Pré-tratamento de materiais lignocelulósicos (cont.)

Sumário e objetivo da aula (2 aulas)

1. Qual a finalidade do prétratamento?

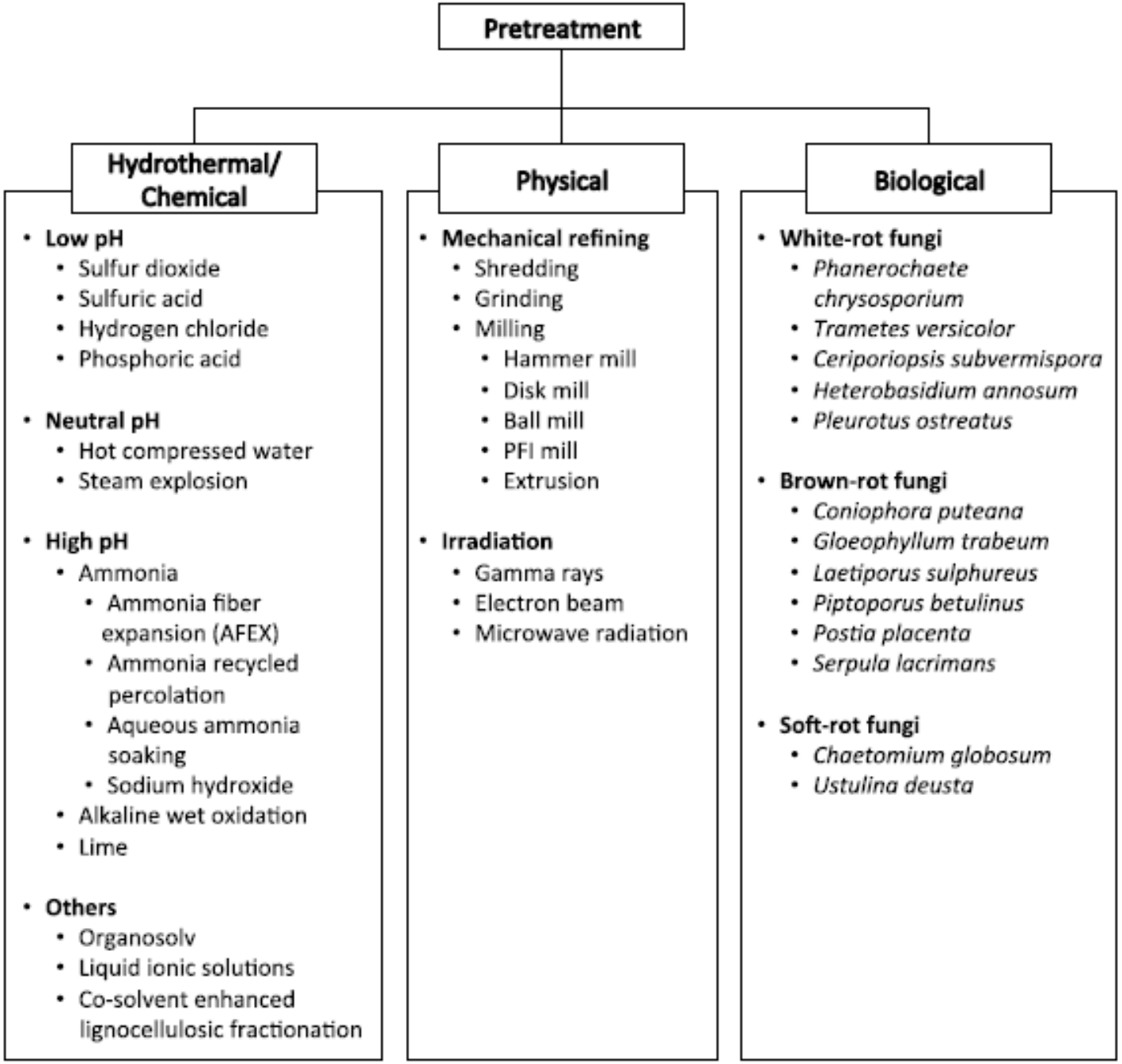
- Porque enzimas apresentam ação limitada na biomassa in natura?

2. Fundamentos e tipos de pré-tratamento

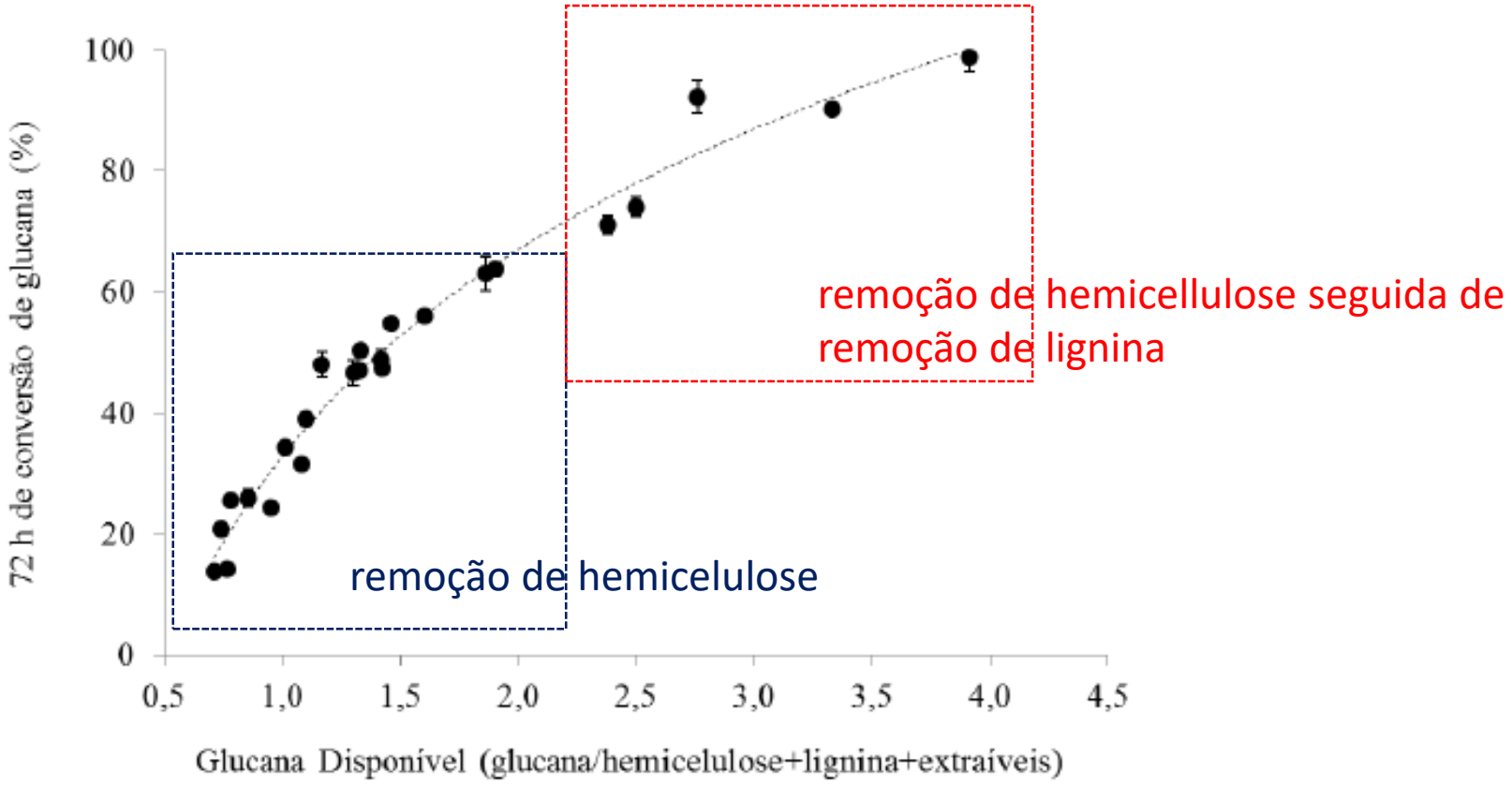
3. Eficiência de hidrólise após o pré-tratamento

4. Correlações entre remoção de componentes no pré-tratamentoe eficiência de hidrólise

5. Balanço de massas e avaliação econômica


Pretreatment
Hydrothermal/ Chemical
Low pH
Sulfur dioxide
Sulfuric acid
Hydrogen chloride
Phosphoric acid
Neutral pH
Hot compressed water
Steam explosion
High pH
Ammonia
Ammonia fiber expansion (AFEX)
Ammonia recycled percolation
Aqueous ammonia soaking
Sodium hydroxide
Alkaline wet oxidation
Lime
Others
Organosolv
Liquid ionic solutions
Co-solvent enhanced lignocellulosic fractionation
Physical
Mechanical refining
Shredding
Grinding
Milling
Hammer mill
Disk mill
Ball mill
PFI mill
Extrusion
Irradiation
Gamma rays
Electron beam
Microwave radiation
Biological
White-rot fungi
Phanerochaete chrysosporium
Trametes versicolor
Ceriporiopsis subvermispora
Heterobasidium annosum
Pleurotus ostreatus
Brown-rot fungi
Coniophora puteana
Gloeophyllum trabeum
Laetiporus sulphureus
Piptoporus betulinus
Postia placenta
Serpula lacrimans
Soft-rot fungi
Chaetomium globosum
Ustulina deusta

Efeito combinado da remoção de componentes



Balanço de massas dentro do processo de pré-tratamento

Fundamental para verificar perda de components e aumento de acessibilidade à cellulose

exemplo de cálculo

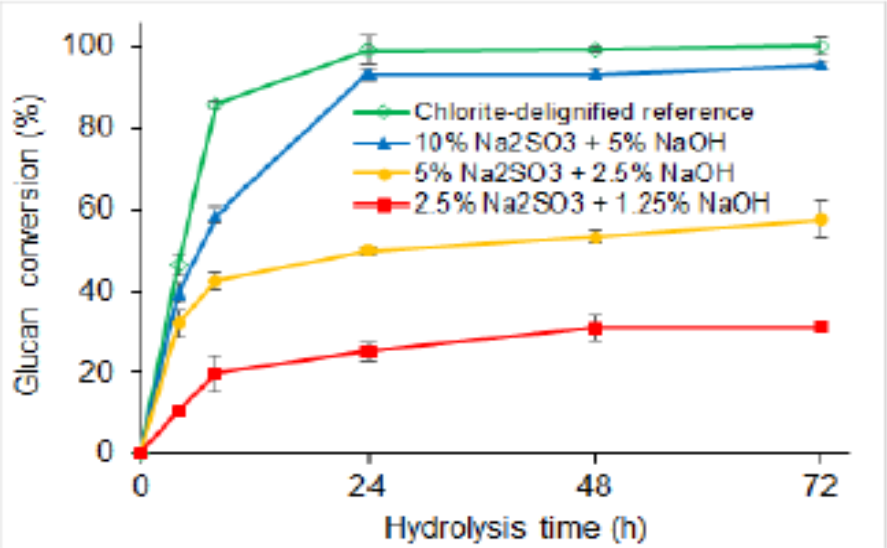
Table 1 Chemical composition and mass balance for sugarcane bagasse components before and after pretreatment via an alkaline-sulfite chemithermomechanical process or chlorite delignification

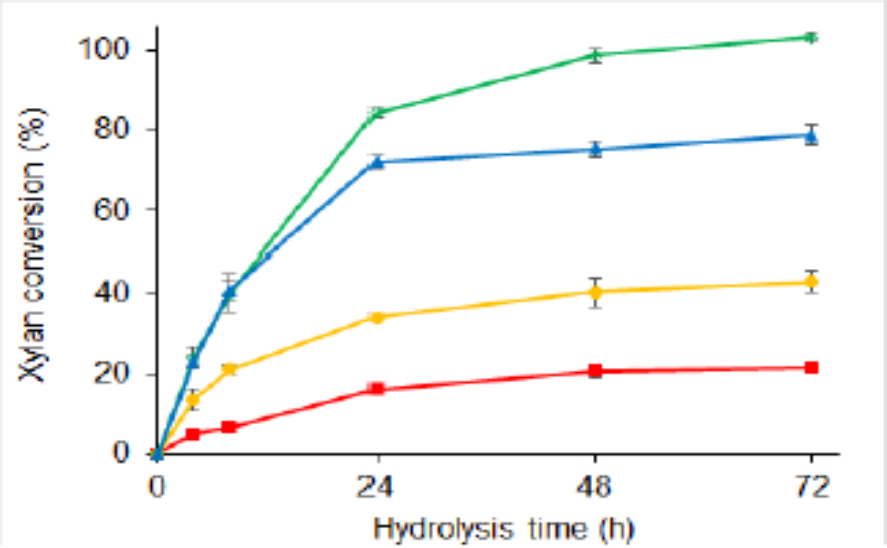
Sample	Chemical composition of samples[a] (g/100 g of pretreated sample)					Solids yield (%)	Mass balance (g/100 g of original sugarcane bagasse)				
	Lignin[b]	Glucan	Hemicellulose				Lignin	Glucan	Hemicellulose		
			Xylan	Arabinosyl	Acetyl				Xylan	Arabinosyl	Acetyl
Untreated	22.4 ± 0.6	40.0 ± 0.1	21.4 ± 0.1	2.0 ± 0.1	3.6 ± 0.1	100	22.4	40.0	21.4	2.0	3.6
2.5% Na_2SO_3 + 1.25% NaOH	24.8 ± 0.3	42.3 ± 0.5	20.4 ± 0.2	1.8 ± 0.1	1.4 ± 0.3	86.8	21.5	36.7	17.7	1.6	1.2
5% Na_2SO_3 + 2.5% NaOH	23.7 ± 0.3	44.0 ± 0.2	19.6 ± 0.1	1.9 ± 0.1	1.1 ± 0.2	84.1	19.9	37.0	16.5	1.6	0.9
10% Na_2SO_3 + 5% NaOH	16.8 ± 0.5	48.3 ± 0.3	20.5 ± 0.3	2.3 ± 0.1	0.1 ± 0.1	81.8	13.8	39.5	16.8	1.9	0.1
Chlorite-delignification	11.5 ± 0.5	43.8 ± 0.5	25.1 ± 0.7	2.8 ± 0.1	2.4 ± 0.4	85.7	9.9	37.6	21.5	2.4	2.1

[a] Original ash content in untreated sugarcane bagasse was 2.8 ± 0.7%

[b] Total lignin contents were not corrected for ash

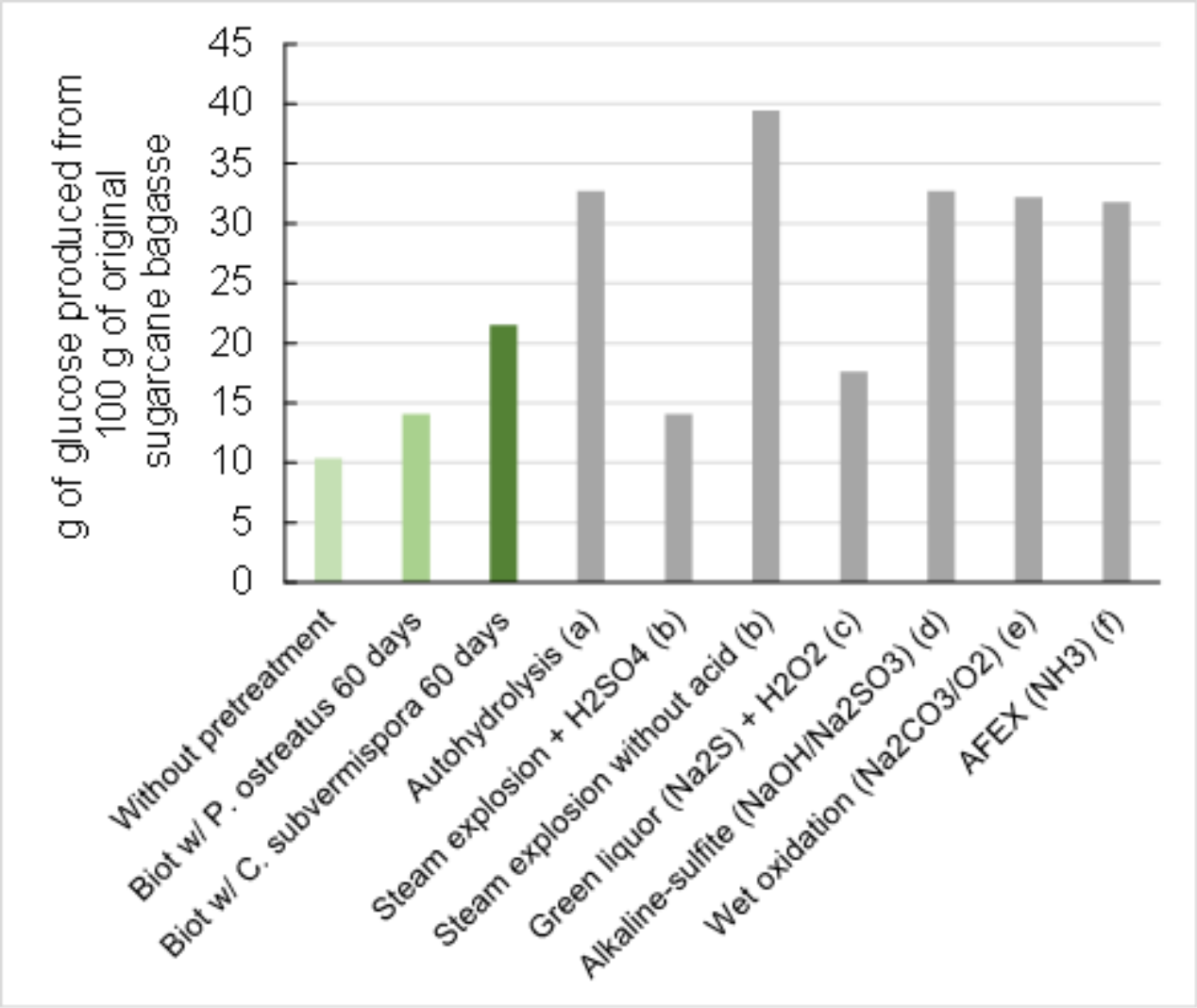
Conversão enzimática de polissacarídeos expressa com base na massa de componente presente no material pré-tratado



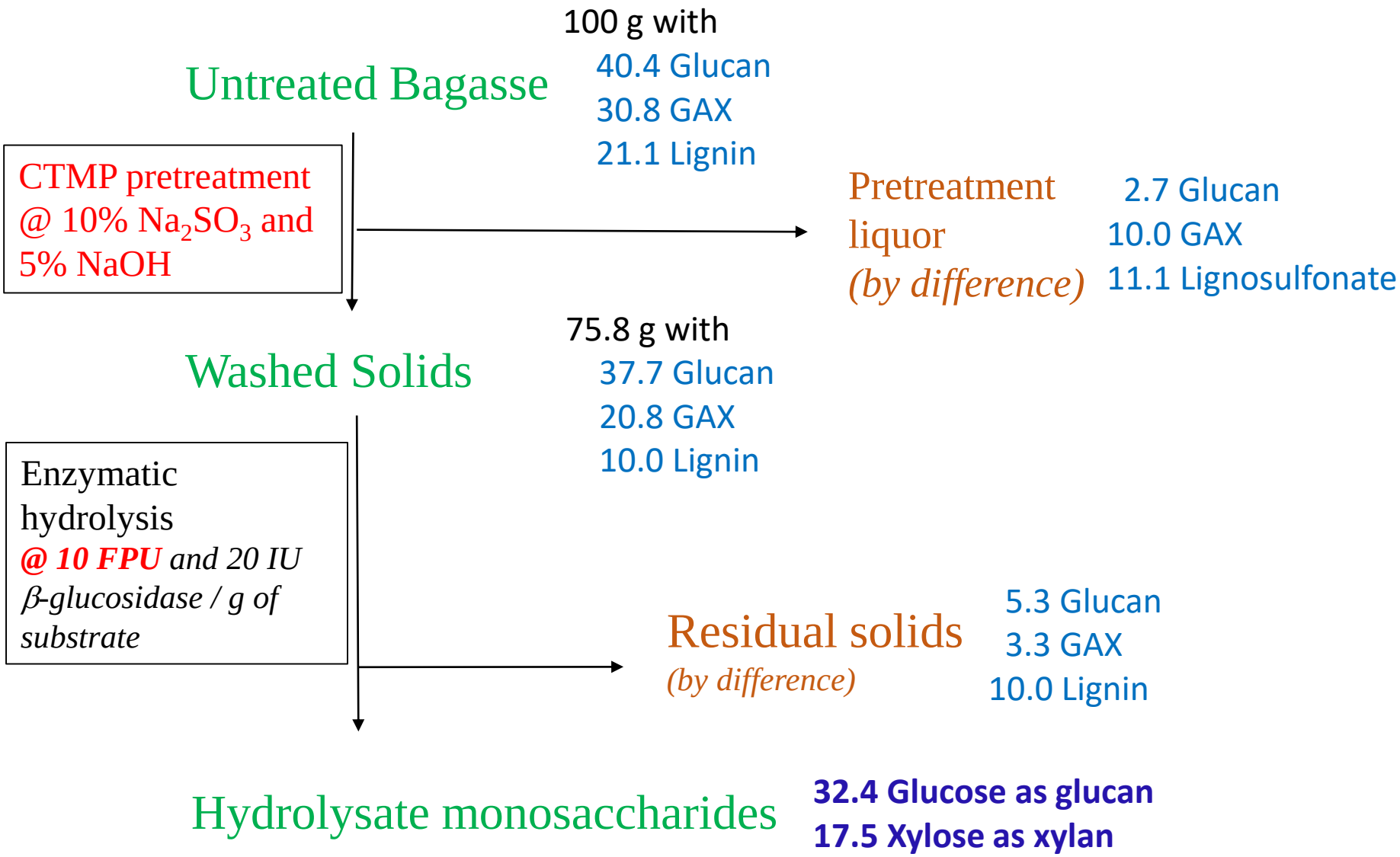


Conversão enzimática de polissacarídeos expressa com base no balanço de massas de componentes

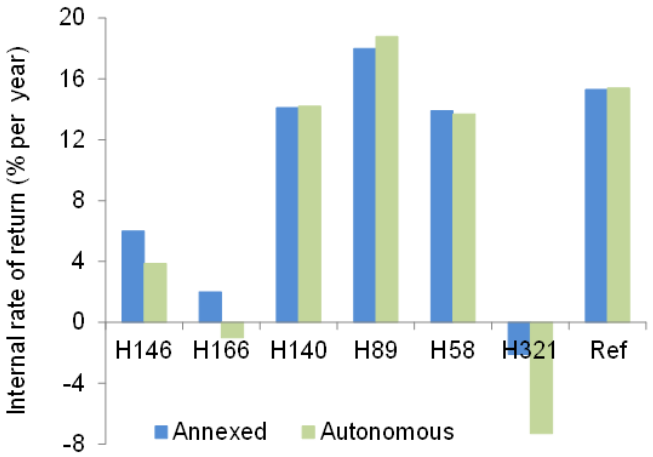
(expressos com base na massa inicial de biomassa)

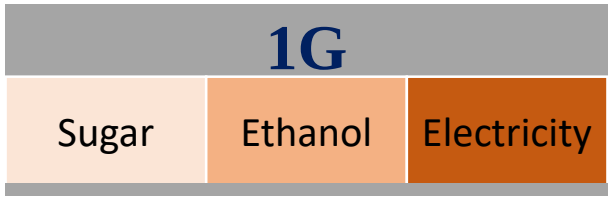


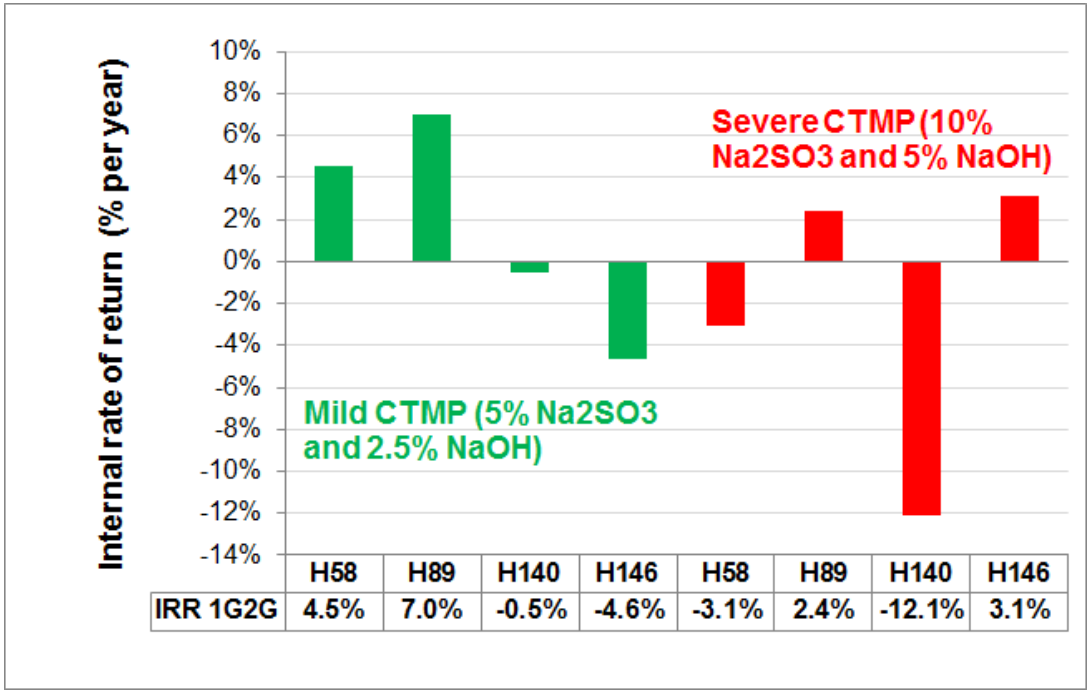
Exemplo de balanço de massas incluindo todas as frações geradas



Avaliação econômica é muito relevante

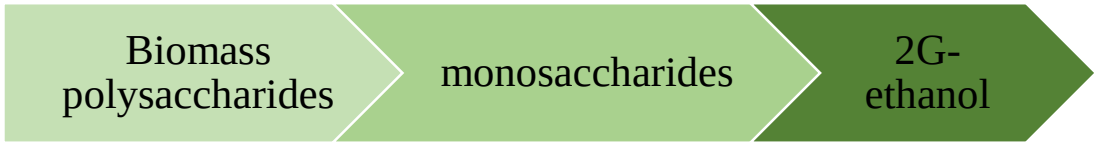




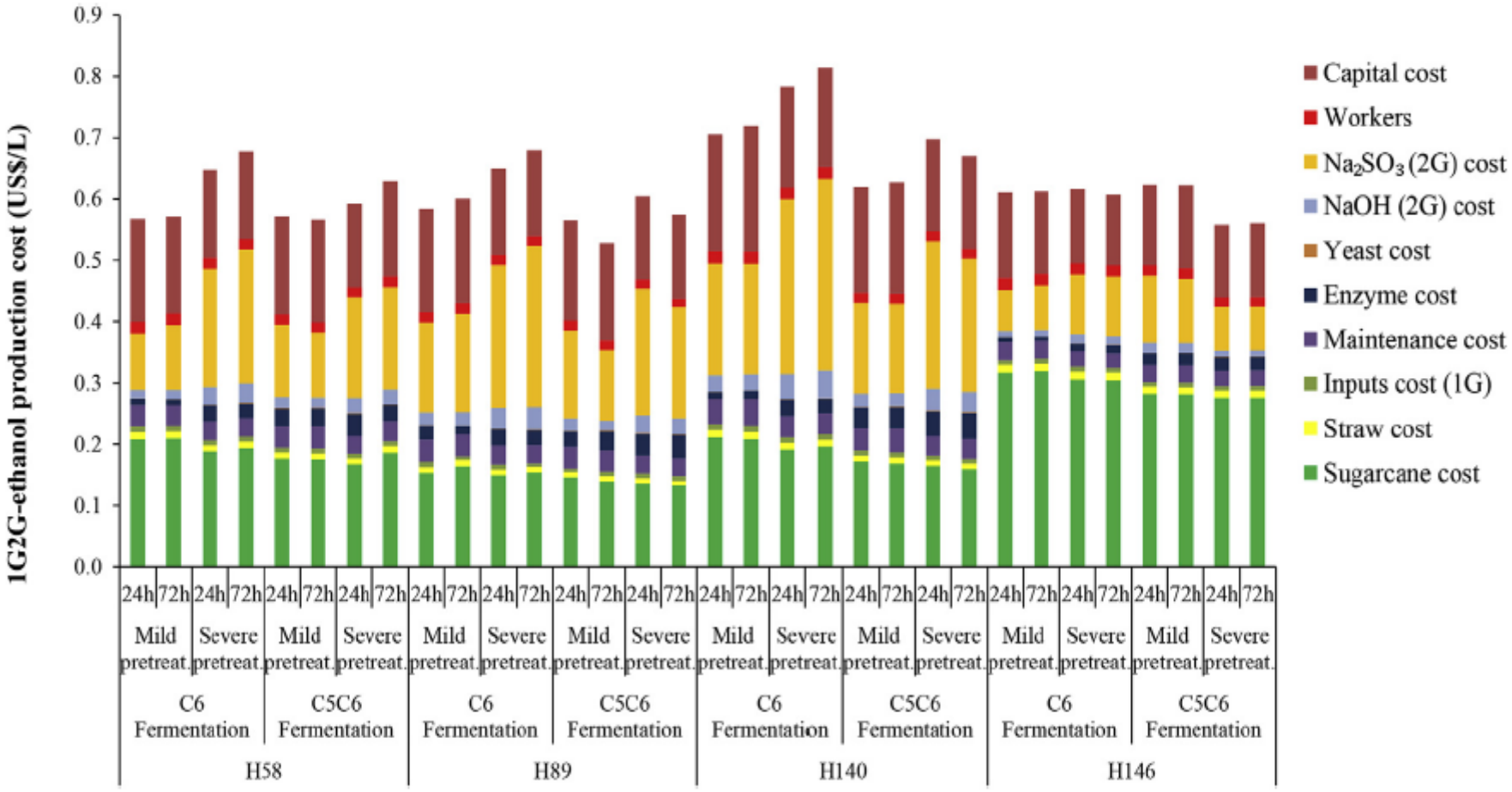


Integrated 1G-2G

(for sugar and ethanol production)



Composição de custos no processo



Itens que afetam fortemente os custos requerem avaliação de "sensibilidade paramétrica"