Optimization of phosphoric acid pretreatment conditions to produce lactic acid from eucalyptus residues

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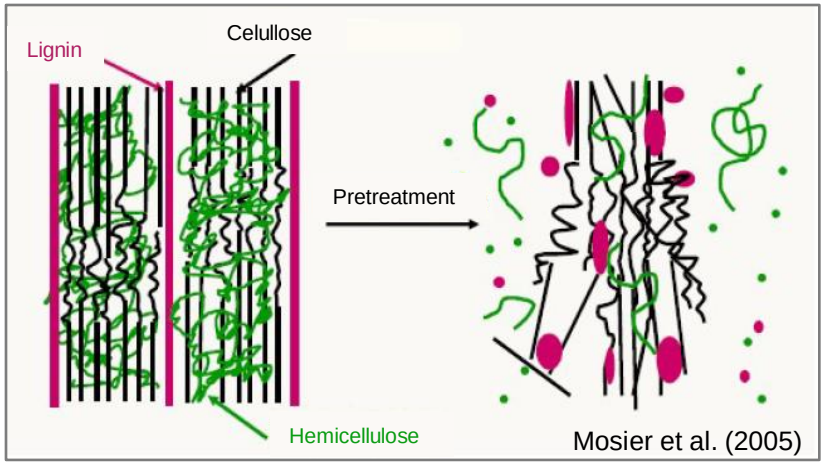
BUENOS AIRES 2023
JUNE 4 - 8

Introduction

Objective: Study of phosphoric acid pretreatment as separation method of hemicellulose in eucalyptus residues

- Principal wood structural compounds: Cellulose, Lignin and Hemicellulose.
- Pretreatments are needed to disrupt the complex structure.
- Lactic acid can be produced from C5 and C6 sugars by fermentation.



Mosier et al. (2005)

Materials and methods

Raw material

Composition: 45% glucan, 14% xylan, 28% lignin

Acid pretreatment

- Acid load: 0.3 – 1.2 g/100 $g_{pinchips}$
- Temperature: 140 – 167°C
- Time: 0 – 50 min
- Liquid/solid ratio: 7 g/g

Lactic fermentation

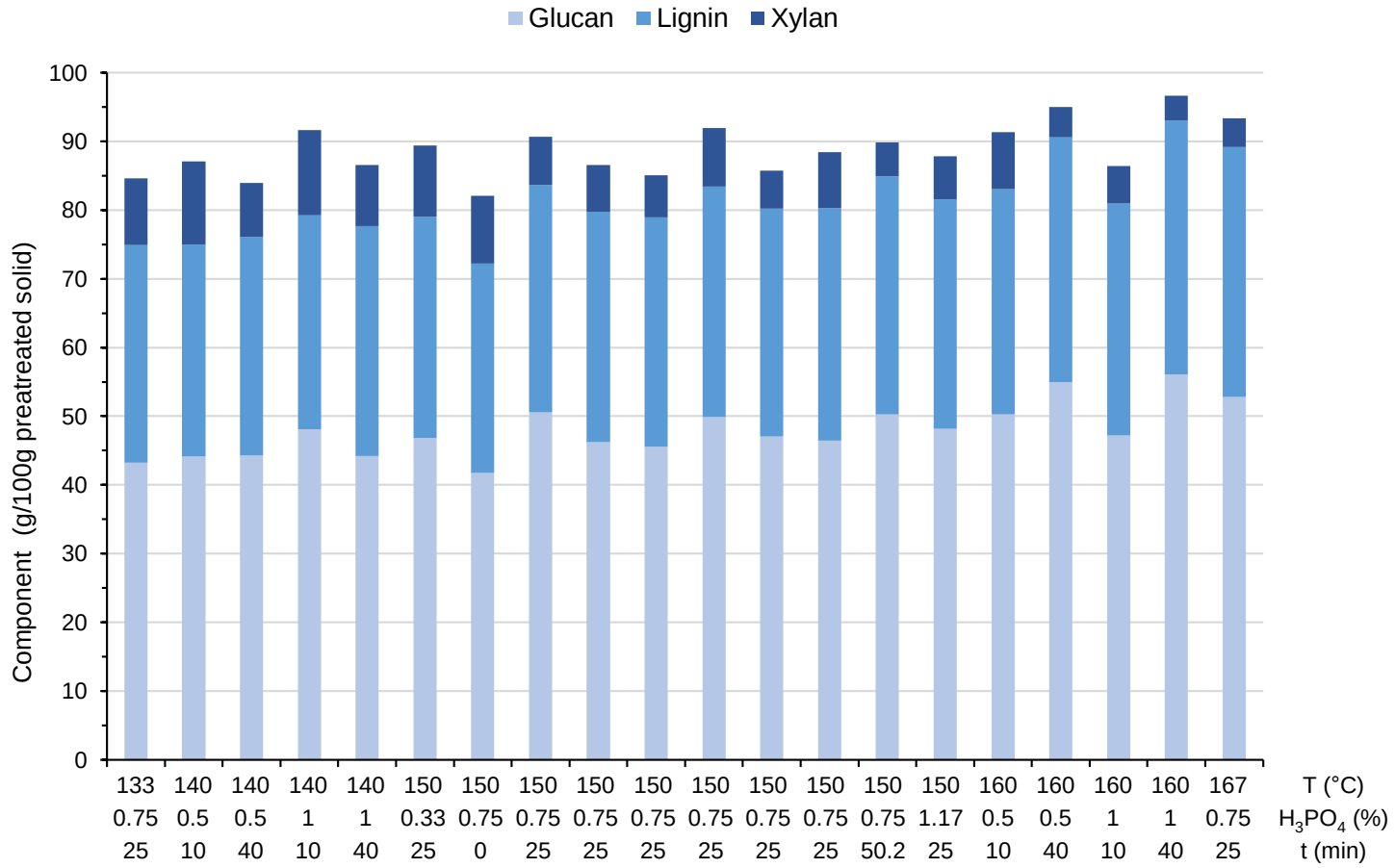
- *Bacillus coagulans* DSM 2314
- Anaerobic
- Temperature: 55°C
- Orbital agitation: 150 rpm

Enzymatic hydrolysis

- Solid load: 16%
- Enzyme load: 25 FPU/g_{glucan} (Novozyme CelliCTec 2)
- Citrate buffer 0.05N (pH 4.8)
- Temperature: 48°C
- Time: 72 h
- Orbital agitation: 150 rpm

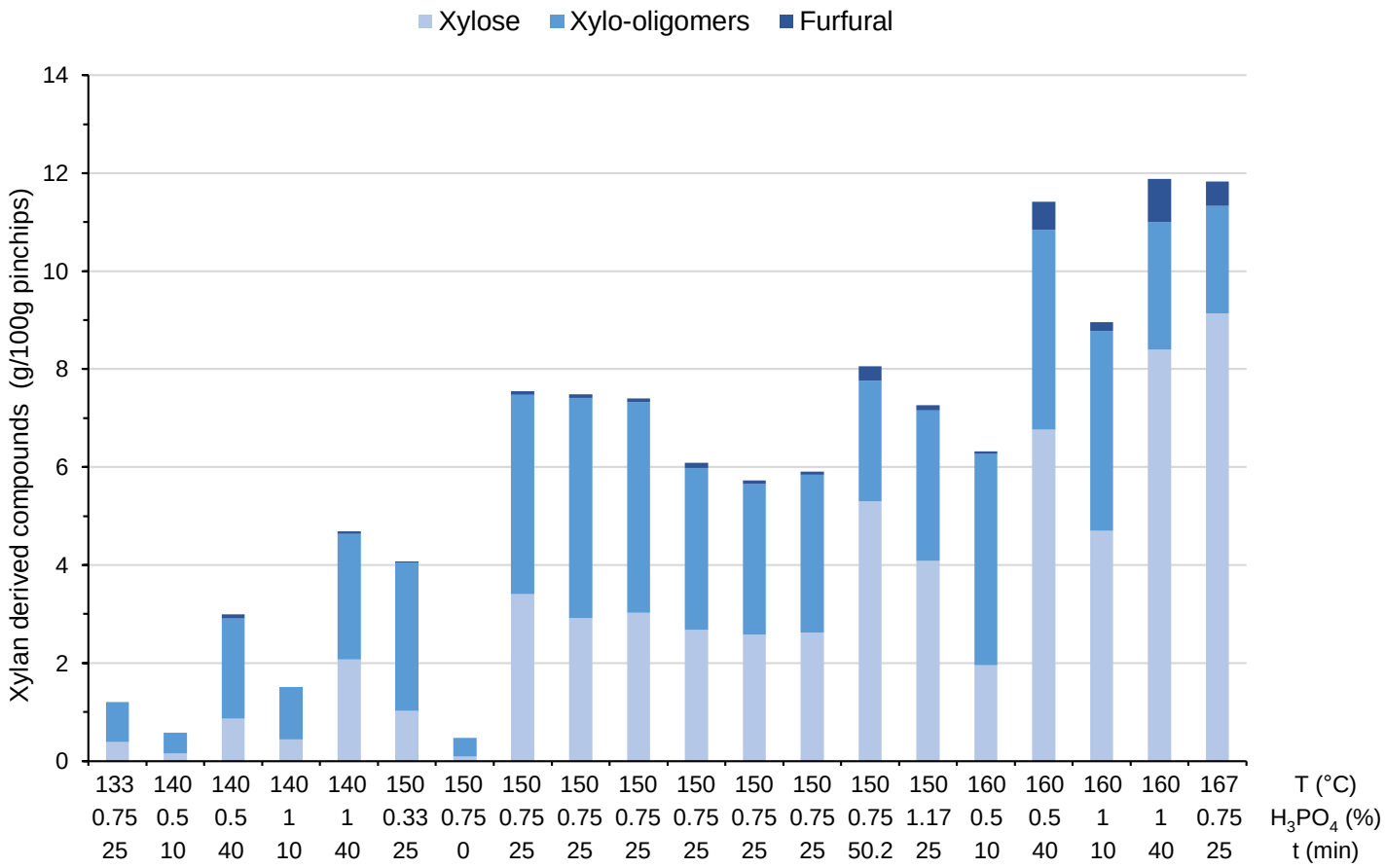
Results and discussion

Solid characterization



Results and discussion

Liquor characterization



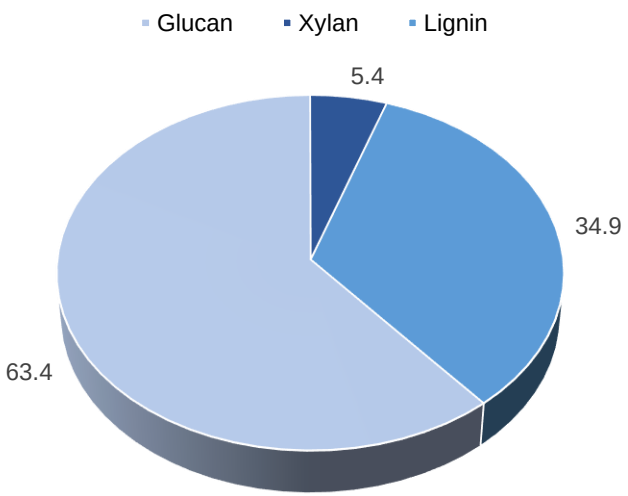
Optimal condition

- T = 160 °C
- H_3PO_4 = 0.6 %
- t = 40 min

Results and discussion

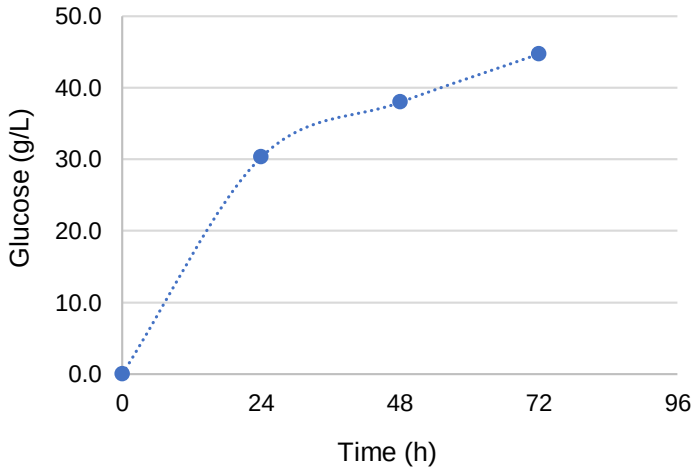
Solid fraction

Characterization



Component (g/100g pretreated solid)

Enzimatic hydrolysis



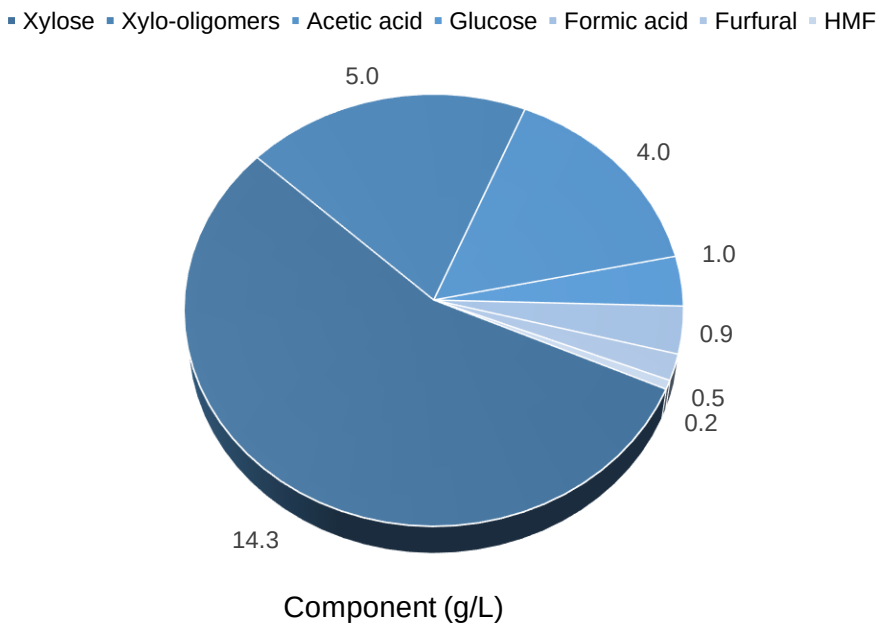
Glucose concentration (g/L)	45
Efficiency* (%)	30

*g glucose produced per 100 g of the theorical glucose that could be produced from the glucan content of the pretreated solid

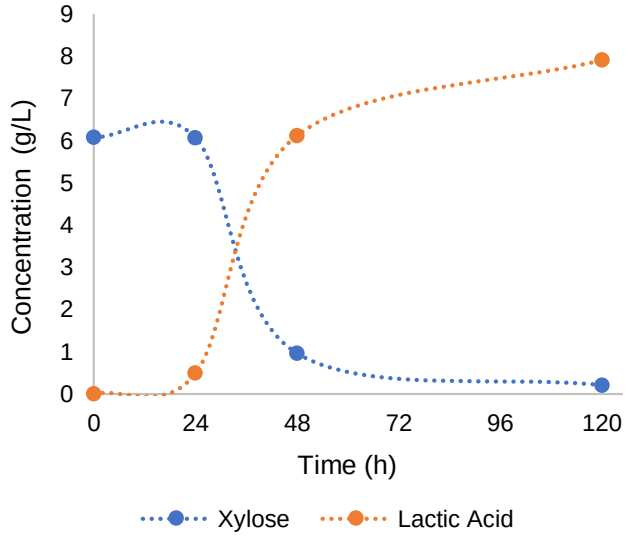
Results and discussion

Liquid fraction

Characterization



Lactic fermentation



Conclusions

- The acid preatreatment was able to extract xylan from the pinchips, principally as monomeric xylose.
- Lactic acid was produced from the hydrolysate using *Bacillus coagulans* DSM 2314.
- Higher enzymatic hydrolysis efficiency was achived after preatreatment.

Acknowledgements

Financial support was provided by the Agencia Nacional de Investigación e Innovación (FSE_1_2019_1_159574) of Uruguay.

The authors thank UPM, Uruguay, for providing raw material.

Thank you for your attention

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