Solid-state fermentation of vine shoots to produce hydrolytic enzymes

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INTRODUCTION

The **winemaking industry** produced 166 millions of hectolitres of wine in 2021. However, this industry also **generates** large amount of **by-products**. Among them, **vine shoots (VS)** are generated yearly and have no practical application.

Due to the composition of VS, this biomass can be valorised through enzymatic hydrolysis and fermentation processes to produce value-added products. On the other hand, a **pretreatment step** before the enzymatic hydrolysis is usually required when the lignin content of the solid is high.

The purpose of this work is to evaluate the **production of enzymes** through **solid-state fermentation** of VS with ***Aspergillus niger*** and study the effect of the **steam explosion pretreatment** on the enzyme production.

MATERIAL AND METHODS

The effect of the **steam explosion pretreatment** on the enzyme production was studied with a **central composite design**:

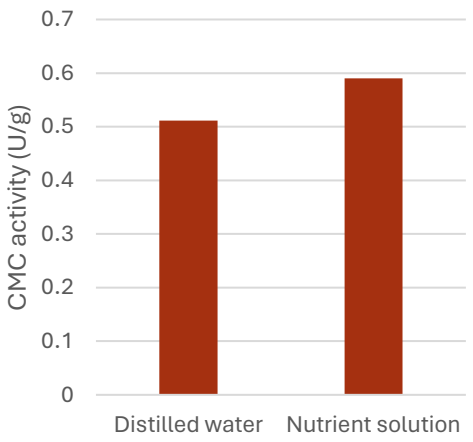
- Temperature: 170 – 200 °C
- Phosphoric acid concentration: 0.5 – 2.5 % w/v

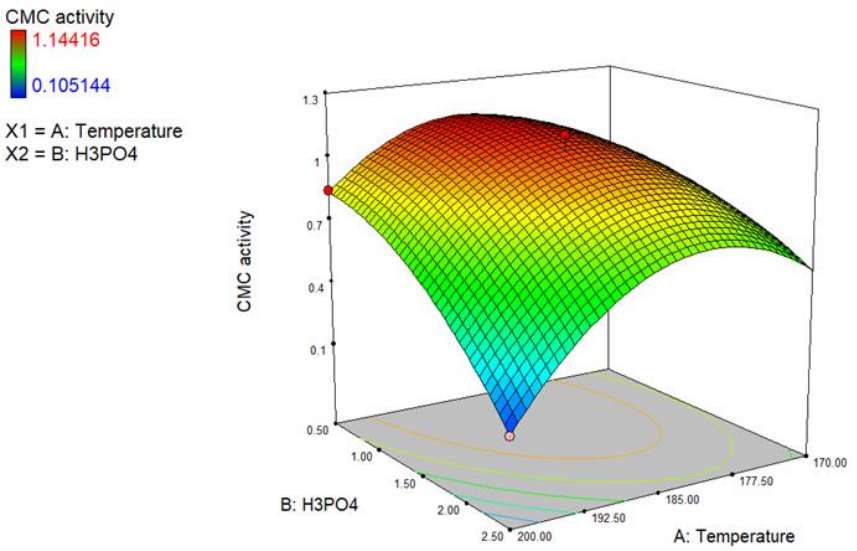
Solid-state fermentation was performed at 70% of moisture content for 3 days.

Vine shoots ***Aspergillus niger*** **SSF**

RESULTS

The **SSF with *Aspergillus niger*** showed **higher growth** when the fermentation was performed **with the addition of a nutrient solution** instead of distilled water. Thus, **cellulase activity** produced after 5 days of fermentation, without the optimization of the process, was **slightly higher** when the fermentation was performed with the nutrient solution.





The **steam explosion pretreatment** affects the production of enzymes. The maximum **CMC activity** obtained is higher than the un-pretreated solid. The results of the **Central composite design** can be adjusted to a **quadratic model** with **a r^2 of 0,992** showed that the maximum enzyme activity was obtained with a **temperature of 185 °C** and a **H_3PO_4 concentration of 0.8 % w/v**.

CONCLUSION

- **Steam explosion pretreatment influence the production of cellulase activity and also improves the enzyme activity produced**.
- The SSF conditions should be optimized for the pretreatment conditions with the highest results.

WORK IN PROGRESS

- **Optimization of the SSF variables with statistical design**
- **Enzymatic hydrolysis** of VS with the enzymes produced by SSF

References

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