Optimisation of a bacterial co-culture for application as Sustainable Bioinoculant to Mitigate Drought Effects in Colombian Grasslands

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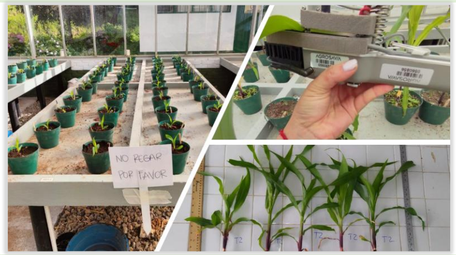
1 INTRODUCTION

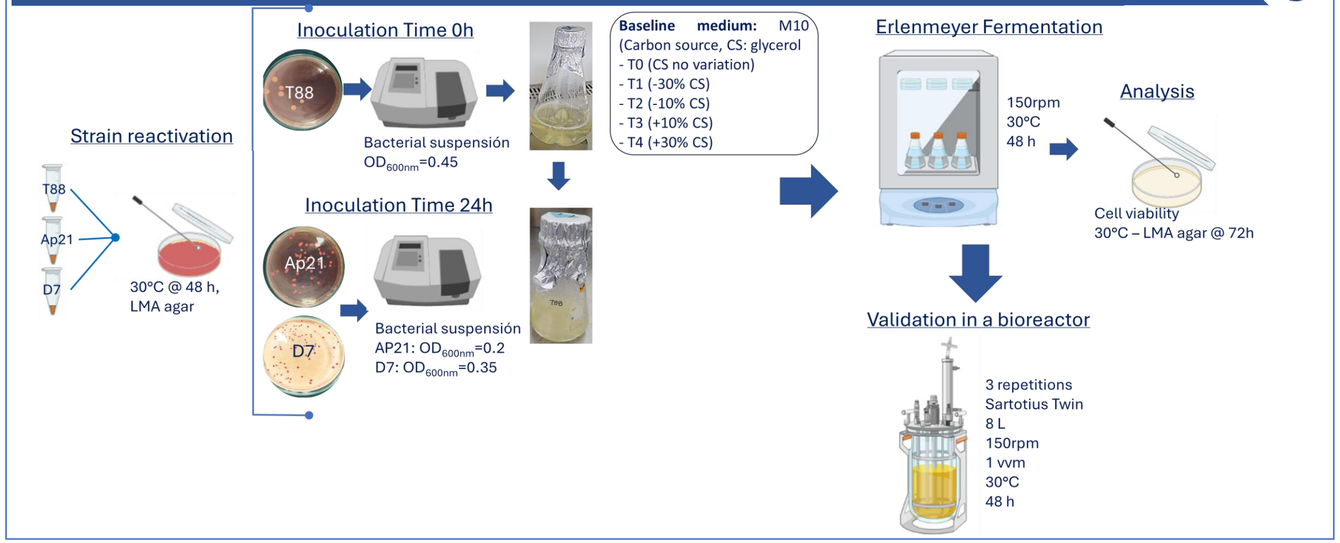
Climate change has intensified droughts, threatening agriculture and food security, especially in tropical regions like Colombia. Water deficit during early crop stages limits plant growth and yield, while excessive fertilizer use degrades soils and raises costs. Plant Growth-Promoting Bacteria (PGPB) offers a sustainable alternative to enhance drought resilience and reduce fertilizer dependence (1). In this sense, AGROSAVIA developed a bacterial consortium of *Herbaspirillum* sp. AP21, *Azospirillum brasilense* D7, and *Rhizobium leguminosarum* T88 to promote growth and mitigate drought stress in forage crops.



2 OBJECTIVES

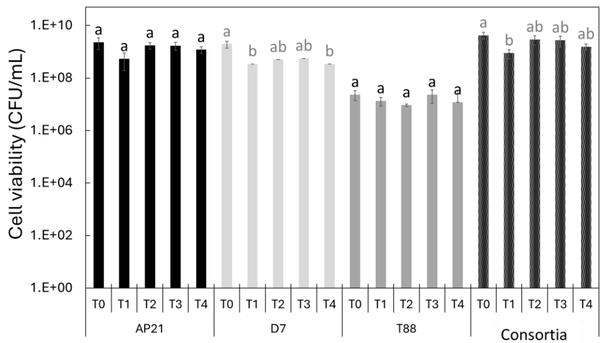
The objective of this study is to evaluate the co-culture fermentation of the strains in M10 medium by testing different carbon source concentrations to define the optimal culture conditions and monitor growth dynamics.

3 METHODS



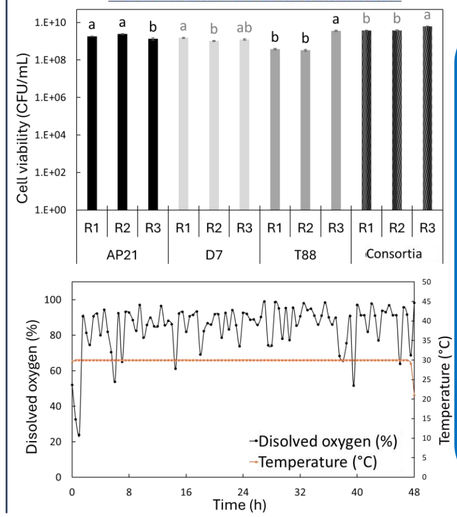
4 RESULTS

Selection of C source concentration



- Only D7 and consortia showed significant differences with T0.
- No improvement was observed, indicating that the current concentration is suitable for consortia growth.

Validation in a bioreactor



The productions showed high reproducibility (CV < 5.5%) and viability (10^9 CFU/mL).

Fermentations in the bioreactor confirming a successful pre-scaling (factor >10) under stable oxygen and temperature conditions.

5 DISCUSSION AND CONCLUSIONS

- Co-culture medium was key to establishing the production conditions of the synthetic bacterial consortium.
- Current carbon concentration supports optimal growth, avoiding unnecessary increases that could raise production costs.
- Successful reproducibility across bioreactor batches demonstrated the robustness of the process and confirming the suitability of the bioreactor configuration for future scale-up.

Results confirm the technical feasibility of producing an efficient PGPB-based bioinoculant, contributing to the development of sustainable agricultural inputs under climate change conditions.

REFERENCES

1. Backer, R., Rokem, J., Ilangumaran, G., Lamont, J., Praslickova, D., Ricci, E., ... & Smith, D. (2018). Plant growth-promoting rhizobacteria: context, mechanisms of action, and roadmap to commercialization of biostimulants for sustainable agriculture. Frontiers in Plant Science, 9. https://doi.org/10.3389/fpls.2018.01473

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