

DEEP EUTECTIC SOLVENT AS A GREEN ALTERNATIVE FOR LIGNIN RECOVERY: OPTIMIZATION OF LIGNIN EXTRACTION FROM AGRO-FOOD RESIDUES THROUGH EXPERIMENTAL DESIGN

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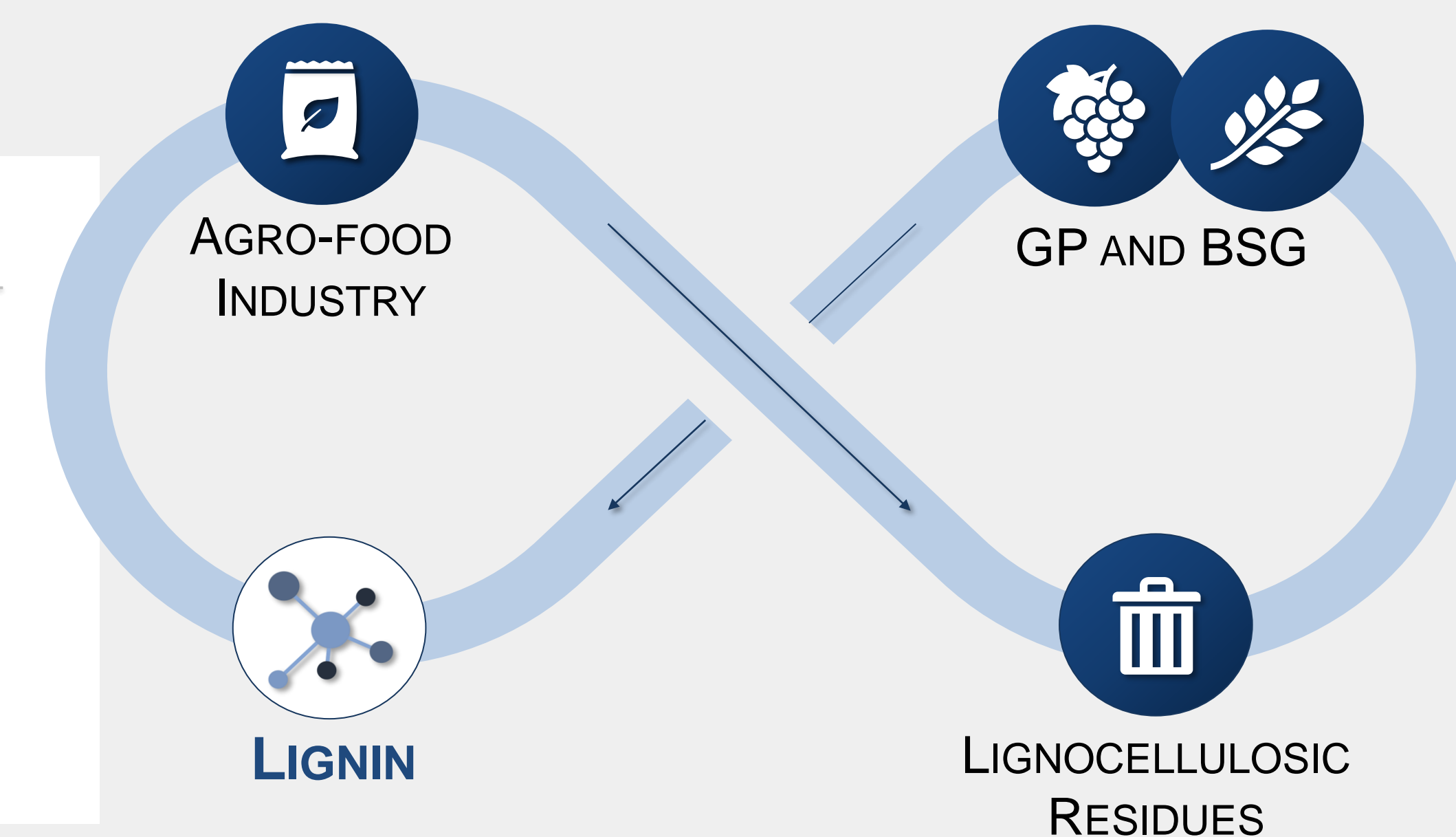


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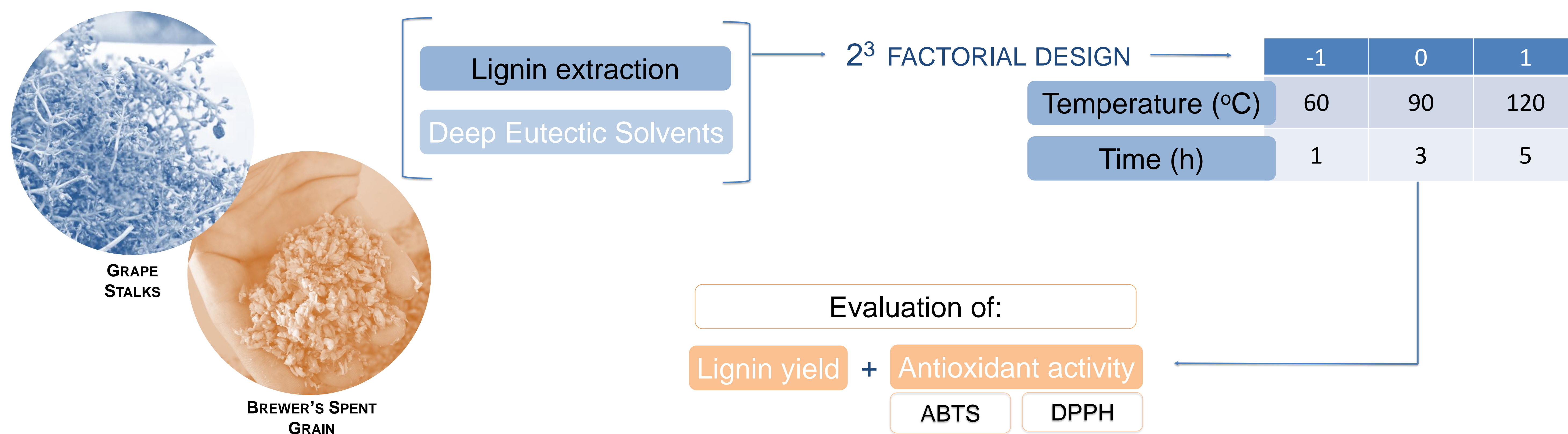
PORTO

INTRODUCTION

Lignin is a biopolymer with interesting applications and thus should be valorized (1). However, its extraction from the lignocellulosic biomass often requires the use of solvents with harsh conditions (2). Deep eutectic solvents (DES) emerged as a greener alternative for lignin extraction due to its solvent recyclability and simpler method (2). Thus, this work was carried out to optimize lignin extraction from agro-food residues, in particular brewer's spent grain (BSG) and grape stalks (GP), using DES.



METHODS



RESULTS

Optimum extraction conditions
(Desirability: GP= 0.86; BSG = 0.90)

Temperature (°C)

120

Time (h)

5

Table 1 – 2³ factorial design results analysis (p-value; r-squared) and corresponding optimized response values for yield and antioxidant activity from grape stalks and brewer's spent grain's lignin extracts.

	GRAPE STALKS			BREWER'S SPENT GRAIN		
	Yield	ABTS	DPPH	Yield	ABTS	DPPH
P-value	0.000	0.001	0.000	0.000	0.000	0.000
R-squared	97.92	78.72	78.45	93.39	97.61	99.47
Prediction	57.76 ¹	1756.79 ²	2784.28 ²	54.09 ¹	561.89 ²	707.29 ²
Desirability	0.7255	0.9394	0.9478	0.8079	0.9027	1.0
Obtained	41.09 ¹	968.37 ²	1225.57 ²	32.8 ¹	303.80 ²	387.54 ²

¹Yield values expressed as percentage (%); ²ABTS and DPPH values expressed as μM of Trolox equivalent/g of lignin.

CONCLUSIONS

Results showed that higher temperature (120 °C) and longer reaction time (5 h) rendered a highest lignin yield, reaching approximately 40%. Additionally, the extracted lignin presented relevant antioxidant capacity. Therefore, DES lactic acid:choline chloride is a suitable and green method to extract lignin from agro-food residues, representing an environmentally friendly alternative to traditional lignin extraction methods.

Bibliography

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