LACTIC ACID BACTERIA INOCULATION MITIGATES GAS PRODUCTION POTENTIAL LOSSES DURING AEROBIC EXPOSURE OF CATCH-UP CROP.

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INTRODUCTION

Anaerobic digestion of energy crops, residues, and wastes has gained significant attention as a sustainable and environmentally friendly alternative to conventional energy sources. Catch-up crops (legumes, grasses or mix) are primarily grown to protect and improve the soil between cereal rotations. With the growing concern over climate change and the need to reduce greenhouse gas emissions, biogas production from catch-up crops offers a promising solution by utilizing noncompetitive human food organic matter and converting it into biomethane. However, the potential yields from biomethane can vary significantly depending on the quality of the silage being added to the generator. Silage inoculation with a combination of lactic acid bacteria has demonstrated a rapid fermentation, preserving nutrient and energy levels, along with an improved aerobic stability of the silage when opened (Arriola et al., 2021).

OBJECTIVE

To evaluate the effect of a combination of lactic acid bacteria on quality and aerobic stability of silage produced for biodigesters.

MATERIALS & METHODS

Cover-crop

Sorghum 58% / Sunflower 28% / Niger 14% (Metha20, LIDEA seeds)
Harvest : Oct 8th, 2021, 19.6% of DM, yield = 13 tDM/ha

Ensiling & Aerobic stability (AS) test

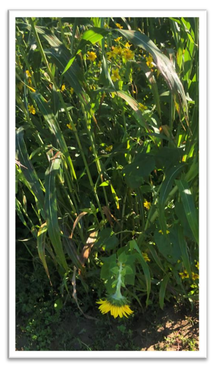
Mini-silo of 12.5 L buckets, 5 kg/replicate, duration: 115 days,
AS for 8 days with buckets (covered with aluminum foil) stored at 21°C

Biochemical methane potential (BMP)

Manual manometric, performed at opening and at the end of AS test

Treatment

1/ Control 2/ **EnergySil** at 2.5 g/t: *Pediococcus pentosaceus, Lactiplantibacillus plantarum, Lentilactobacillus buchneri.* Total of **150 000 cfu/g** + enzymes

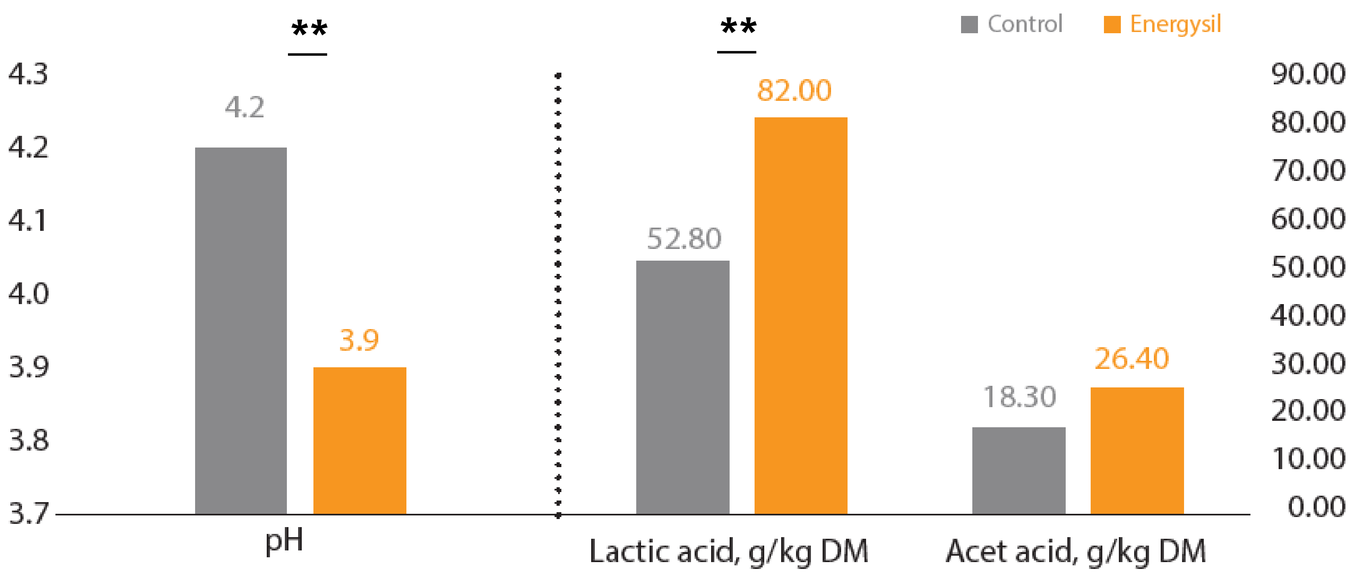


RESULTS & DISCUSSIONS

• Fermentation characteristics

EnergySil lowers the pH of catch-up crop silage more efficiently

Lactic and acetic acid levels after 115 days ensiling

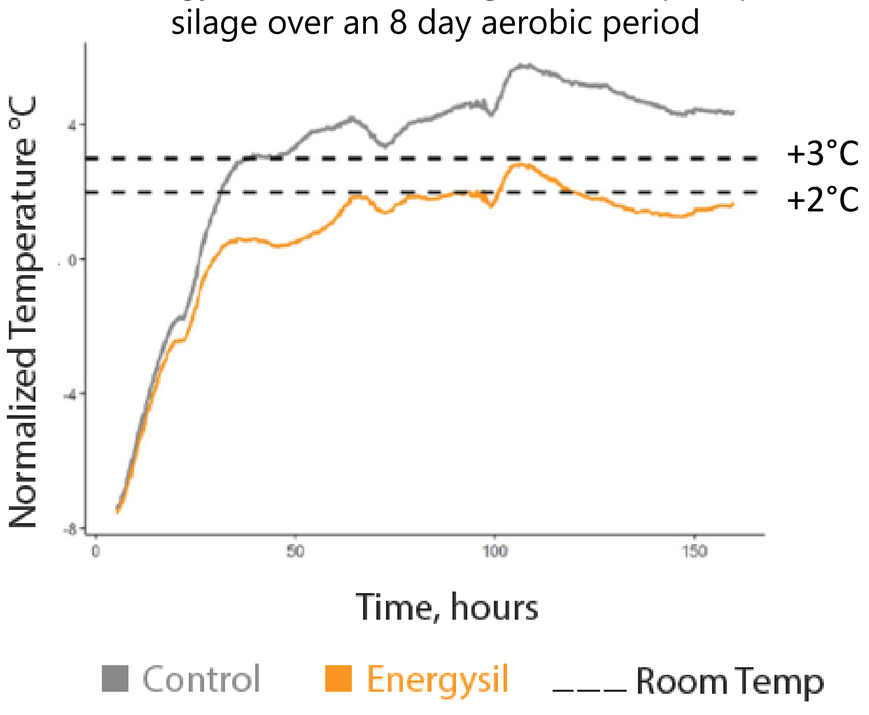


*** P< 0.05*

EnergySil produced more lactic acid reducing the pH faster which helped **reduce the DM losses by 2.2 %** compared to control

• Aerobic stability

EnergySil reduces heating in catch-up crop silage over an 8 day aerobic period

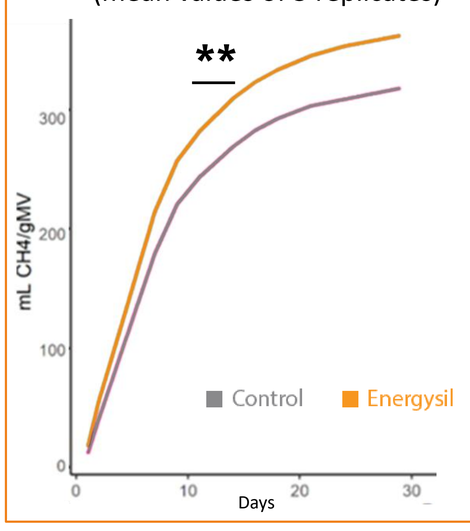


• Fermentation losses and BMP

	Control	EnergySil
At opening		
DM losses, %	**6.0 ± 3.9** [a]	**3.8 ± 5.0** [b]
BMP, L CH4/kg with volatiles	336 ± 18 [a]	343 ± 25 [a]
After AS test		
DM Losses, %	**10.4 ± 17.5**[a]	**4.4 ± 6.8** [b]
BMP, L CH4/kg with volatiles	**318 ± 16** [a]	**362 ± 23** [b]
Total production of CH4, (Opening & AS), m³/ha	**3 485 ± 625** [a]	**4 336 ± 432** [b]

Different superscripts (a–b) in the same row indicate significant differences (P < 0.05)

BMP after AS test
(mean values of 5 replicates)



EnergySil silage makes more biogas, faster (>10% more after 10h of BMP) = increased potential in **faster passage rate at the plant**

By limiting aerobic spoilage, **EnergySil** offers **1 T/ha DM extra silage** compared to control
=>Stable silage gives **more biogas (~25%) per ha harvested**

CONCLUSIONS

By improving the preservation and aerobic stability of catch-up crop silage a combination of hetero- and homo-fermentative lactic acid bacteria with enzyme maintains the biogas production per hectare compared to untreated control silage. Gas yield per hectare have been maximized and losses minimized.