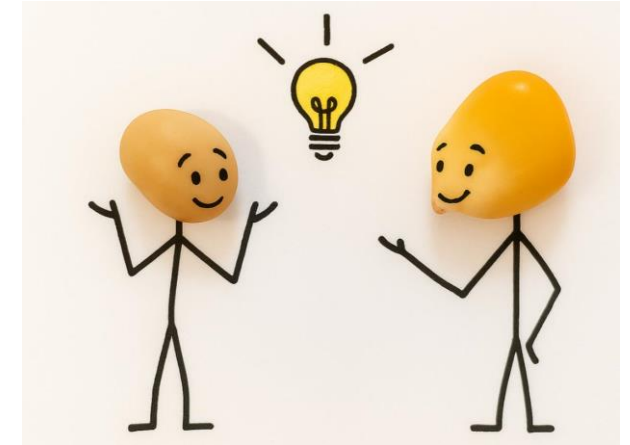
- Rich in protein, amino acids and highly digestible
- Require drying and thermal processing to inactivate antinutritional factors (trypsin inhibitor activity - **TIA**)
- ☹️ 🔥 Energy- and labor-intensive
- ☹️ 🌡️ Processing risks: Overheating ⇒ protein damage
- 👉 Studies suggest TIA breakdown during soybean meal fermentation

🌽 A potential solution

- High-moisture corn is widely ensiled in Germany
- Harvested around the same time and has good ensiling properties

🎯 Study Aim

- Evaluate fermentation quality of soybean–high-moisture corn mixtures
- Assess TIA degradation during co-ensiling of soybeans and corn

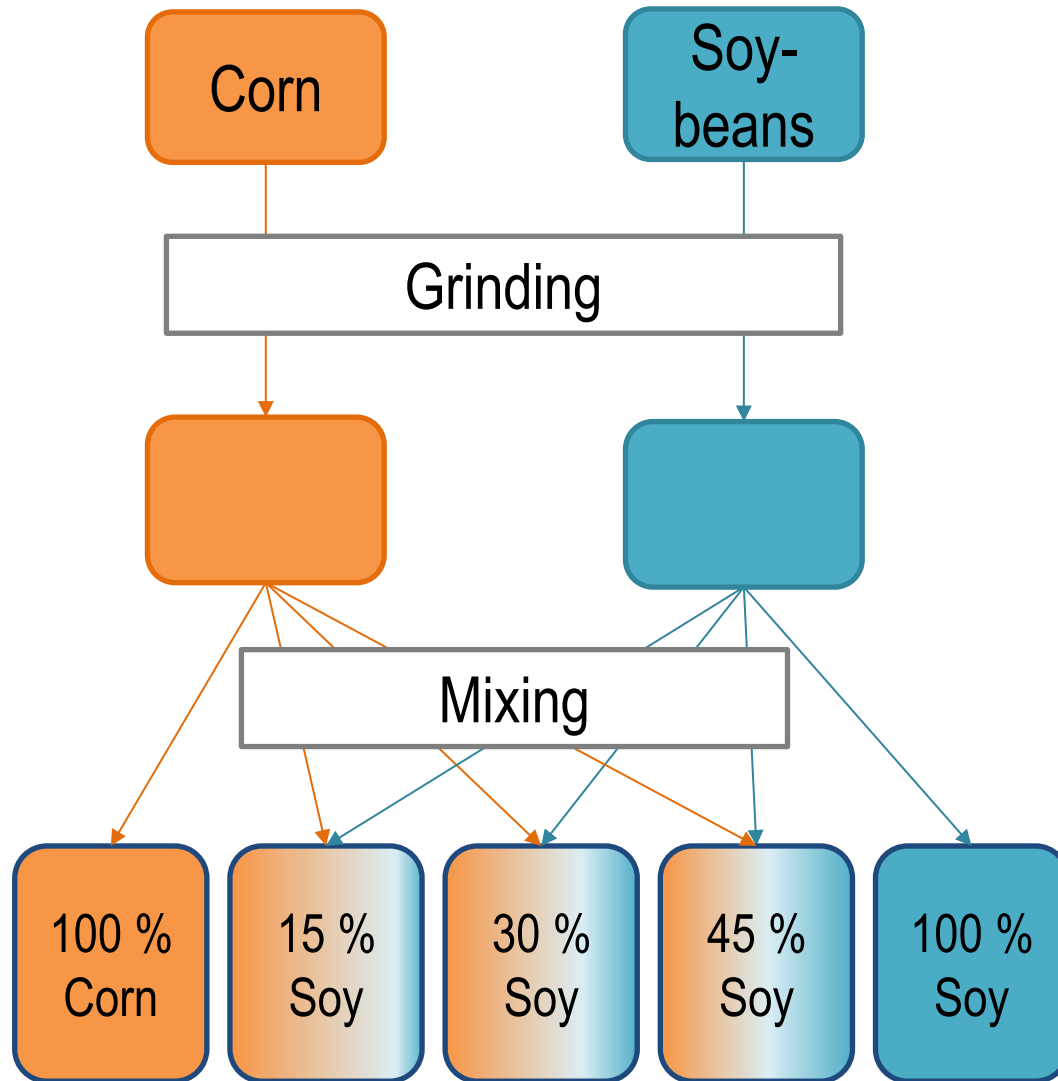


Materials and Methods

Grains

Meal

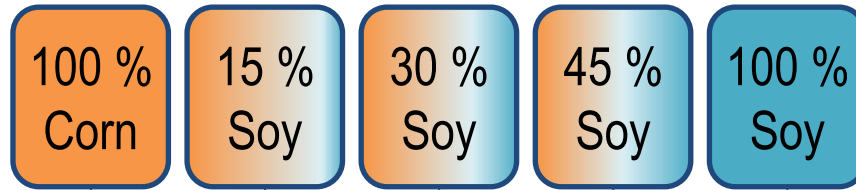
5 Mixtures



	Corn	Soybeans
DM (g/kg)	713	869
CP (g/kg DM)	96	349
CL (g/kg DM)	47	259
WSC (g/kg DM)	32	77
BC (g/kg DM)	7	63

Materials and Methods

5 Mixtures



3 (4) Treatments:

Control



Silage additive 1



L. Plantarum (homofermentative)

Silage additive 2



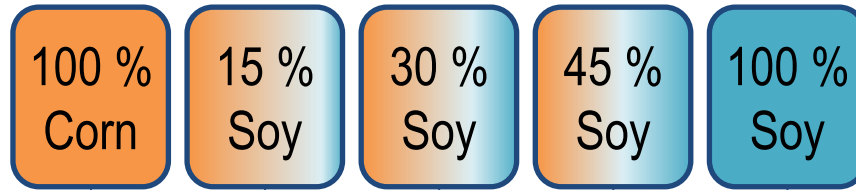
P. pentosaceus, *L. brevis*, *L. buchneri*, *L. plantarum*,
L. rhamnosus (homo- +heterofermentative)

Propionic acid (5 l/t)



Materials and Methods

5 Mixtures



3 (4) Treatments:

Control

Silage additive 1

Silage additive 2

Propionic acid (5 l/t)

⇒ **Laboratory silo test** in mason jars according to the DLG Testing Guidelines (DLG, 2018, three replicates each):



after 49 days: **Aerobic stability**

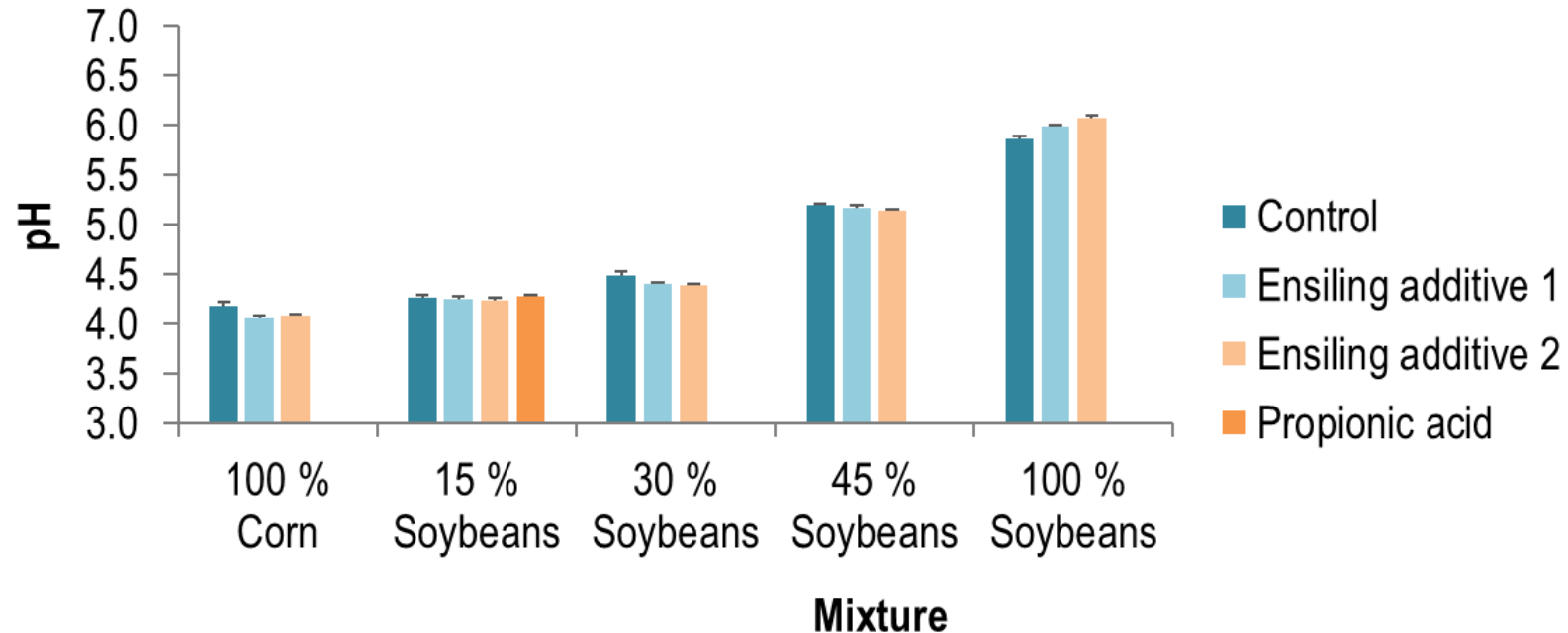


after 90 days: **Fermentation quality, TIA***



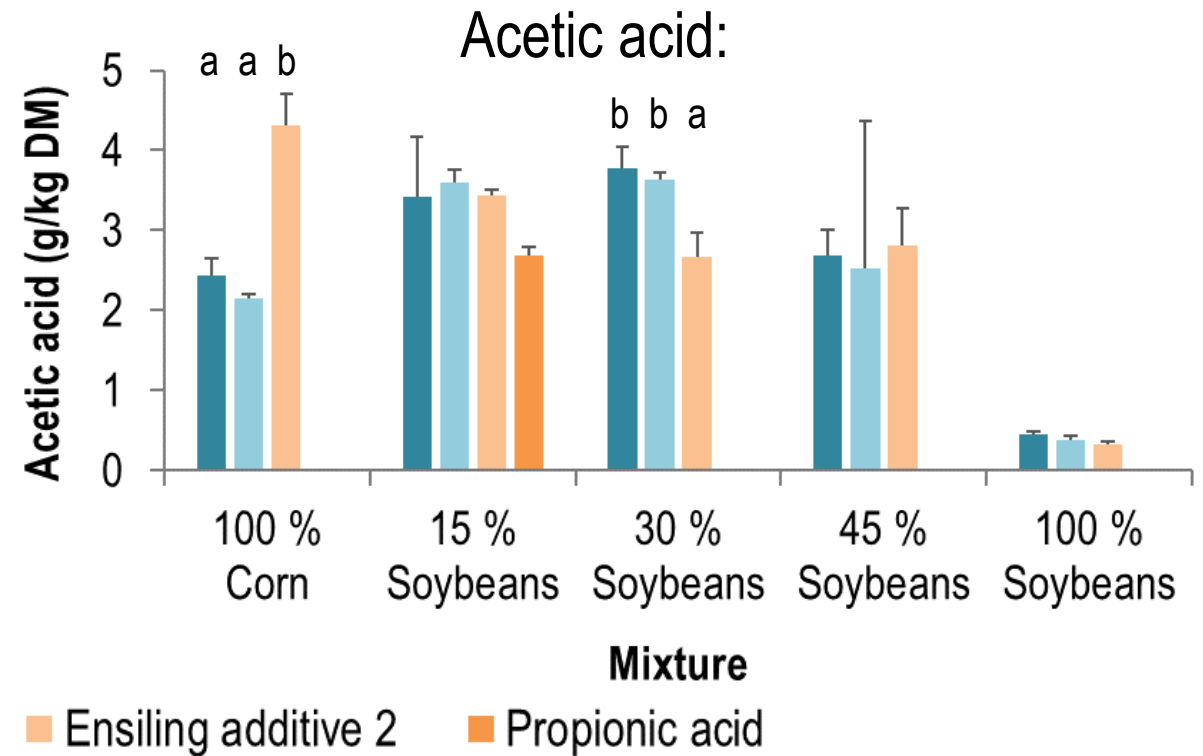
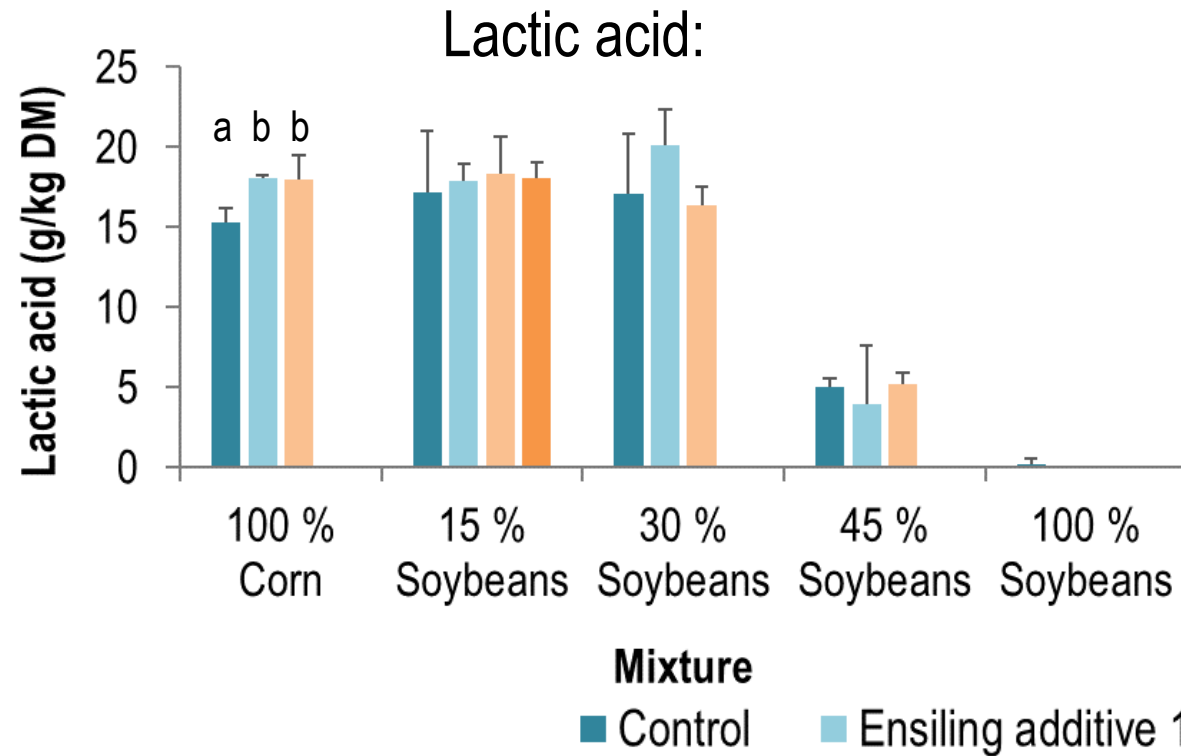
ANOVA: Effects of mixture & treatment

Results: Silage pH after 90 days



- ⇒ At soybean levels up to 30%, pH decreased below 5.0
- ⇒ Hardly any pH reduction observed in pure soybean silage
- ⇒ No relevant effect of silage additives

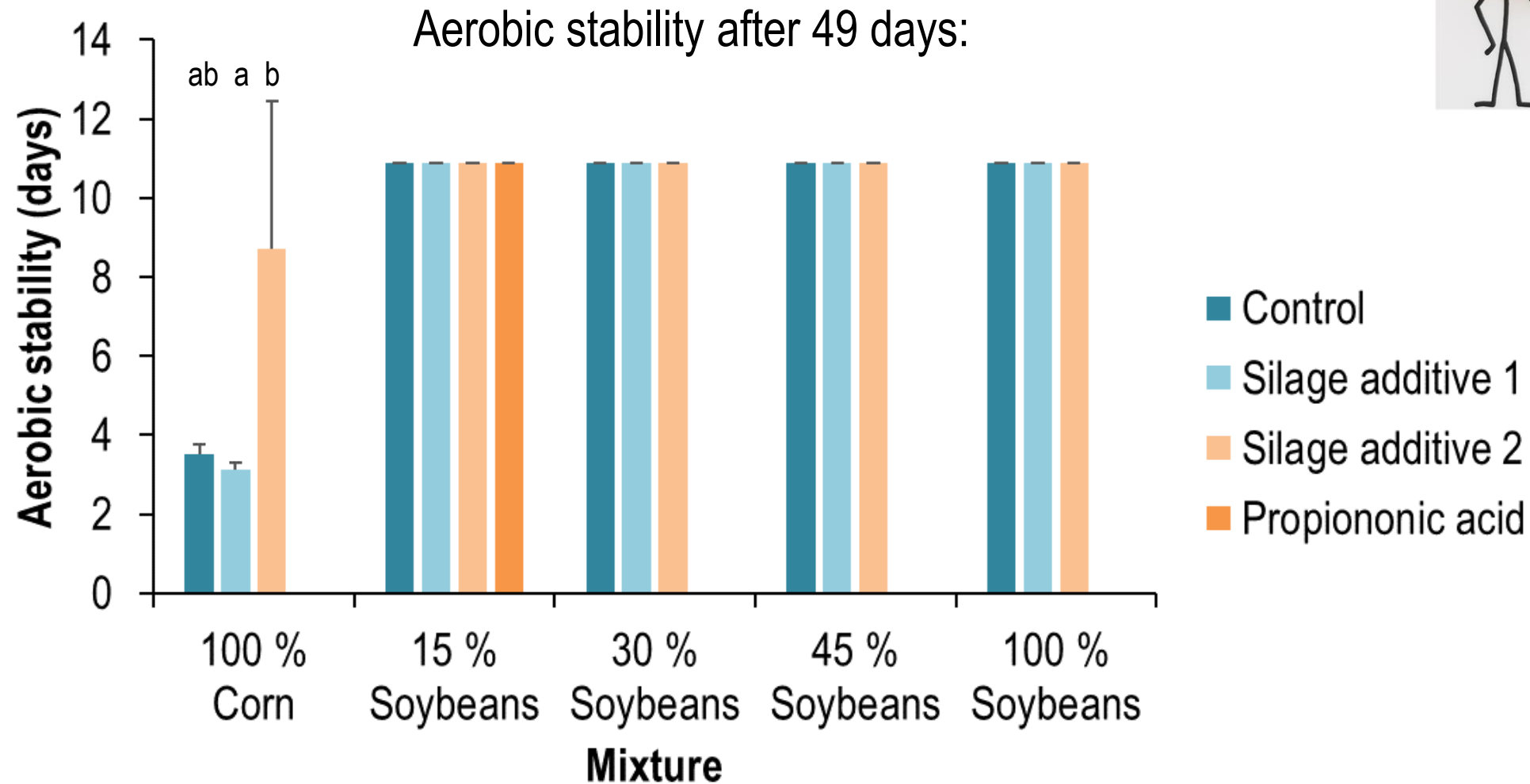
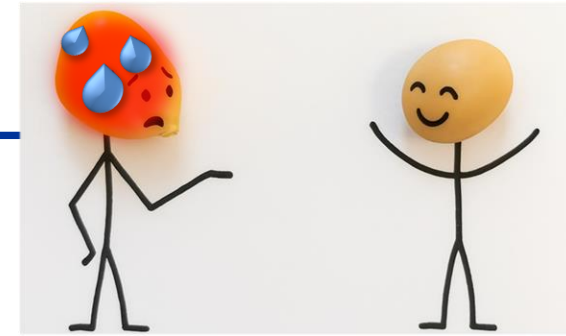
Results: Fermentation Quality



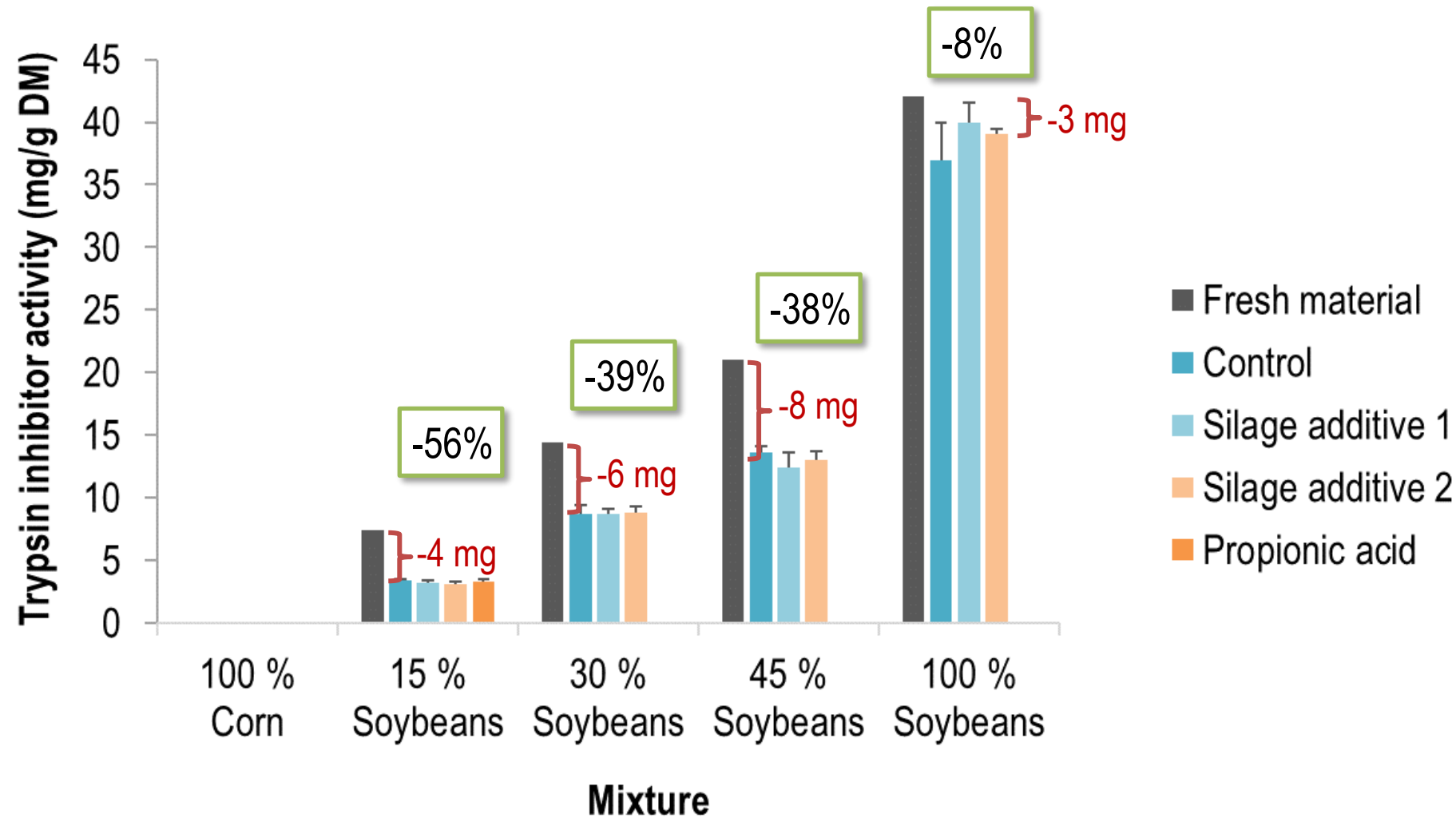
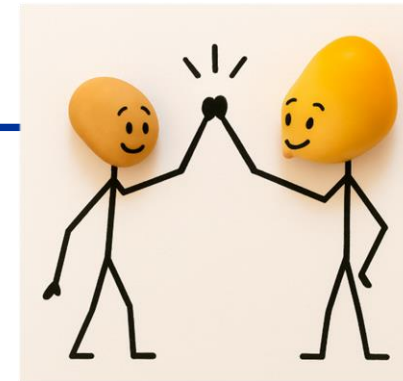
- ✓ **Butyric acid:** Not detected
- ✓ **Propionic acid:** Only detected in the variant treated with propionic acid

- ✓ **Ethanol and NH₃ content:** Low
- ✓ **Dry matter losses:** Low

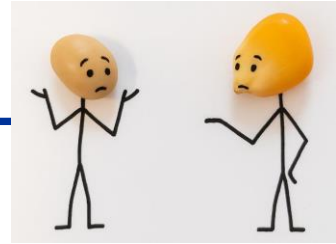
Results: Aerobic Stability



Results: Trypsin Inhibitor Activity (TIA)



Notable Observations



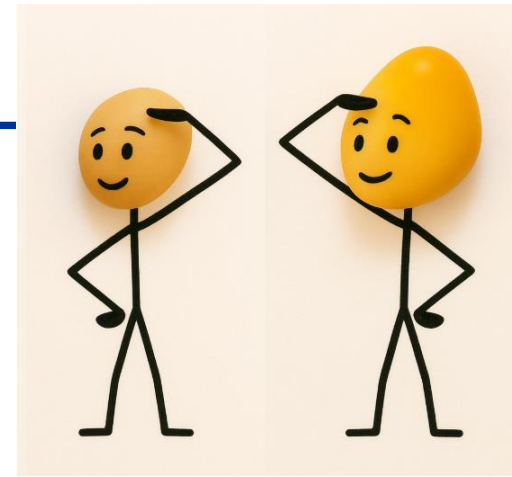
- Silages made from corn-soybean mixtures showed a tendency to form strong agglomerations
- Noticeable browning in the mixtures



100 % 15 % 30 % 45 % 100 %
Corn Soybeans Soybeans Soybeans Soybeans



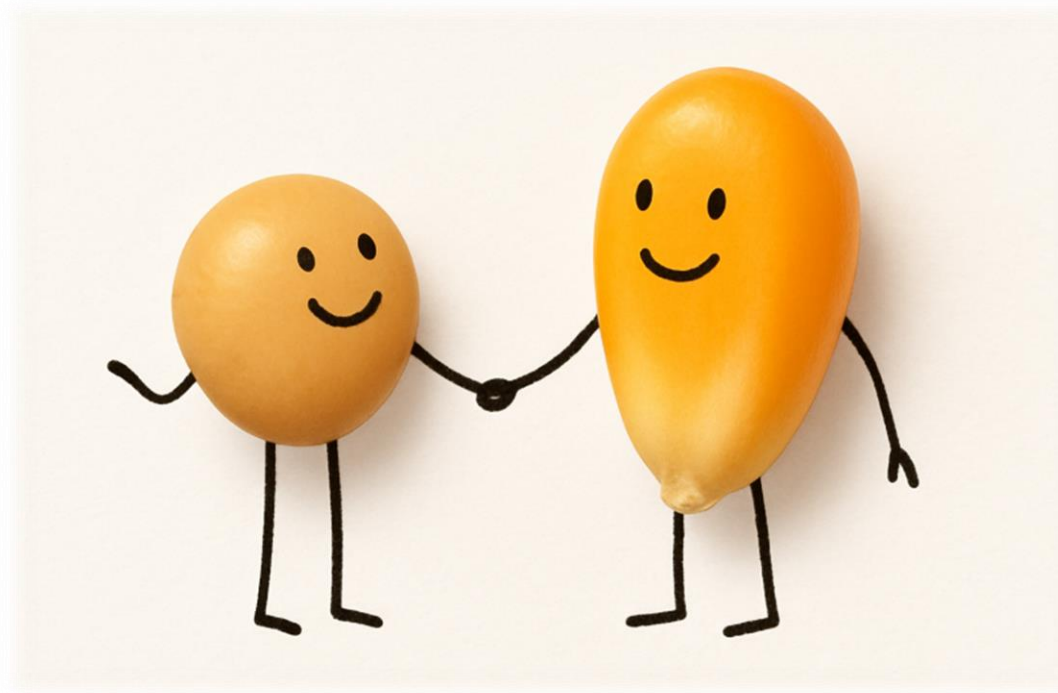
Conclusion and Outlook



- ✓ **Ensiling** of corn–soybean mixtures works with up to **30% soybean** through lactic acid fermentation
- ✓ **Soybeans improve aerobic stability** of silage significantly
- ✓ **TIA reduction** was observed, correlated with pH
- X **Additives** had minor effects on fermentation and stability
- ✓ **Co-ensiling soybeans with high-moisture corn** reduces need for drying/toasting
- ☞ Further research needed on **nutritional value**, other **antinutritional factors** (e.g., lectins) and **fat quality** (oxidation, stability)
- ☞ **Practical techniques** (grinding, filling, unloading) need testing at farm scale
- ⇒ **High innovation potential** for use in pigs, poultry and cattle



Thank you for your attention!



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