



Enzymatic Saccharification of Wheat Straw

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Helix Lab

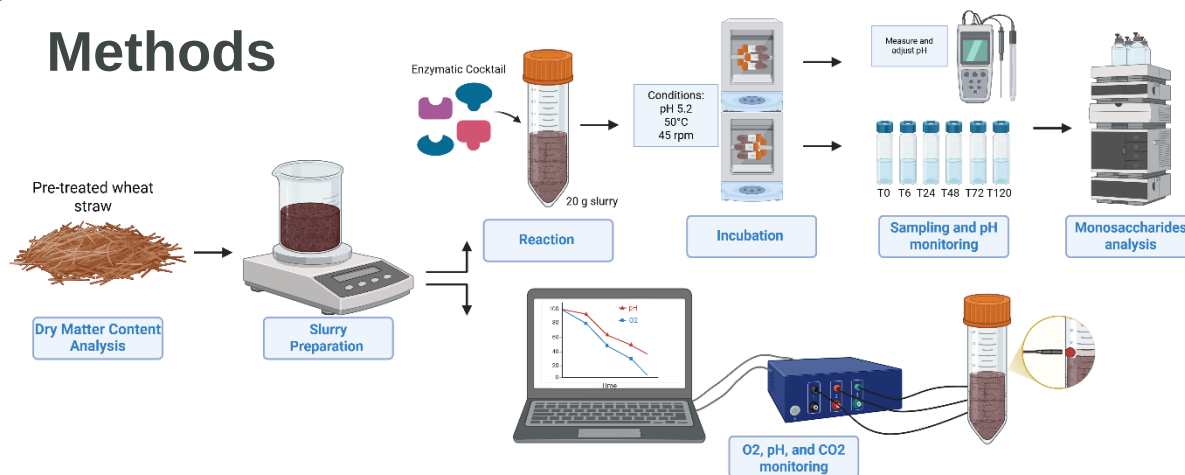
Introduction

The reliance on fossil fuels continues to drive greenhouse gas emissions, emphasizing the need for renewable alternatives¹. **Second-generation (2G) bioethanol**, produced from lignocellulosic biomass, offers a sustainable solution by reducing carbon emissions and dependence on non-renewable resources². However, **enzymatic hydrolysis**—a key step in bioethanol production—depends on costly **enzyme cocktails**³ that require **optimization** to enhance efficiency and minimize environmental impact.

This project aims to:

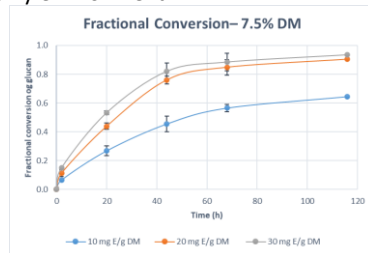
- **Validate** a published enzymatic assay protocol to assess enzyme cocktail efficiency at Meliora Bio.
- **Monitor** slurry conditions to better understand the enzymatic environment and abiotic reactions in pretreated wheat straw.
- **Enhance** hydrolysis efficiency, lower production costs, and contribute to more sustainable bioethanol production.

Methods



Outcome

- Calculate **cellulose-to-glucose conversion** for comparison and enzyme kinetics.
- **O₂ pH, CO₂ monitoring** of slurry under varying conditions.
- Provide a reproducible workflow for the **optimization** process and generate insights into **abiotic reactions** in the slurry environment.



Perspectives

Future research

- Expand monitoring of environmental variables under different pretreatments and enzyme combinations.
- Develop a modular protocol adaptable to changes within Meliora Bio's settings.

Helix Lab Fellowship

- Acquired **international** hands-on experience with applied science.
- Learned from Kalundborg **industry**.
- **Networking** through collaborations and events.

[1] Correia, B., Matos, H. A., Lopes, T. F., Marques, S., & Girio, F. (2024). Sustainability Assessment of 2G Bioethanol Production from Residual Lignocellulosic Biomass. *Processes*, 12(5), Article 5.

[2] Umesh, & Moholkar, V. S. (2025). 2G Bioethanol for Sustainable Transport Sector: Review and Analysis of the Life Cycle Assessments. *Current Pollution Reports*, 11(1), 11.

[3] Qi, B., Chen, X., Shen, F., Su, Y., & Wan, Y. (2009). Optimization of Enzymatic Hydrolysis of Wheat Straw Pretreated by Alkaline Peroxide Using Response Surface Methodology. *Industrial & Engineering Chemistry Research*, 48(15), 7346–7353.