In vitro nutrient fermentation and methane mitigation potential of pineapple by-product silage in ruminants

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Introduction

- High-fibrous tropical forages ferment primarily to acetic acid in the rumen, thereby increasing enteric methane (CH4) production.
- In contrast, non-structural carbohydrates (e.g., starch) shift fermentation toward propionic acid production, thereby mitigating CH4 production.
- Pineapple by-product silage, rich in fibrous residues with soluble sugars, is a potential alternative feed in tropical ruminant feeding.
- However, its fermentation dynamics and impact on CH4 production have not yet been explored.

Objectives

- To determine the *in vitro* gas production, CH4 yield, volatile fatty acids (VFA) profile, and dry matter (DM) degradability of pineapple by-product silage after 48 hours of *in vitro* incubation.
- To evaluate the effect of mixing pineapple by-product silage with tropical grass on mitigating CH4 production.

Conclusion

Pineapple by-product silages exhibit a more intensive and superior fermentation of nutrients compared to Toledo grass, resulting in increased acetic acid production and elevated methane production.

Materials and Methods

Treatments

- T1: Pineapple by-product silage without inoculant
- T2: Pineapple by-product silage inoculated with *Lentilactobacillus buchneri*
- T3: Pineapple by-product silage inoculated with *Lentilactobacillus buchneri* and homofermentative lactic acid bacteria
- T4: *Urochloa brizantha* cultivar Toledo grass (CIAT 16835)
- T5: 30% Pineapple by-product silage without inoculant mixed with 70% Toledo grass
- T6: 9% Pineapple by-product silage without inoculant mixed with 91% Toledo grass

In vitro incubation

Time: 24 and 48 hours, with 3 flasks per treatment

Gas production by Theodoru et al. (1994) | CH4 production using gas chromatograph | VFA using HPLC | DM degradability

Statistical analyses

- Treatment and incubation time as independent factors.
- Linear mixed-effects model: gas and CH4 production with repeated measures.
- Generalized least-squares model: VFA concentrations and DM degradability.
- Significance level: $p < 0.05$

Results

CH4

Pineapple by-product silage

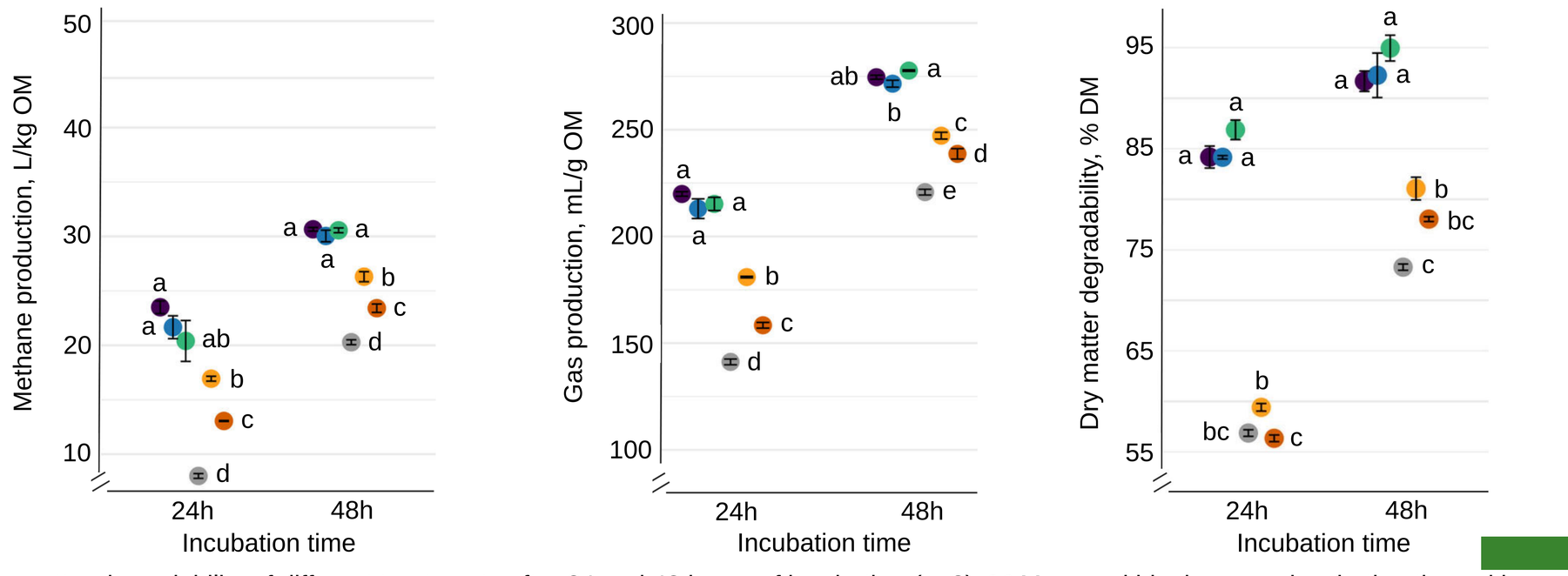

Figure 1 Methane production, gas production, and dry matter degradability of different treatments after 24 and 48 hours of incubation (n=3). [a-e] Means within the same incubation time with different superscripts differ ($p < 0.05$). Error bars = standard error; DM = dry matter; OM = organic matter; h = hour.

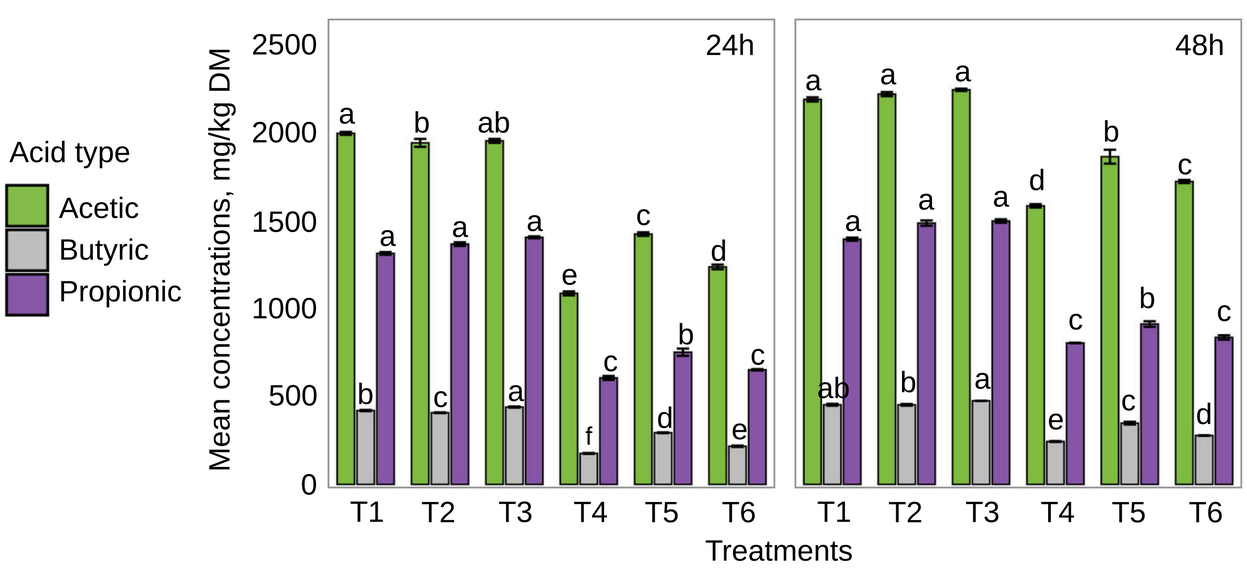

Figure 2 Mean concentrations of acetic, butyric, and propionic acid of different treatments after 24 and 48 hours of incubation (n=3). [a-f] Means within the same acid type and time point with different superscripts differ ($p < 0.05$). Error bars = standard error; DM = dry matter; h = hour.

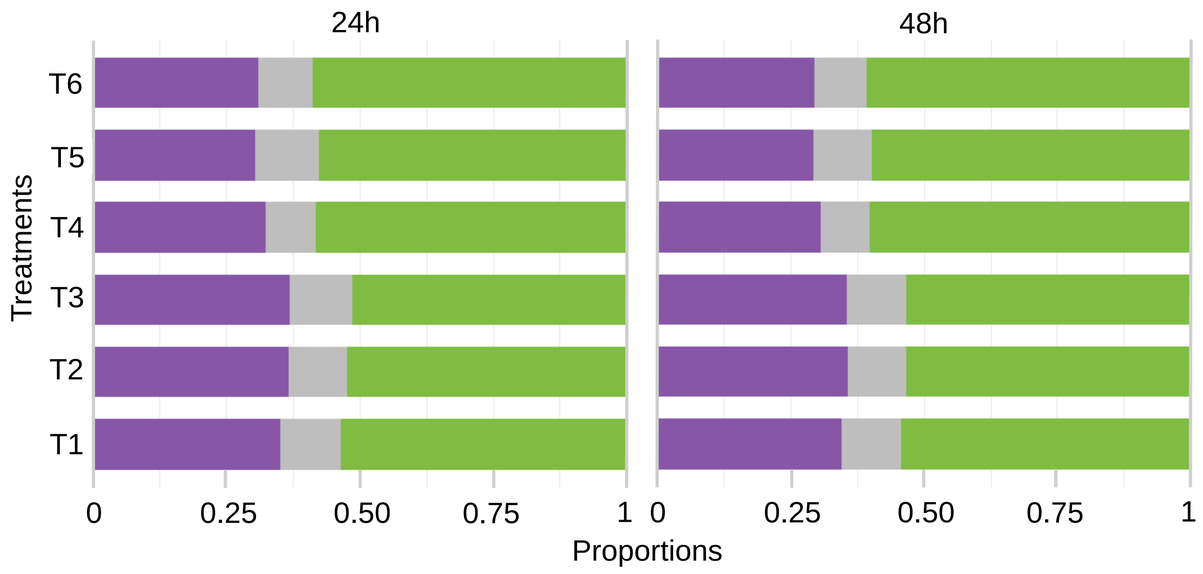

Figure 3 Proportions of acetic, butyric, and propionic acid to total acids of different treatments after 24 and 48 hours of incubation (n=3). h = hour.

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