

## GLYCOLIPID BIOSURFACTANT FROM *STENOTROPHOMONAS MALTOPHILIA* PRODUCED FROM AGRO-INDUSTRIAL WASTE: CHARACTERIZATION AND POTENTIAL APPLICATION AS A SURFACTANT

Ferreira, I. N. S.<sup>1,2</sup>, Souza, A. F.<sup>1</sup>, Campos-Takaki, G. M.<sup>1</sup>

Graduate Program in Civil Engineering, Universidade do Vale do Rio dos Sinos, São Leopoldo, Av. Unisinos 950, São Leopoldo, RS, 93035-070, Brazil<sup>1</sup>

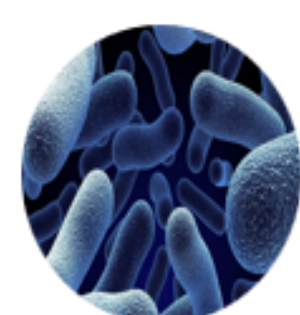
Catholic University of Pernambuco, Brazil<sup>2</sup>

### INTRODUCTION & AIM

With ongoing climate change and the growing global population, there is an urgent need to identify creative, efficient, and cost-effective natural products that can benefit humanity. Biosurfactants are produced by various microorganisms and exhibit several distinct properties compared to synthetic surfactants, including mild production conditions, multifunctionality, higher biodegradability, and lower toxicity resulting from the synthesis of active compounds by living cells (Gayathiri et al., 2022).

The present study addresses the optimization of biosurfactant production by *Stenotrophomonas maltophilia* UCP 1601 using low-cost substrates, as well as its performance as a foaming agent in the formulation of a bioproduct for the surfactant industry.

### METHOD



*Stenotrophomonas maltophilia* UCP 1601

Reuse of agro-industrial waste as substrates

glycerol, corn steep liquor, and waste soybean frying oil.



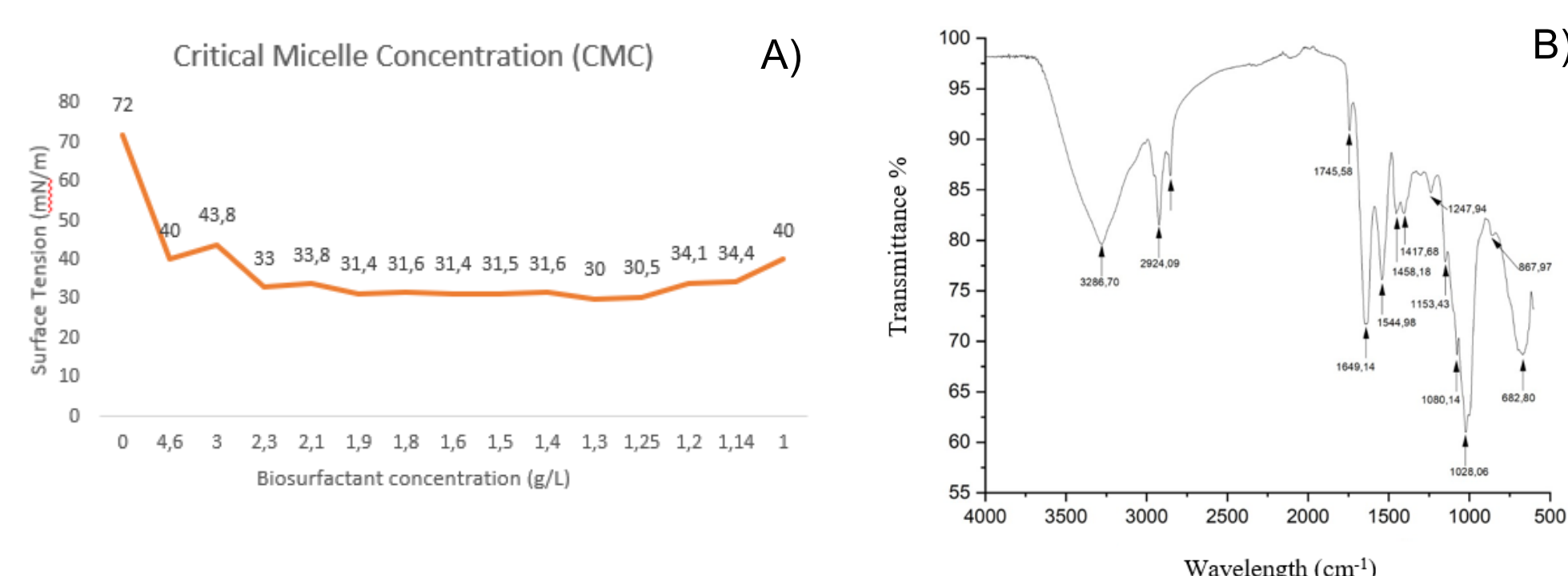
- Saline mineral medium + 7.5% crude glycerol (carbon source)
- 7.5% corn starch (nitrogen source) 10% post-frying soybean oil
- pH 7 and sterilized in an autoclave for 15 min at 121°C
- 96 hours of cultivation, 31°C and 150 rpm agitation speed.

#### Characterizations of the biomolecule produced:

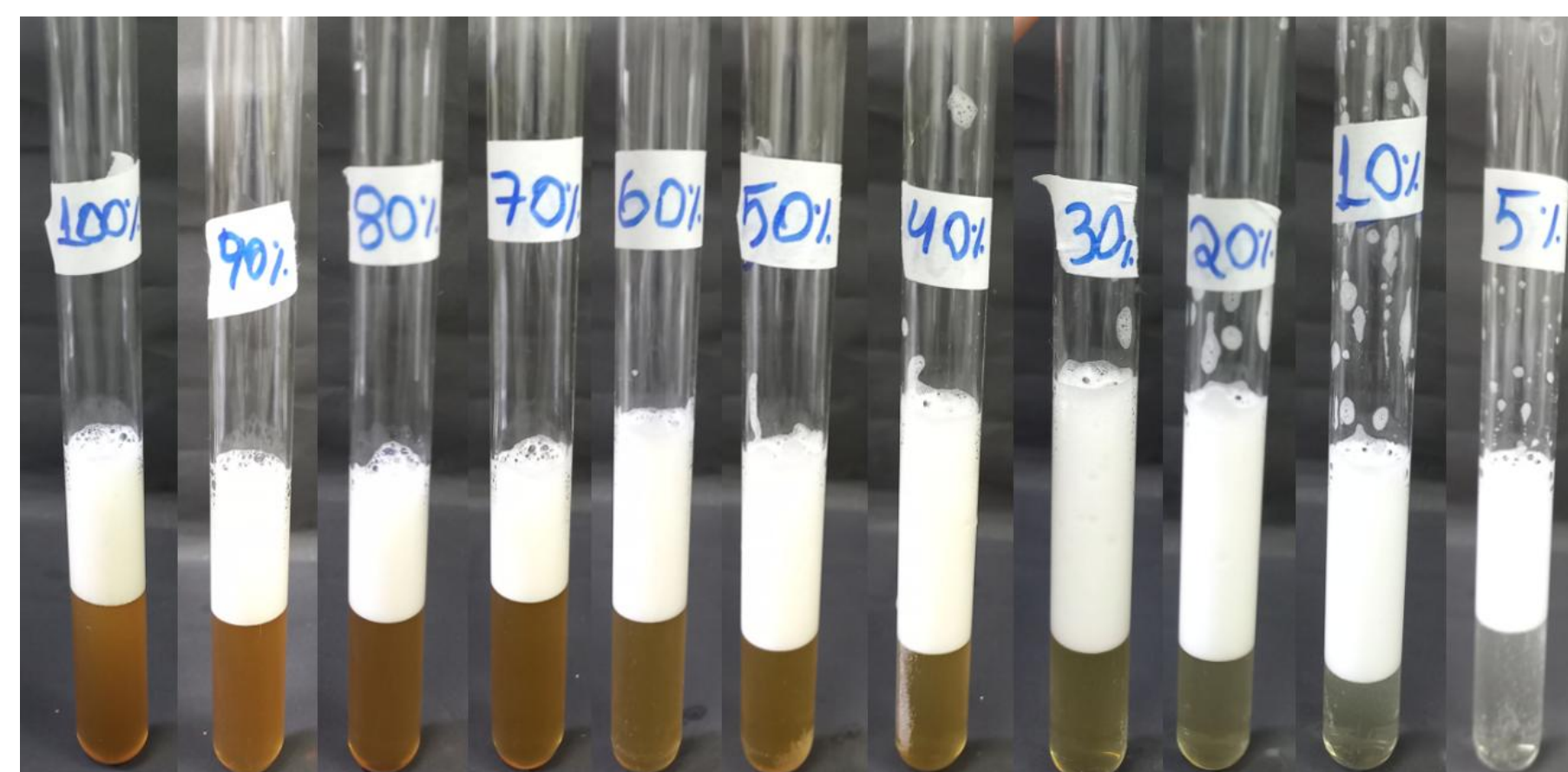
- Surface tension and critical micelle concentration (CMC);
- Zeta potential;
- FTIR, and determination of carbohydrates, lipids, and proteins;
- Foaming activity and hemolytic activity.

### RESULTS & DISCUSSION

**Figure 1.** Characterization of the biosurfactant produced by *Stenotrophomonas maltophilia* UCP 1601. (A) Critical micelle concentration (CMC); (B) FTIR analysis for the identification of functional groups present in the produced biomolecule.



**Figure 2.** Image of the foam formed by different concentrations of the biosurfactant produced by *Stenotrophomonas maltophilia* UCP 1601.



- The biosurfactant exhibited a surface tension of 31 mN/m and a CMC of 1.3 g/L,
- The produced biomolecule exhibits an anionic chemical nature. The foaming activity showed 75% efficiency at 0 min at a concentration of 10% of the produced biomolecule.
- Hemolytic activity was positive for alpha-type hemolysis, indicating low toxicity for human use.

### CONCLUSION

The results point to a functional biomolecule with potential application in the surfactant industry, in addition to presenting a sustainable production process that contributes to the SDGs, particularly Goals 12 and 13.

### REFERENCES

- GAYATHIRI, Ekambaram et al. Biosurfactants: Potential and eco-friendly material for sustainable agriculture and environmental safety—a review. **Agronomy**, v. 12, n. 3, p. 662, 2022.
- KUMARI, Khushbu et al. Amelioration of lipopeptide biosurfactants for enhanced antibacterial and biocompatibility through molecular antioxidant property by methoxy and carboxyl moieties. **Biomedicine & Pharmacotherapy**, v. 161, p. 114493, 2023.