

A microbiota e o aumento da produção de biogás: pre-tratamento, co-digestão, bioaumentação, co-cultura e uso de enzimas

Nome: Suelen Osmarina Paesi
Universidade de Caxias do Sul

Universidade de Caxias do Sul



Linha de Pesquisa do LDM

Produção de Biometano e Biohidrogênio e outros produtos de interesse biotecnológico a partir de resíduos agroindustriais

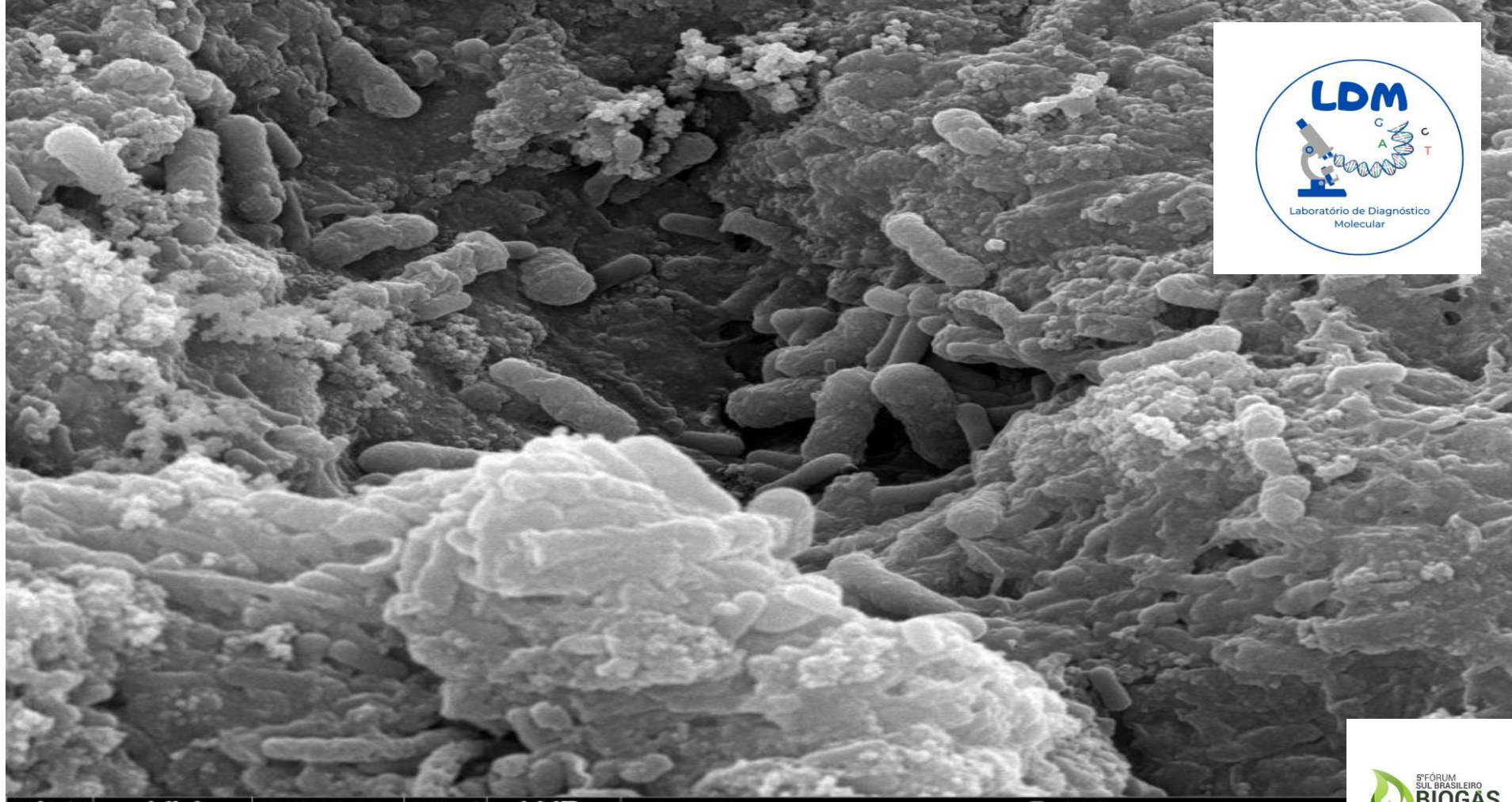


Pesquisa
Prestação de Serviços
Inovação
Formação de recursos

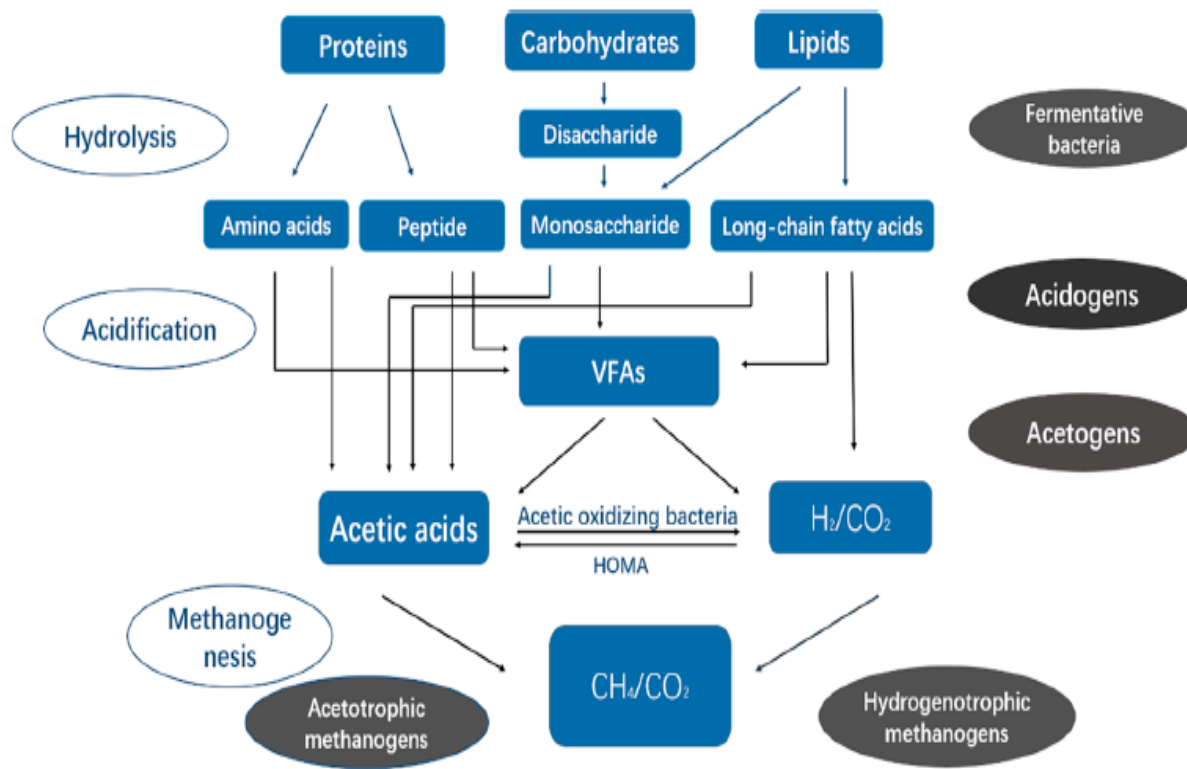
A photograph of a herd of white Zebu cattle in a field. The cattle are of various ages, with some showing prominent humps. They are standing in a field of dry, yellowish-brown grass. The lighting is warm, suggesting late afternoon or early morning. The text is overlaid on the top right of the image.

O Brasil é hoje o maior exportador mundial de proteína animal.

Grande disponibilidade de biomassa, no Brasil, para geração de Biogás



Consórcio de microrganismos da Digestão Anaeróbia



Papel da Microbiota na Digestão Anaeróbia



Identificação de Microrganismos

Microscopia

- Formato
- Formação de esporos



Isolamento

Isolar **1%** da comunidade microbiana



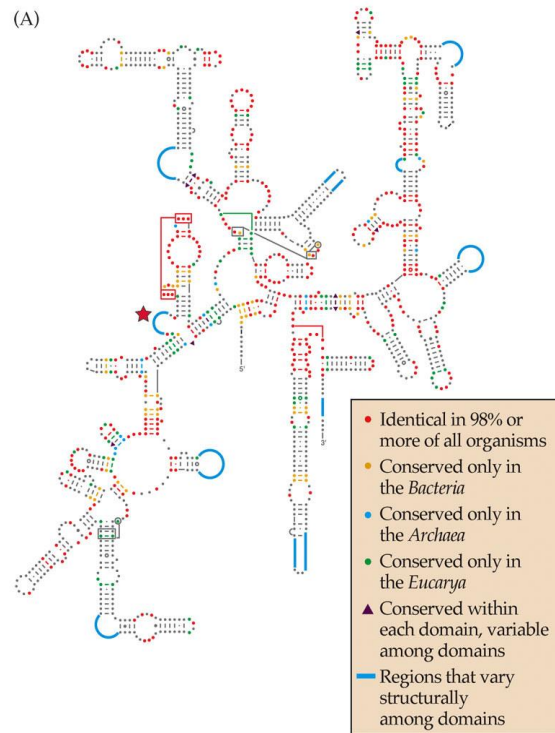
Biologia molecular



- Extração de DNA
- Sequenciamento
- Análises dos meta dados por meio de bioinformática

Identificação taxonômica por sequenciamento do gene rRNA16S

Região conservada em partes entre as bactérias e archeas
regiões V3 e V4 (RNA 16S)
É um marcador filogenético



MICROBIAL LIFE, Figure 17.3 (Part 1) © 20

Sequências de DNA do gene RNA16S que são alinhadas à banco genômicos

MX: Alignment Explorer (sequences.fasta)

Data Edit Search Alignment Web Sequencer Display Help

DNA Sequences Translated Protein Sequences

Species/Abbrv	
1. a41782b91715dc4fc1a4557bb557cb3	GGGGGATATTGCAATGGGGGGAACCCGTGACGACCAACGCCCGTGAAAGGAAGAAAGTTTTCGGATTGTAAACCTCTTTTATTAAAGGACGA
2. f9860a1ae1aa25b5b5a2d7367a9b2bc	GGGGGAATATTGCAATGGGGGGAACCCGTGACGACCAACGCCCGTGAAAGGAAGAAAGTTTTCGGATTGTAAACCTCTTTTATTAAAGGAAAT
3. fd204f7a88e546b2288f9b86489a32	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
4. cc1f106dae404eca16e3b7d588d58645	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
5. f9ee3bca2831ea4d6f024e6d76222639	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
6. 6a4b3316a3f74498a7b14a2fea8fe131	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
7. 18e779a2e5b5d44b06c30b27fe0ae080	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
8. 2b14b1d45d6fe2c341d0e8e2a28f2393	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
9. 0ca87af0de55611a2a2e3c8d06256d7d	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
10. 598404b18f9f8d2579e4675a0571e66b	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
11. 8acdd8a43d4ebf720823ceea4f45850dc	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
12. dd5ce8db0b40693d540cb5aaf1b93c1c7	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
13. bfad690571983692244717f38b9c41c7	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
14. e27337a44899a2c5d5f5106ebd4d7d7f	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
15. e0c7507884f3170835d383d4c75406d	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
16. 77da8d8afe07e31d0a9647da10ee90f7	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
17. f20d4981bbe9fb0785daa14c3d8bc1e5	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
18. 18111f12da1c0ea618fb5e6fe91d6c7	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
19. 4149e7afca13d557b531ca7bd17d8fec	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
20. b609cb3b1669f6502169cbcb6fb656746	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
21. 074f8ed1013ab4880af3b1f043dc09b7	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
22. c1db166555f93719888b03a40bed1b4	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
23. 667c7a9ba435be56714ebcd4557f2a37	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
24. 1cb8a031381848c3d88aacc0ee37ca	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
25. 3a3d386cd02b3285466f0469a81b7c	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
26. 84a7eb7493a5ad38f5f42938c7e4ebc0c	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
27. 2e398b8d21cd0766b2cf014de5f215f	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
28. 7c50b569fdae883020dcbf31140301	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
29. 0e9de20713bc15def3e1d741f827b832	GAGGAATATTGGTCAATGGGCGAGAGCCGTGAACGACCAAGTACGCTGAAGGAAGTACCTGCCATGGGTTGTAAACCTCTTTTATTAAAGGAAAT
30. 82d893fe895776cd1933ca2a2076405c	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT
31. a5d3419ca92bb71955c745ce0759d02	GGGGGAATATTGGAATGGGGGGAACCCGTGACCAAGCAACGCCCGTGAAAGGAAGAAAGGCTTCGGGTTGTAAACCTCTTTTATTAAAGGAAAT

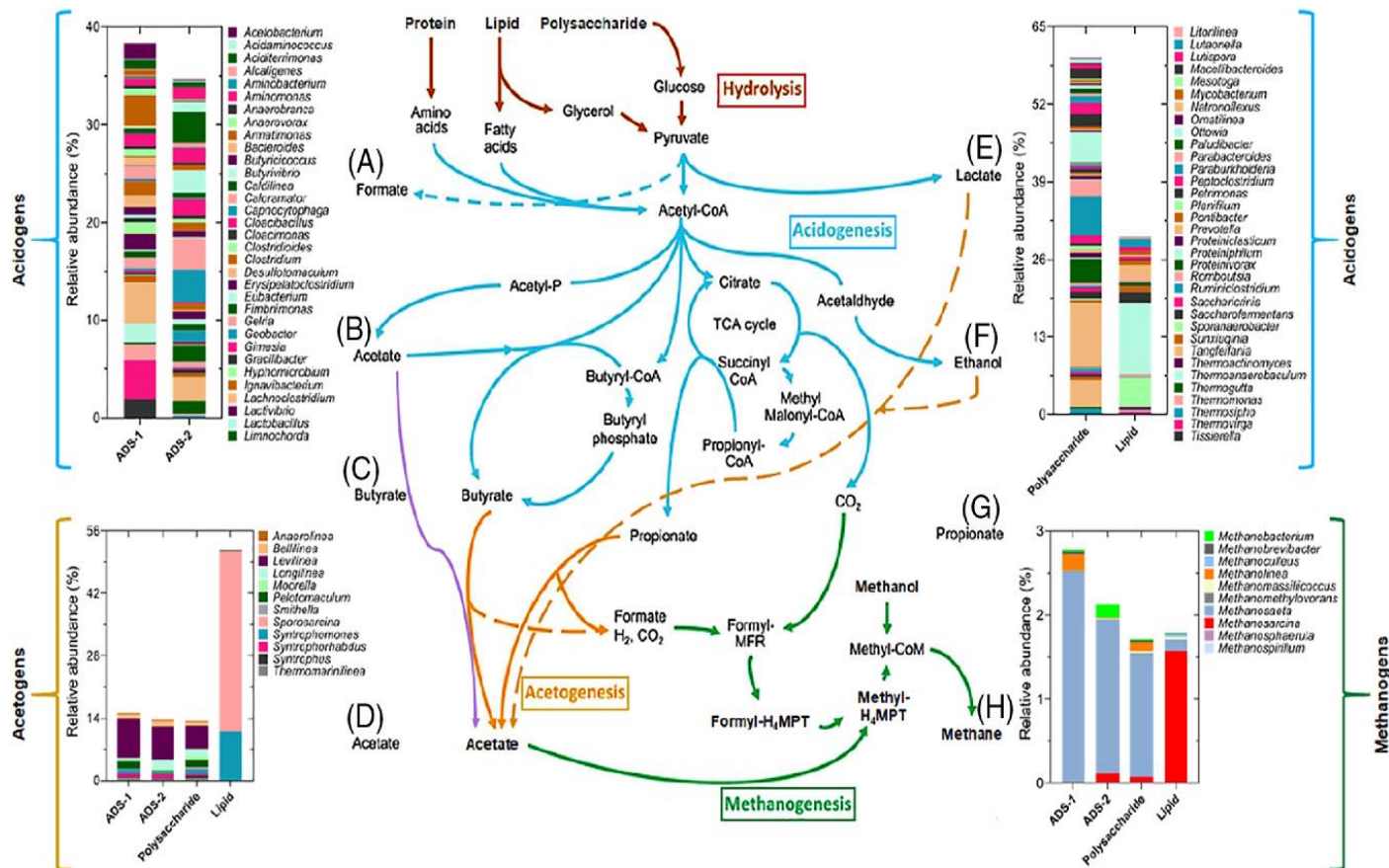
Site # 1 with w/o gaps

Selected genetic code: Standard

16°C 10:43 16/09/2022

Microbial Symbiosis: A Network towards Biomethanation

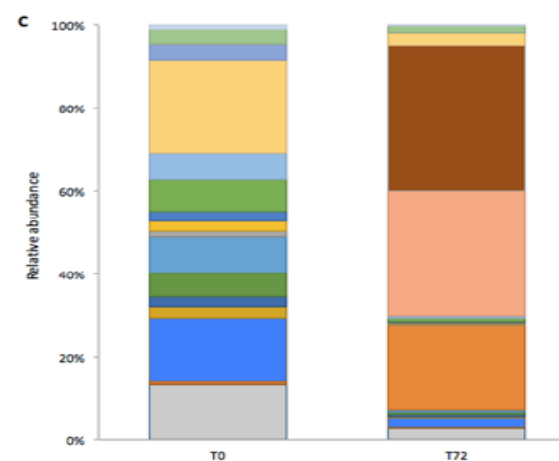
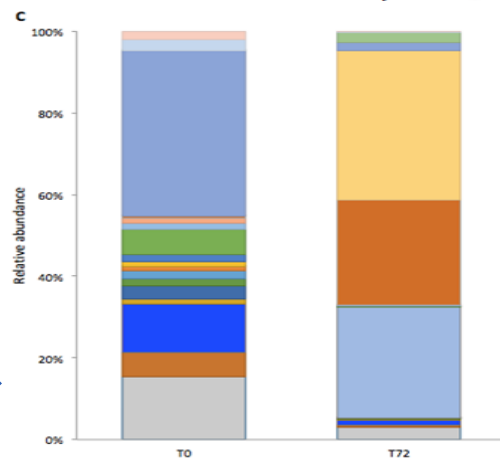
<https://doi.org/10.1016/j.tim.2020.03.012>





Comparison of two different kinds of seed sludge and characterization of microorganisms producing hydrogen and soluble metabolites from raw glycerol

Suelen Paesi¹ · Ariela Schiavenin¹ · Leandro Gois Almeida¹ · Darliane Andreis¹ · Flaviane Eva Magrini¹ · Leticia Marconatto² · Luiz Gustavo dos Anjos Borges² · Adriana Giongo²



- Methanobacterium** (p=0.033)
- Methanosaeta** (p=0.081)
- WSA2 OTU* (p=0.004)
- Bacteroidales OTU (p<0.001)
- Clostridiaceae OTU (p<0.001)
- Clostridium* (p<0.001)
- FCPU426 OTU (p<0.001)
- Geobacter* (p=0.001)
- Hyd24-12 OTU (p<0.001)
- MSBL9 OTU (p=0.063)
- OP8 OTU (p=0.055)
- Peptostreptococcaceae* OTU (p<0.001)
- SHA-114 OTU (p=0.014)
- Syntrophaceae* OTU (p=0.004)
- Syntrophomonas* (p<0.001)
- Syntrophorhabdaceae* OTU (p<0.001)
- Syntrophus* (p<0.001)
- Treponema* (p=0.006)
- Others (< 1%)

Conhecer
os MO é
controlar
a
produção



Microbiota profile in mesophilic biodigestion of sugarcane vinasse in batch reactors

Janaina Ilitchenco^{a,*}, Vanessa Peruzzo^b, Flaviane Eva Magrini^a, Leticia Marconatto^c, Ana Paula Torres^d, Ladem...

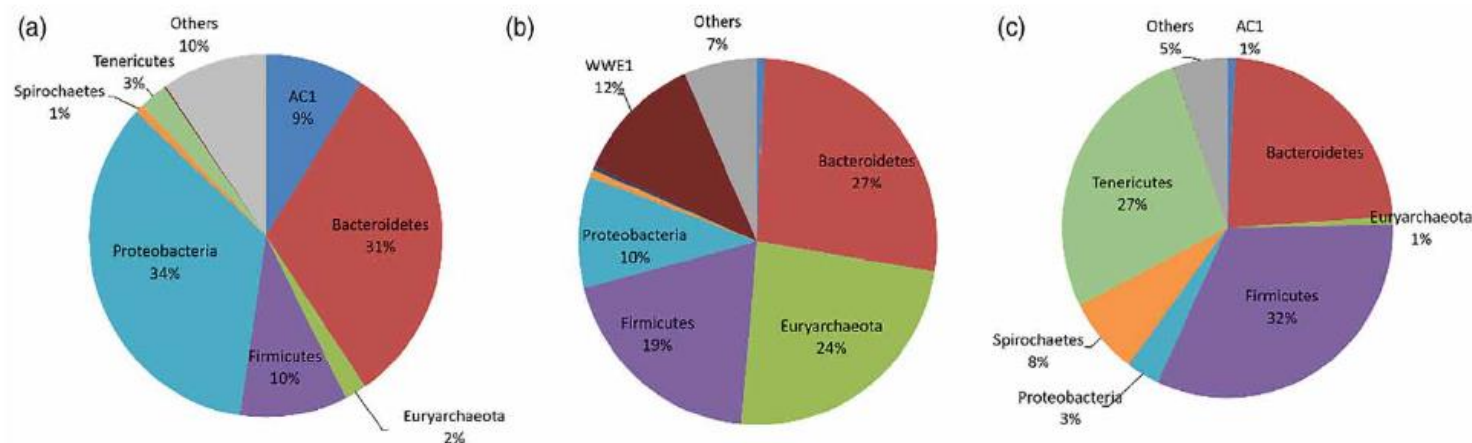
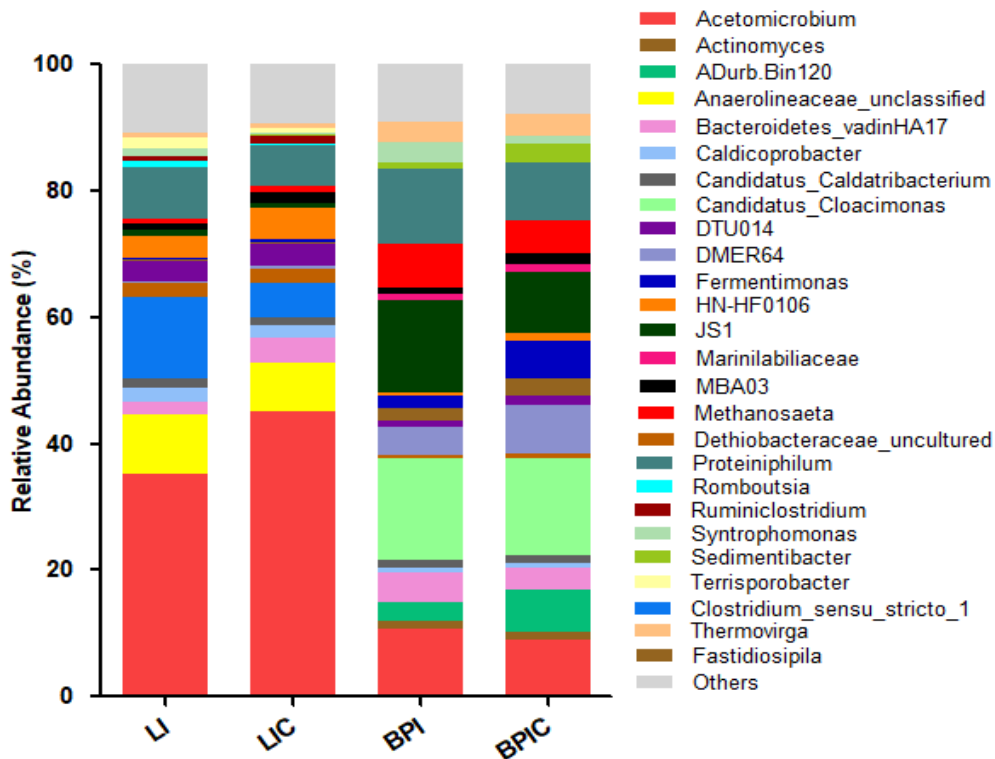


Figure 4 | Relative abundance to the phylum level in the initial sample –IS (a), peak methane production –MS (b) and final sample of the fermentation – FS (c).

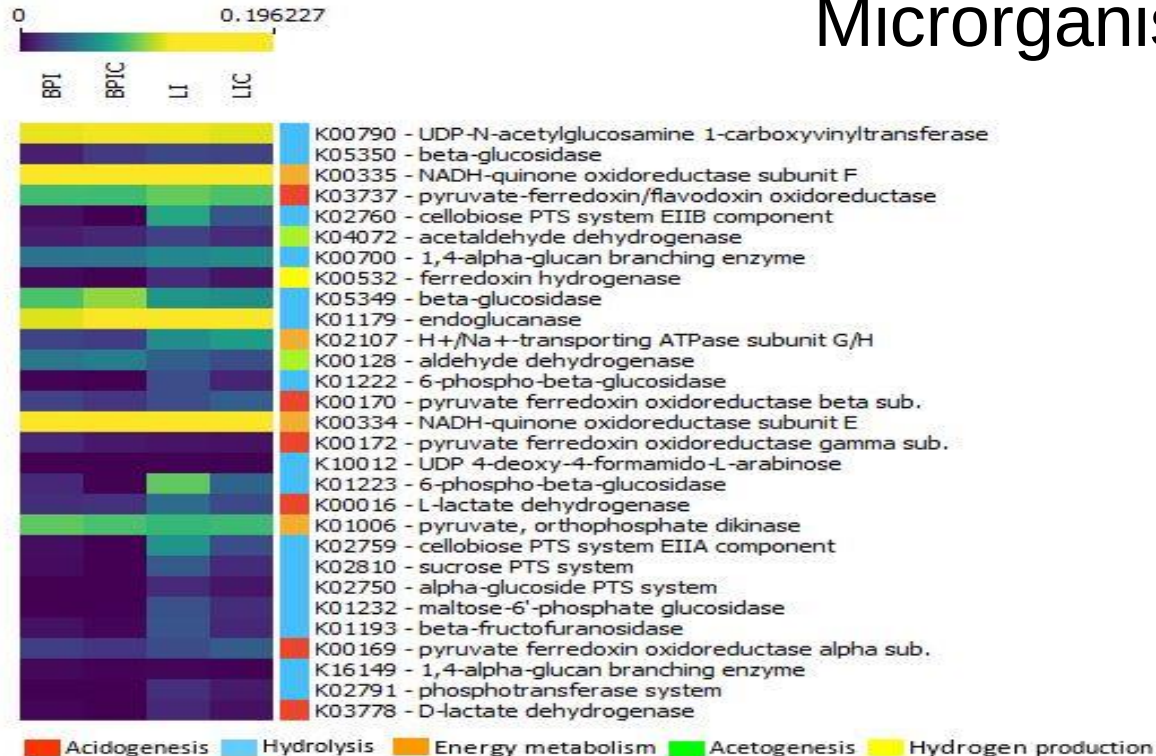
Microbiota de Reatores (resíduos alfundegários)

CIBiogás- Itaipu

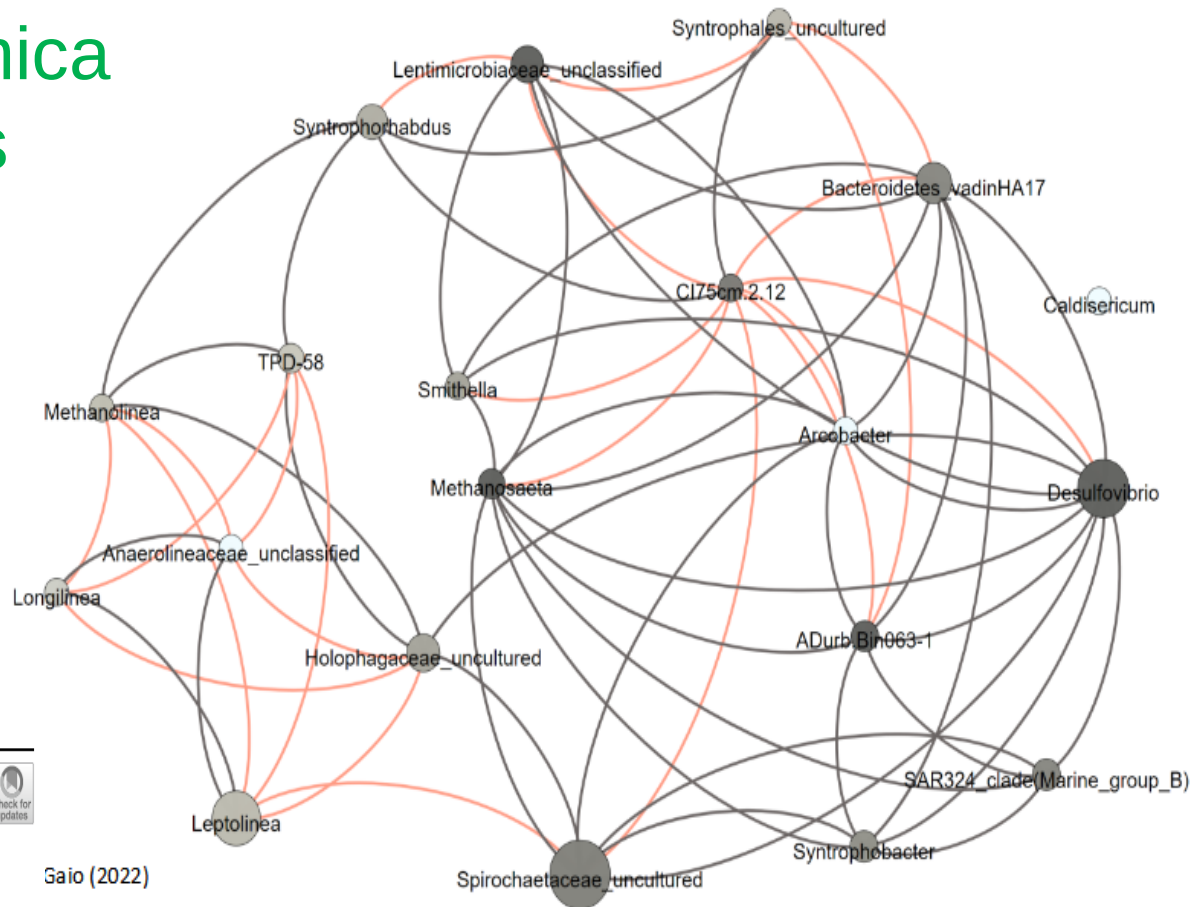


Relative abundance (%) of bacterial and archaea genus identified by rRNA16S, with abundance above 1% from the biogas production reactors.

Predição Funcional dos Microrganismos da DA



Assinatura taxonômica de MO em ETEs



Bioprocess and Biosystems Engineering
<https://doi.org/10.1007/s00449-022-02814-9>

RESEARCH PAPER



Gaio (2022)

Seasonal characterization of the prokaryotic microbiota of full-scale anaerobic UASB reactors treating domestic sewage in southern Brazil



Pré-tratamento do Inóculo

Variation of the Prokaryotic and Eukaryotic Communities After Distinct Methods of Thermal Pretreatment of the Inoculum in Hydrogen-Production Reactors from Sugarcane Vinasse

Flaviane Eva Magrini¹ · Gabriela Machado de Almeida¹ · Denis da Maia Soares¹ · Luiz Gustavo dos Anjos Borges² · Leticia Marconatto² · Adriana Giohno² · Suelen Paesi¹

F. E. Magrini et al.

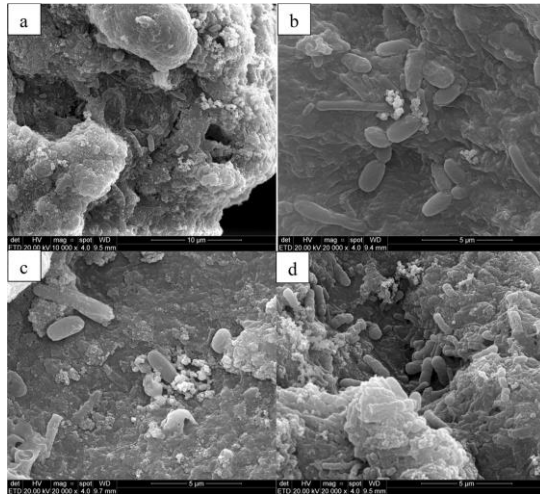
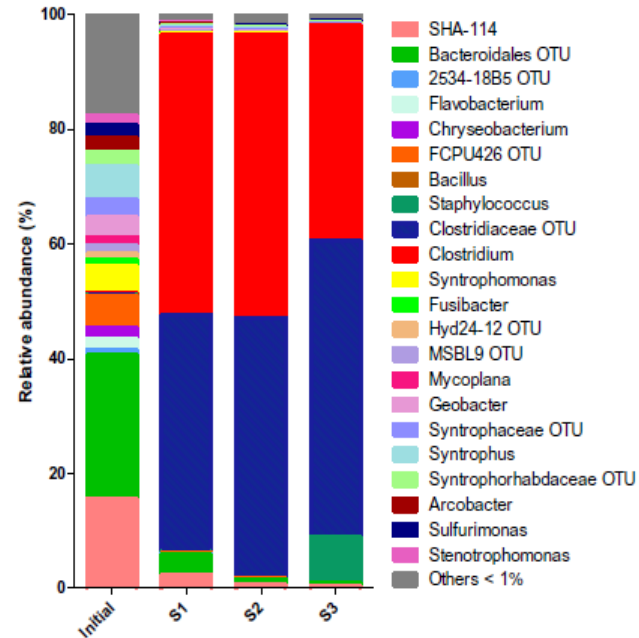


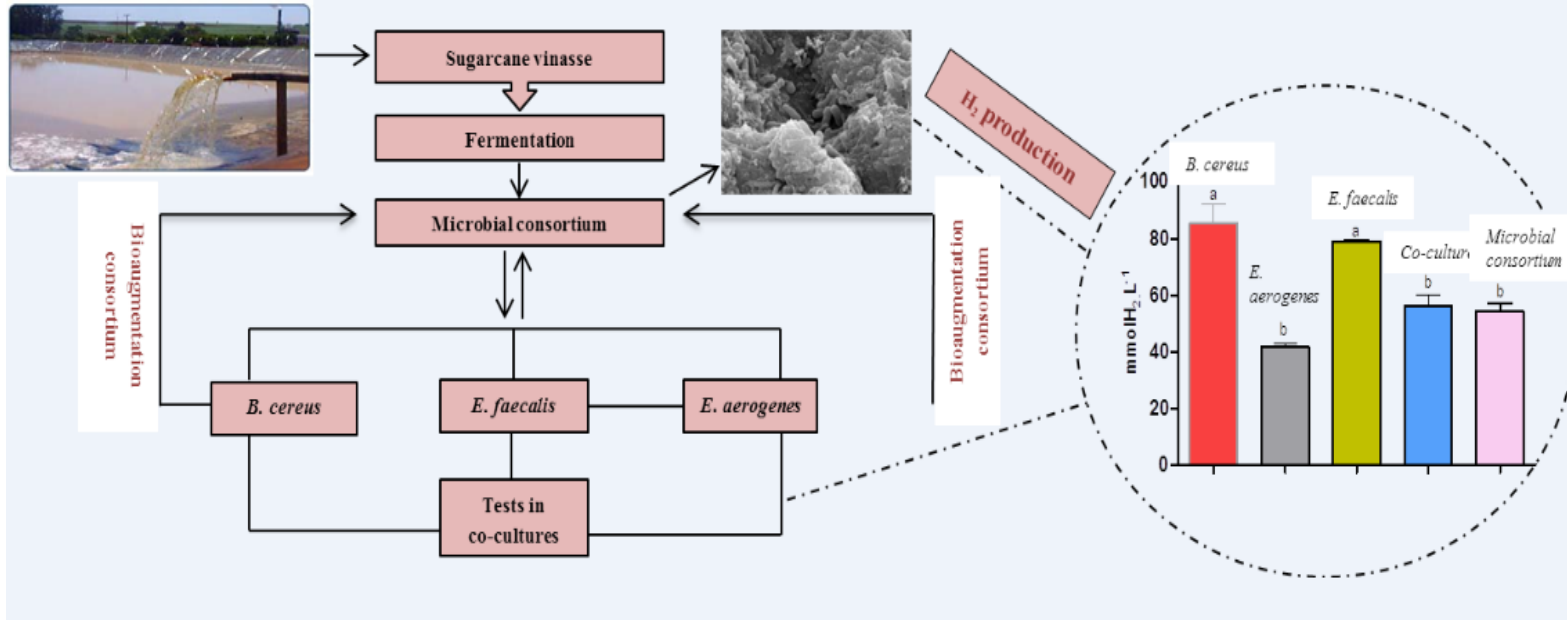
Fig. 3 Relative abundance profiles of the predominant genera of the microbial communities classified according to the analysis of the 16S ribosomal gene of the initial inoculum and in different tests: S1, S2 and S3 (Color figure online)





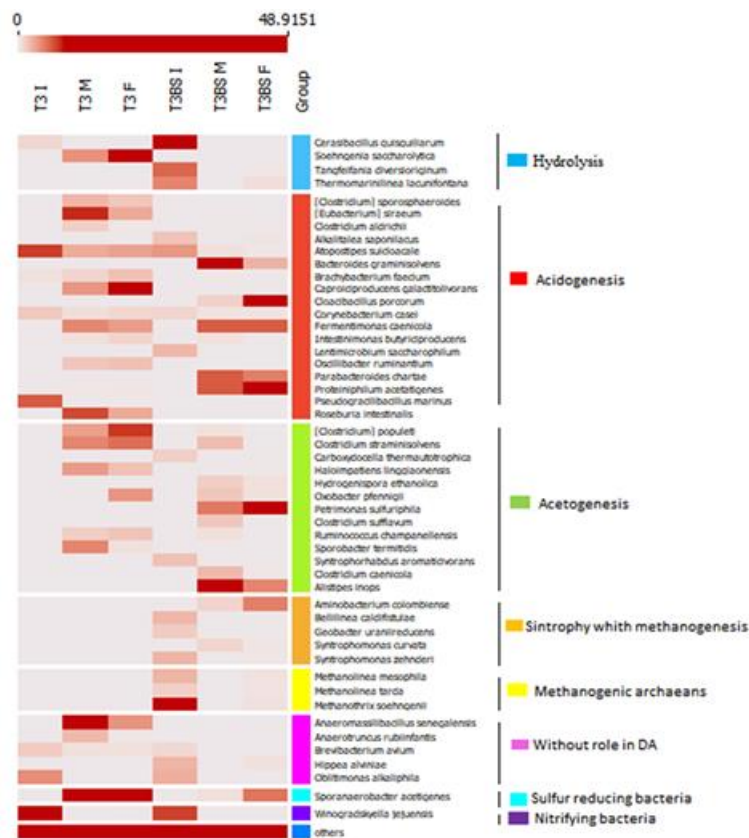
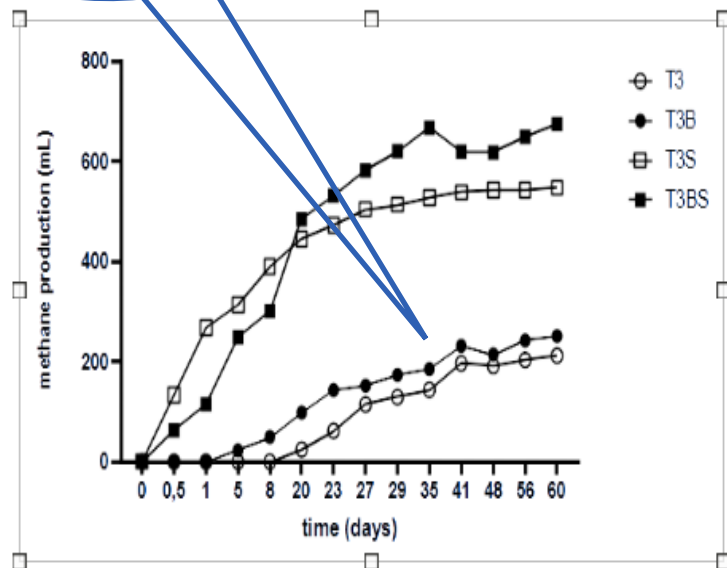
Co-cultura para produção de Biogás: Hidrogênio e Metano

Comparison of hydrogen and volatile fatty acid production by *Bacillus cereus*, *Enterococcus faecalis* and *Enterobacter aerogenes* singly, in co-cultures or in the bioaugmentation of microbial consortium from sugarcane vinasse



Bioaugmentação para melhorar a produção de Metano

Inóculo
Comercial



Co-cultura e Bioaugmentação

Biomass and Bioenergy 168 (2023) 106672

Contents lists available at ScienceDirect

Biomass and Bioenergy

journal homepage: www.elsevier.com/locate/biombio



Strategies of co-cultures and bioaugmentation by *Bacillus amyloliquefaciens*, *Clostridium bifermentans*, *Enterobacter muelleri*, and *E. tabaci* for increasing the production of hydrogen from raw glycerol

Flaviane Magrini e col, 2022

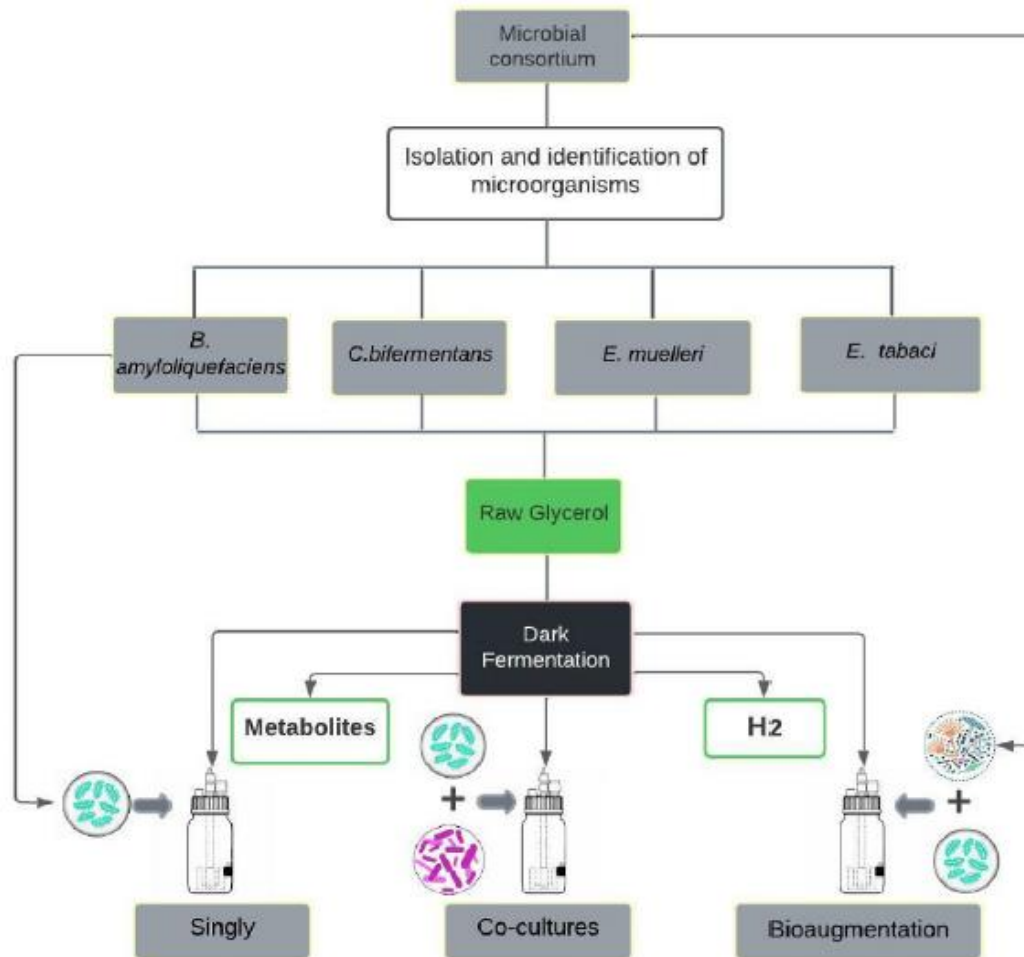


Fig. 2. Experimental flowchart of the assays of hydrogen production.

Co-cultura e Bioaugmentação

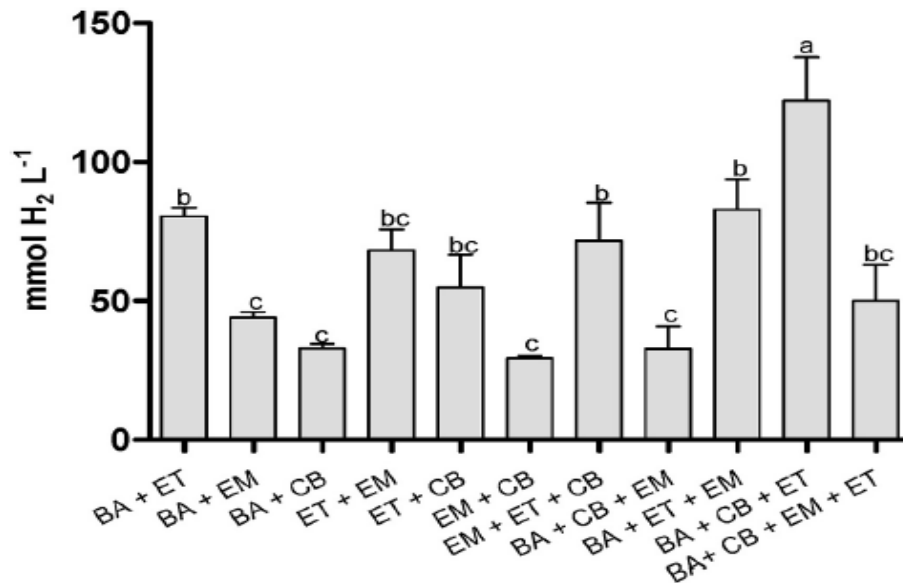


Fig. 5. Cumulative production of hydrogen (mmol H₂ L⁻¹) by co-cultures. Means followed by the same letters are not significantly different (Tukey's test $P \leq 0,05$).

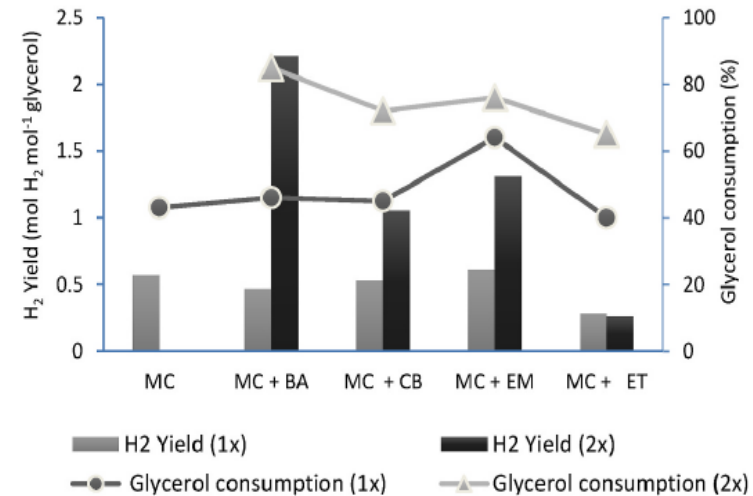
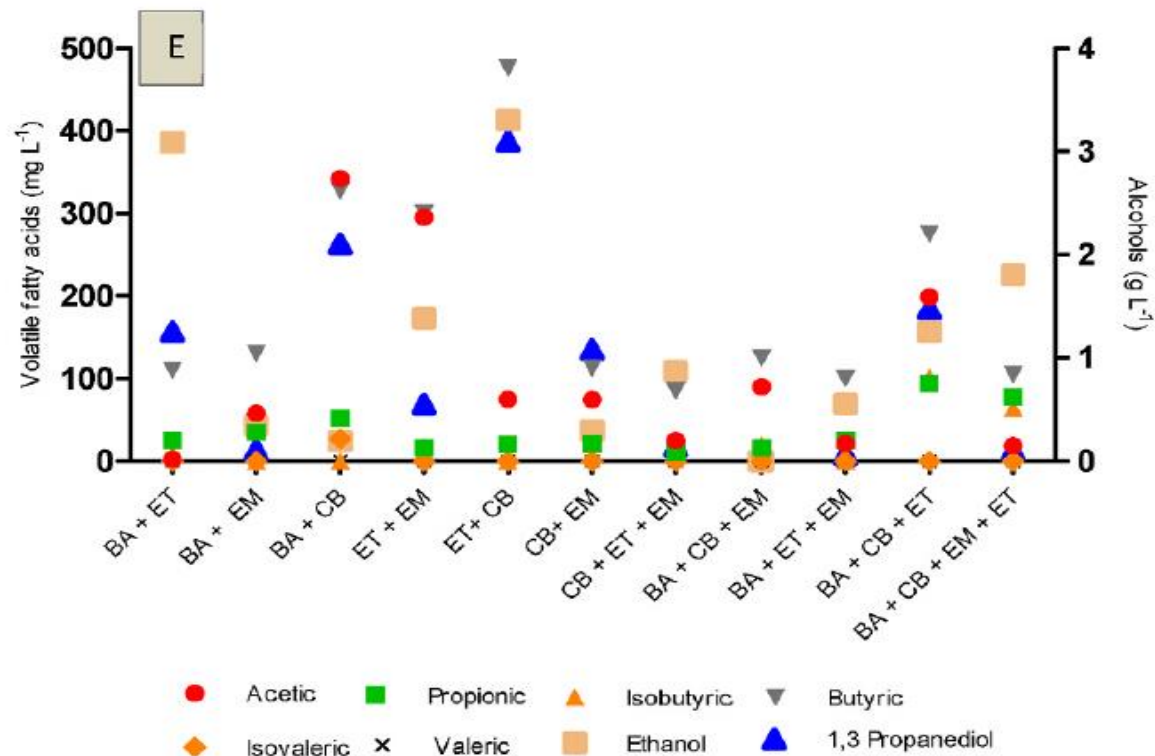


Fig. 8. Hydrogen yield (mol H₂ mol⁻¹ glycerol) and glycerol consumption (%) by the microbial consortium (MC) and bioaugmentation at different concentrations (1X and 2X).

Produção de ácidos e coprodutos de interesse biotecnológico

Economia circular e Biorrefinaria



Vantagens da co-digestão de resíduos



Resíduos
de origem
animal

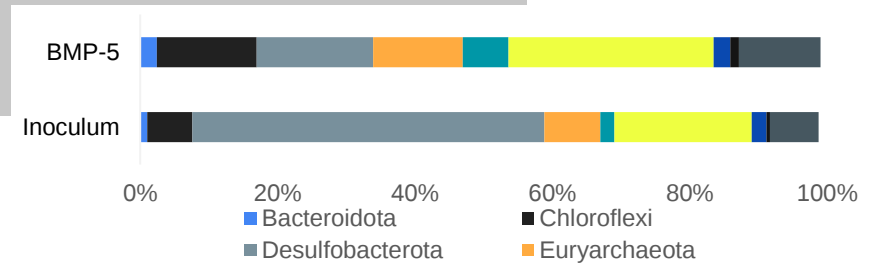
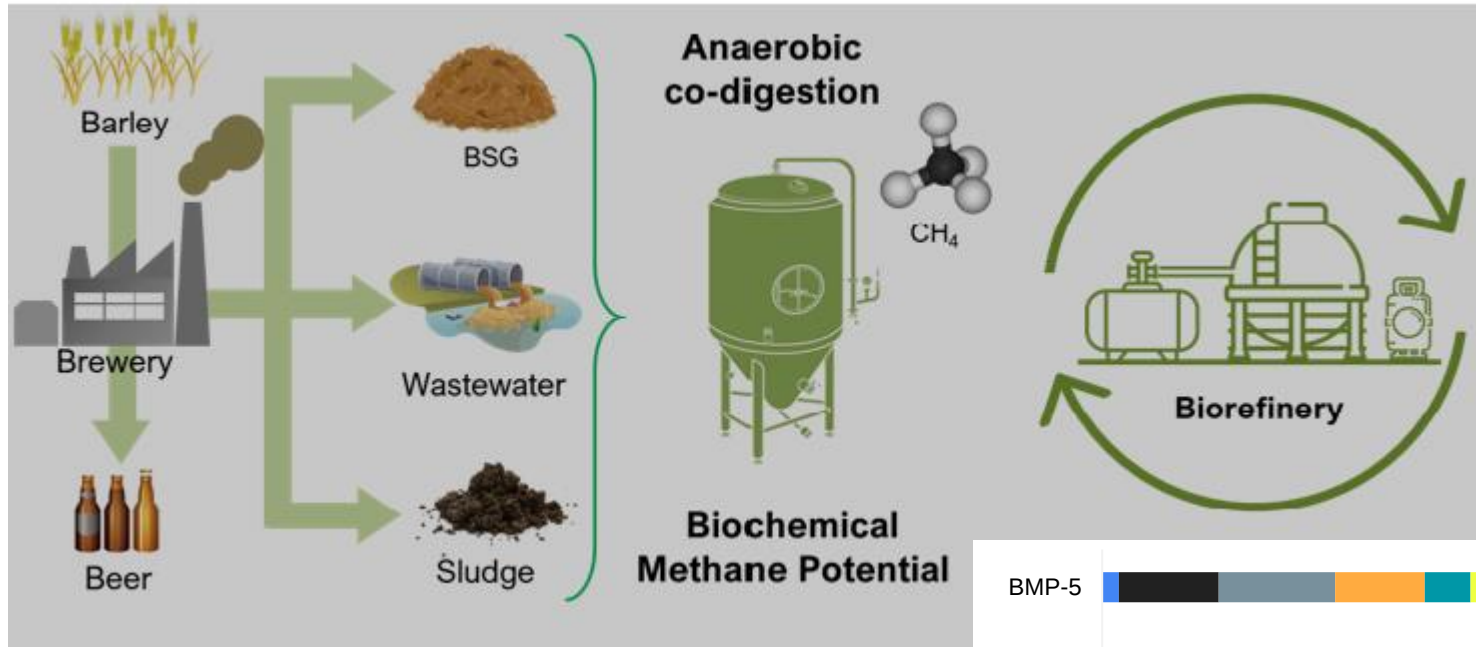


Resíduos
da indústria
de biodiesel

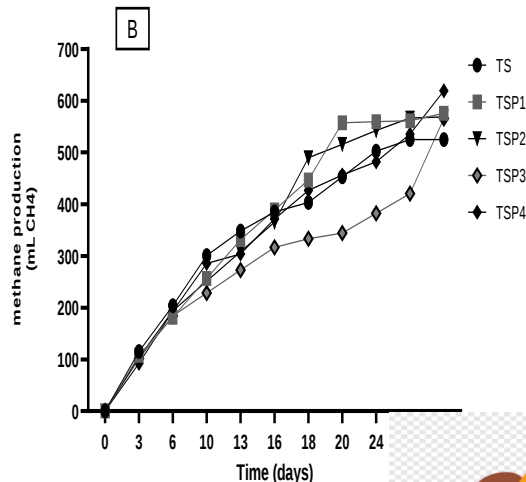
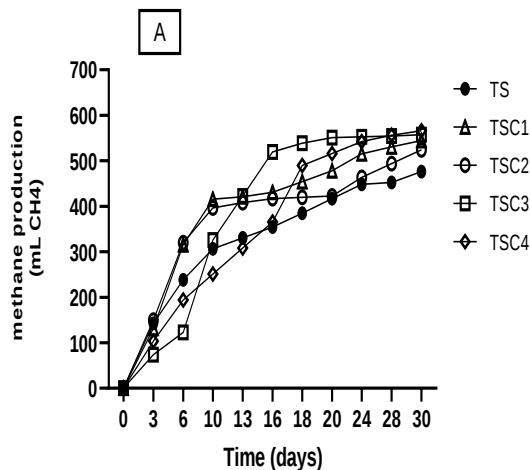


Aumento da
produção de metano

Co-digestão em resíduos de cervejaria

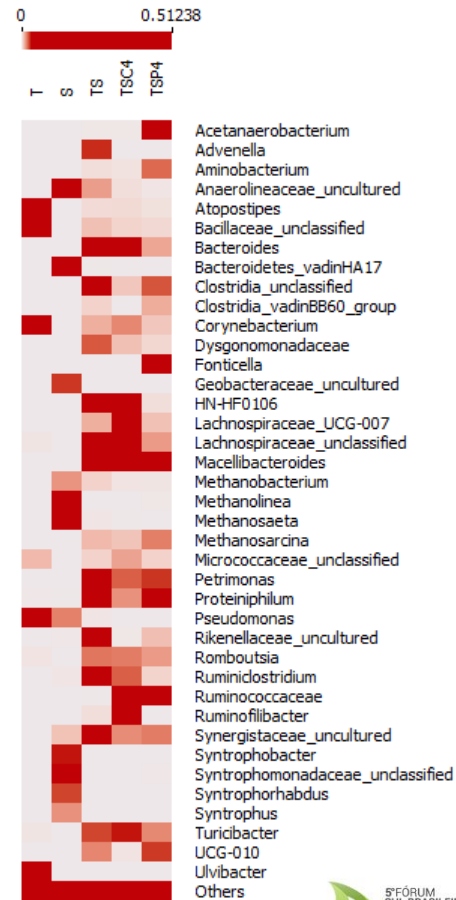
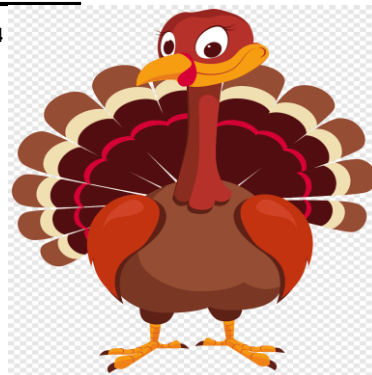


Uso de enzima na produção de biogás e metano



Identification and functional characterization of the microbiota active in the anaerobic digestion of turkey litter and granular sludge, with enzymatic pretreatment

Janaina Ilchenco e col, 2023



2023
sopaesi@ucs.br

