Supplementary material

Enzymatic saccharification of delignified biomass intensified by hydrodynamic cavitation

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1. Supplementary material for Introduction section

Table S1. Comparison of glucose yields per 100 of precursor dry mass attained in several recent works using acid oxidative delignification.

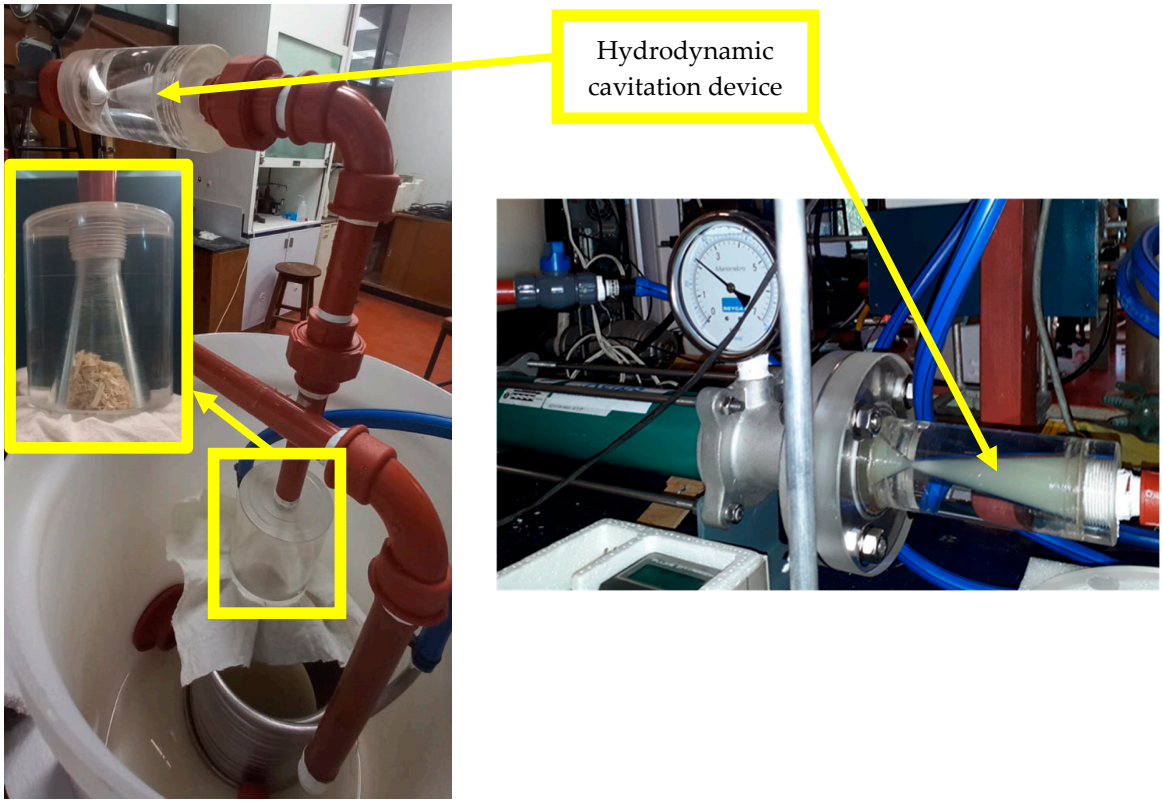
Precursor	Delignification method	Glucose yield (g/100g dry mass)	Reference
Masson Pine	Ethanol extraction + $HP_{0.75}$-$GA_{0.25}$ S/L: 1/10 90°C 3 h	38.3	Guo et al., 2025 [21]
Chinese fir	$HP_{0.5}$-$AC_{0.5}$ S/L: 50/500 60°C 2 h 200mM H_2SO_4	33.0	Ying et al., 2025 [19]
Chinese fir	$HP_{0.5}$-$AC_{0.5}$ S/L: 50/500 60°C 2 h 200mM H_2SO_4 + alkaline digestion (0.5 % NaOH, 22 °C, 1 h)	41.5	Ying et al., 2025 [19]
Bamboo	$HP_{0.8}$-$AC_{0.2}$ S/L: 1/10 60°C 2 h 100mM H_2SO_4	27.3	Ying et al., 2023 [17]
Bamboo	$HP_{0.8}$-$AC_{0.2}$ S/L: 1/10 60°C 2 h 100mM H_2SO_4 + alkaline post-incubation (0.5 % NaOH, 22 °C, 1 h)	29.8	Ying et al., 2023 [17]
Bamboo	$HP_{0.5}$-$CA_{0.5}$ + 0.5% v/v H_2SO_4 S/L: 1/15 80°C 3 h	43.49	Meng et al., 2023 [20]

Bamboo	$HP_{0.5}$-$AC_{0.5}$ + 0.5% v/v H_2SO_4 S/L: 1/15 80°C 3 h	35.4	Meng et al., 2023 [20]
Bamboo	$HP_{0.5}$-$AC_{0.5}$ + 0.5% v/v H_2SO_4 S/L: 1/15 60°C 2 h	31.4	Meng et al., 2022 [16]
Poplar	$HP_{0.8}$-$AC_{0.2}$ S/L: 1/10 60°C 2 h 100mM H_2SO_4 + AC hydrolysis (2 % AC, 170 °C, 0.5 h) + alkaline incubation (0.1 % NaOH, 50 °C, 1 h)	36.1	Lin et al., 2023 [14]
Poplar	$HP_{0.8}$-$AC_{0.2}$ S/L: 1/10 60°C 2 h 100mM H_2SO_4 + LA hydrolysis (2 % LA, 170 °C, 0.5 h) + alkaline incubation (0.1 % NaOH, 50 °C, 1 h)	30.3	Lin et al., 2023 [14]
Poplar	DA–2N (3% H_2SO_4 + 2-Naphtol 5% w/w S/L: 1/10 180°C 1 h) + ASU (12 %, Na_2SO_3 to Na_2CO_3 ratio of 1:1 S/L: 1/10 140°C 1 h).	38.3	Huang et al., 2021 [12]
Poplar	DA–2N (3% H_2SO_4 + 2-Naphtol 5% w/w S/L: 1/10 180°C 1 h) + AHP (S/L: 15/450 1 % w/v H_2O_2 80°C 1 h pH=11.6 adjust with 5M NaOH)	38.9	Huang et al., 2021 [12]
Eucalyptus sp.	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + washing intensified by HC	34.5	Current work
Eucalyptus sp.	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + traditional washing step	24.7	Current work
Tipuana tipu	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + washing intensified by HC	30.2	Current work
Tipuana tipu	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + traditional washing step	16.1	Current work
Pinus sp.	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + washing intensified by HC	12.9	Current work
Pinus sp.	$HP_{0.5}$-$AC_{0.5}$ S/L: 15/250 90°C 1 h + traditional washing step	10.7	Current work

HP: H_2O_2 30% w/w; GA: Gluconic acid 50% w/w; AC: Acetic acid (glacial, > 99% w/w); CA: citric acid 50% w/w; LA: lactic acid (>99% w/w); HC: hydrodynamic cavitation; DA: dilute acid; ASU: alkaline sulfonation treatment

Subscribes indicate volume fraction in the mixture

2. Supplementary material for Materials and Methods section



(**a**) (**b**)

Figure S1. Photographs of the set-ups used for the washing step intensified by HC. (**a**) Without solid circulation, showing an enlargement of the sample container; (**b**) With solid circulation.

3. Supplementary materials for Results and Discussion section

Table S2. Crystallinity index of raw and treated filter paper.

	Crystallinity index (%)			
Washing method	**Raw (without pretreatment)**	**Soaking**	**HC**	**HC with 0.3%w/w H_2O_2**
Filter paper	82.4	79.8	84.2	81.8

Table S3. Cellulose and lignin content of the raw and delignified LCBs obtained with the different washing methods, including solid recovery.

Sample	Cellulose (% dry mass)			Lignin (% dry mass)			Solid recovery (%)	
	Raw	Soaking	HC	Raw	Soaking	HC	Soaking	HC
Eucalyptus sp.	47	67	84	24	3.3	2.7	67.2	50.9
Tipuana tipu	43	61	82	29	3.1	nd	68.9	51.4
Pinus sp.	41	63	83	34	nd	nd	64.3	48.3

nd: not detected

Table S4. Glucose yields obtained expressed as mass of glucose generated per 100 g of precursor dry mass.

	g glucose/100g raw LCB	
Washing method	**Soaking**	**HC**
Eucalyptus sp.	24.7	34.5
Tipuana tipu	16.1	30.2
Pinus sp.	10.7	12.9

Table S5. Extra energy consumption required for performing HC during the washing step referred to the energy consumed for HPAC. Ratio of the energy consumed per unit of generated glucose mass using HC referred to the same when using traditional washing methods for which energy consumption is assumed to be negligible. Energy savings by implementing HC during the washing step.

Sample	Extra energy consumption required for performing HC	Relative energy consumption to obtain 1g glucose	Energy savings by implementing HC
		HC/Soaking	
Eucalyptus sp.	7%	0.77	23%
Tipuana tipu		0.57	43%
Pinus sp.		0.89	11%