



EFFECT OF ALKALINE PEROXIDE PRETREATMENT ON FIBRE COMPOSITION OF VARIOUS LIGNOCELLULOSIC RESIDUES

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INTRODUCTION



Wheat straw (WS)



Exhausted sugar beet
cossettes (ESBC)



Sunflower stalk (SS)



Rice husk (RH)

Low-Cost

Fuels

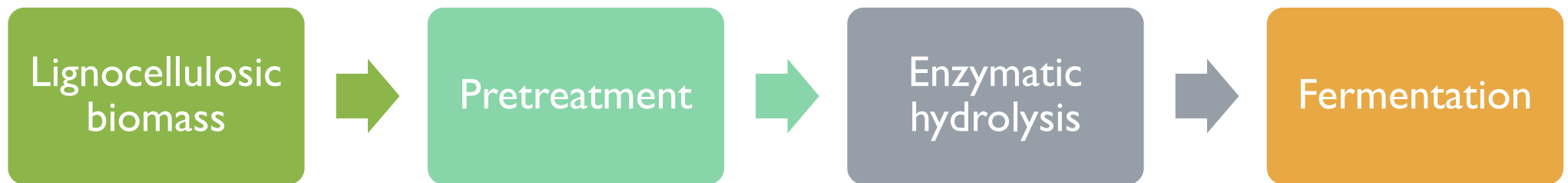
Polyhydroxyalkanoates
(PHAs)

Organic acids

Abundant

INTRODUCTION

Biotechnological process



Alkaline hydrogen peroxide pretreatment

The aim is to break down the recalcitrant structure of lignocellulose to make cellulose and hemicellulose more accessible to the enzymes

INTRODUCTION

Alkaline hydrogen peroxide pretreatment

- This pretreatment is an oxidative process which could significantly improve biomass digestibility.
- It selectively removes lignin and deconstructs the cell walls.

Advantages

Reducing process cost

Utilization of chemicals at low temperature and concentration

Disadvantages

Production of inhibitory compounds



MATERIAL AND METHODS

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- All the solids were milled and sieved



Exhausted sugar beet
cossettes (ESBC)



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Rice husk (RH)

Particle size

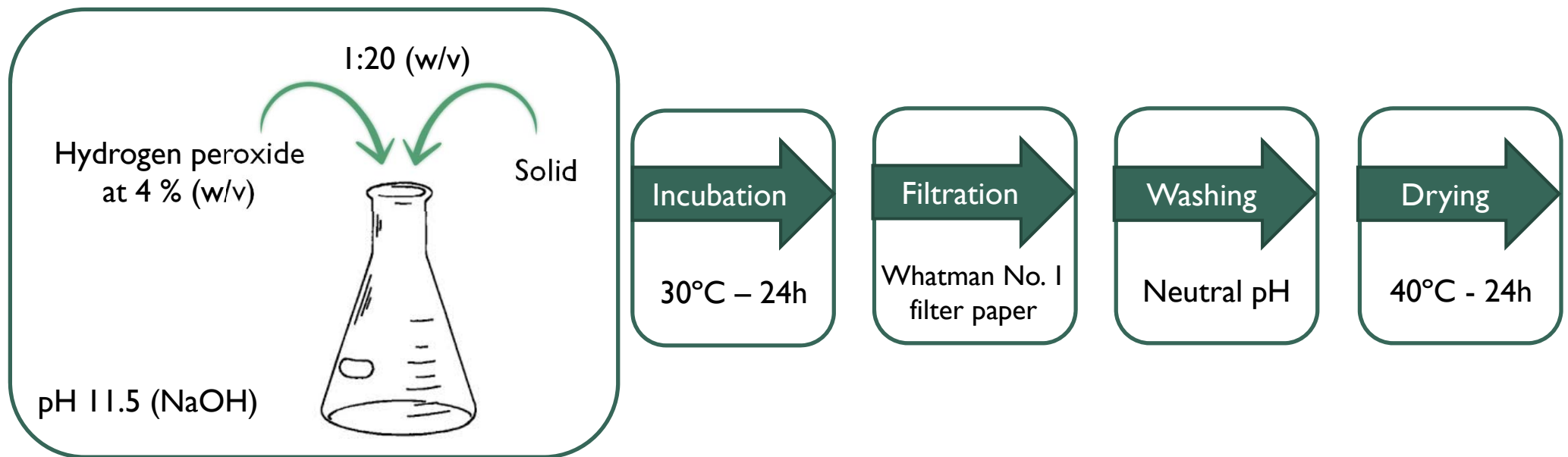
- 0 – 0.5 mm
- 0.5 – 1 mm
- 1 – 1.5 mm
- 1.5 – 2 mm

Particle size

- 0.5 – 1 mm

MATERIAL AND METHODS

■ Alkaline hydrogen peroxide pretreatment



MATERIAL AND METHODS. FIBRE COMPOSITIONAL ANALYSIS

- The determination of acid detergent fibre (ADF) and acid detergent lignin (ADL) according to EN ISO 13906:2008
- The determination of amylase treated neutral detergent fibre (NDF) according to AOAC 2002:04/ISO 16472:2006.

Code	Sample fraction	Compliant substances	Denomination
A	removed with acetone	Fats, oils, wax	fats
B+C	removed with neutral detergent	Proteins, enzymes, pectins, soluble salts, etc.	Salts and no cellulosic
B	no calcined removed	soluble salts	Salts
C	calcined removed	rest of removable material no saline	no cellulosic
D	removed with acid detergent	Hemicellulose, etc.	Hemicellulose
E	removed with concentrated acid	Cellulose, soluble lignin	Cellulose
D+E	removed with acid	hemicellulose, cellulose and soluble lignin	Cellulose and Hemicellulose
F	calcined not removed	insoluble lignin, etc.	Lignin
G	not calcined and not removed	insoluble salts, minerals, etc.	Minerals
B+G	total no calcined	Total salts	Salts and minerals



RESULTS AND DISCUSSION

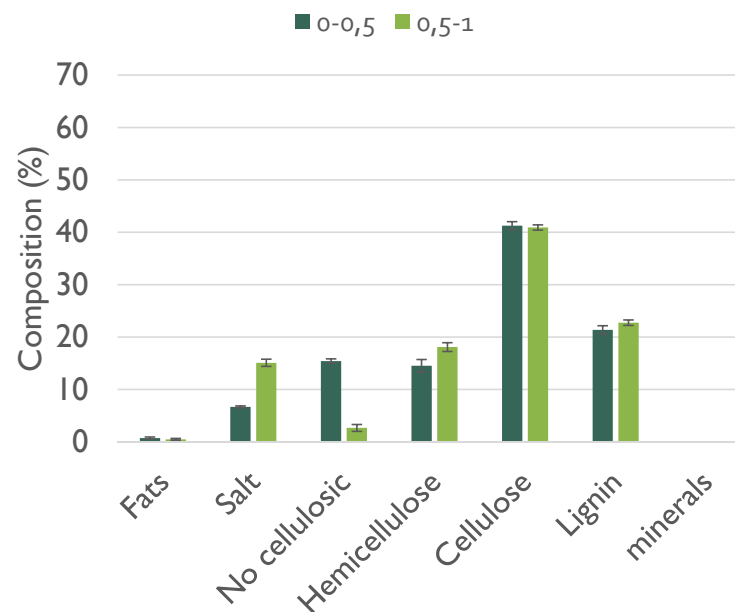
RESULTS AND DISCUSSION. Influence on the solid particle size

AHP pre-treatment was applied on milled **rice husk** and four different ranges of size were assayed

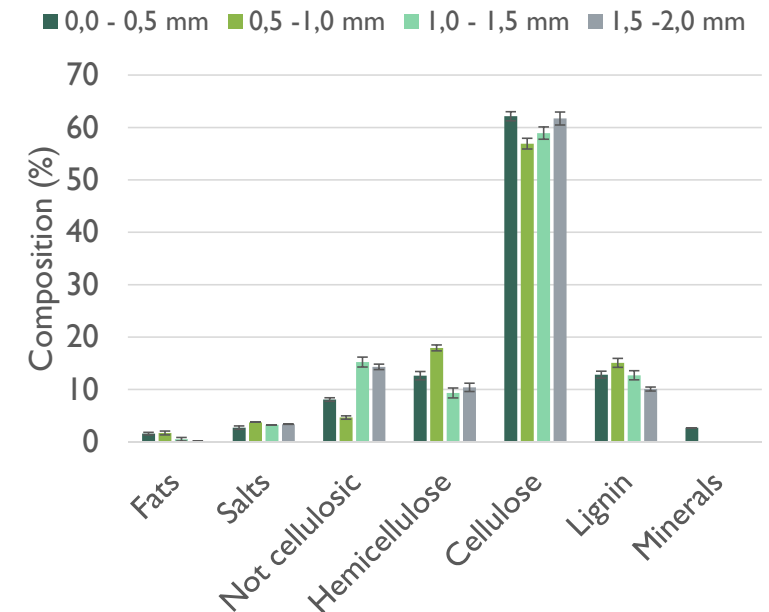
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The average weight losses produced after AHP peroxide pre-treatment was $25.31 \pm 0.38 \%$

Fibre composition of rice husk



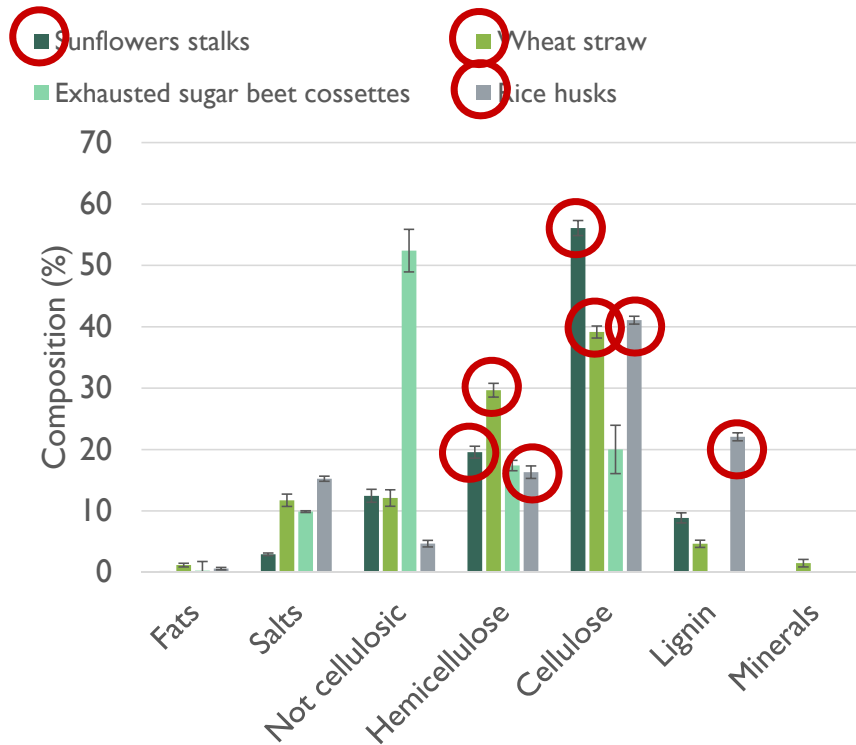
Before AHP pretreatment



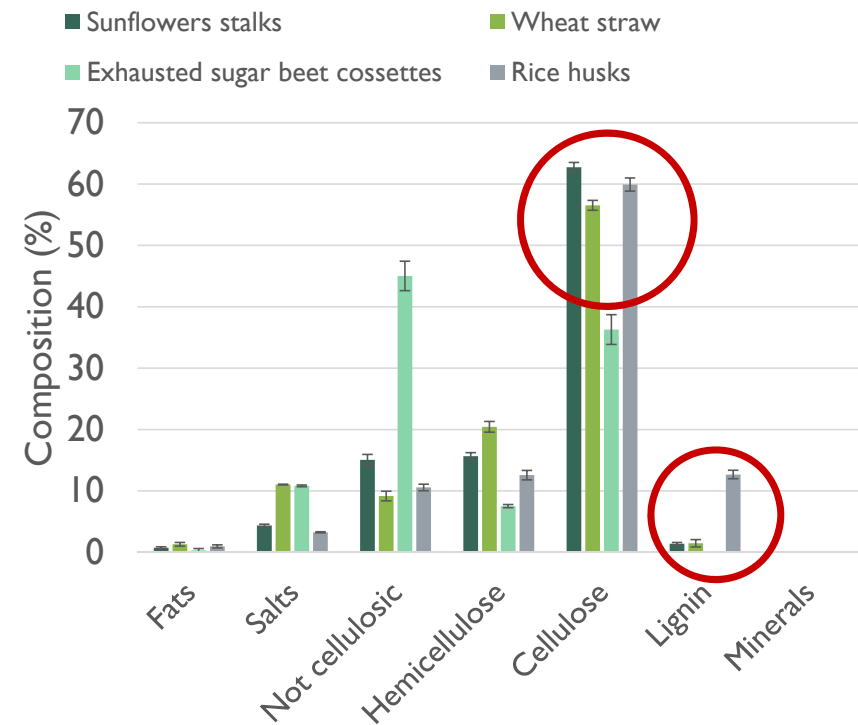
After AHP pretreatment

RESULTS AND DISCUSSION. Effect on different agro-industrial residues

Fibre composition before AHP

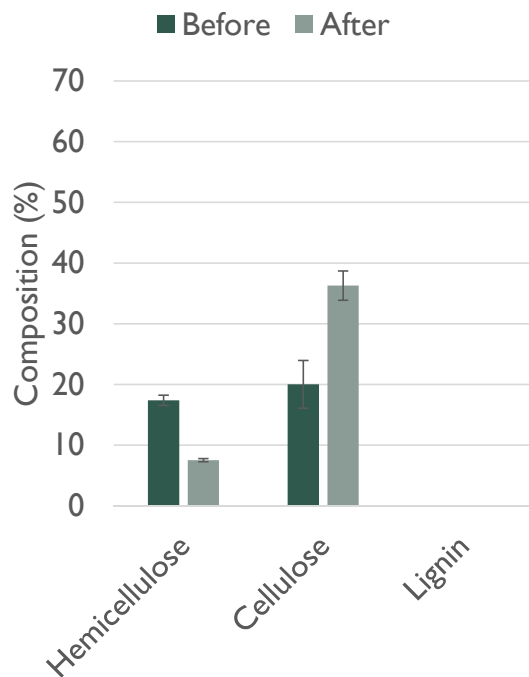


Fibre composition after AHP

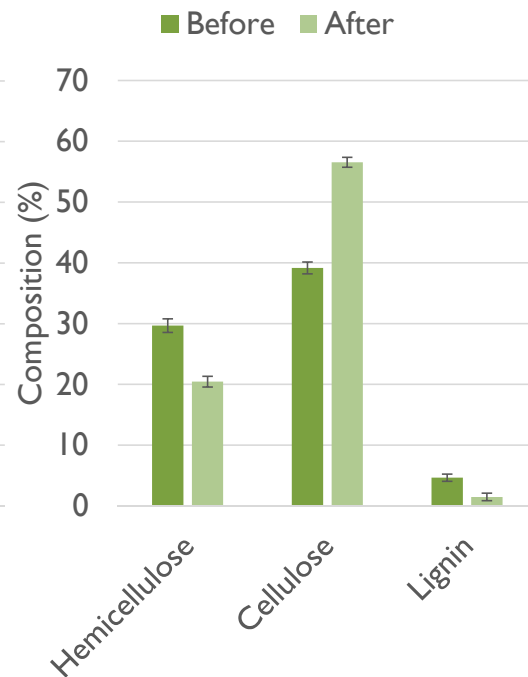


RESULTS AND DISCUSSION. Effect on different agro-industrial residues

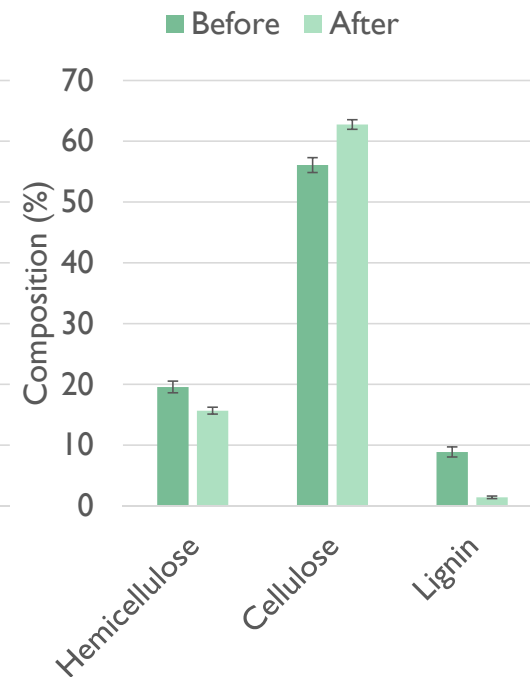
Exhausted sugar beet cossettes



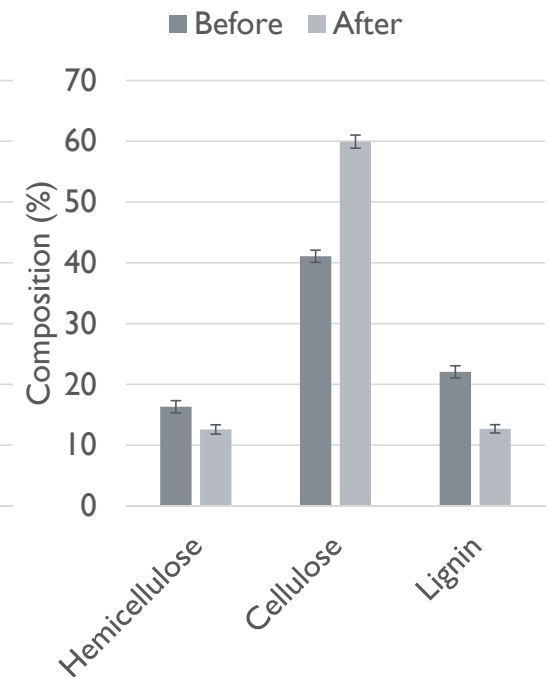
Wheat straw



Sunflowers stalks



Rice husks





CONCLUSIONS

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Lignocellulosic biomass is a potential raw material for the production of added-value products through fermentation of monomeric sugars. Nevertheless, a previous pretreatment stage is needed to make the polymers more accessible to the enzymes in the hydrolysis step producing the fermentable sugars

- Efficient pretreatment to remove a significant amount of lignin
- Cellulose fraction was not affected achieving its concentration
- Higher concentrations of hydrolysable polymers were attained; higher hydrolysis yields.



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