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EXTRACTION OF OLIGOSSACHARIDES FROM TWO AGRO-INDUSTRY BY-PRODUCTS - BREWER'S SPENT GRAIN AND WHEAT BRAN - AND ITS POTENCIAL FOR VALORISATION

Maria J. Costa[a], José A. Teixeira[a]
[a]Centre of Biological Engineering, University of Minho, Campus de Gualtar, 4710-057 Braga, Portugal
jateixeira@deb.uminho.pt
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Introduction. The aim of this work was to optimize the extraction of oligosaccharides from brewer's spent grain (BSG) and wheat bran (WB) in order to have a preliminary assessment of its prebiotic potential.
Oligosaccharides extraction was carried out by enzymatic and hydrothermal treatments and its efficiency compared.
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Methods. After collection, the samples were dried to 85% dry content and stored safely. The values of Cellulose, Hemicellulose and Lignin were determined by quantitative acid hydrolysis with 72% (w/w) sulphuric acid, following standard methods (Browning 1967). Glucose, xylose and arabinose contents were analysed by HPLC.
Hydrothermal extraction was done with different time conditions (20, 30, 40 and 50 minutes) at 180ºC and 5% of raw material (table 1) and enzymatic extraction with two different enzyme concentrations of endoxylanase (1 and 2%) at 55ºC for 24 hours and 9% of raw material (Table 2). Quantification of oligosaccharides - Glucooligosaccharides (GOS), Xylooligosaccharides (XOS) Arabin-oligosaccharides (AOS)) in the liquid phase was done according to the methodologies described by Aguedo et al. 2014 with some modifications.

Results. The oligosaccharides concentration in BSG (g/100g$_{BSG}$) and WB (g/100g$_{WB}$) extracts obtained by hydrothermal treatment is displayed in Table 1.

Table 1. Oligosaccharides composition of BSG and WB extracts obtained by hydrothermal extraction

		Hydrothermal extraction						
		BSG				WB		
	Time (min)	20	30	40	50	20	30	50
Composition g/100g	GOS	2.9	4.4	3	4.8	14	13.8	17.1
	XOS	3.9	10.1	10.5	10.2	4.4	8.6	11
	AOS	2.5	2.1	2.3	1.1	1.4	2.1	2.4
Extraction Yield (%)	GOS	15.2	23	15.8	25.5	51	50.3	62.2
	XOS	29.8	77.5	80.5	77.9	34.9	68.9	87.8
	AOS	47.6	39.1	44.3	21.4	24.8	37	42

The results for the enzymatic extraction are presented in Table 2.

Table 2. Oligosaccharides composition of BSG and WB extracts obtained by enzymatic extraction

		Enzymatic extraction			
		WB		BSG	
	Endoxylanase concentration	1%	2%	1%	2%
Composition g/100g	GOS	5.4	6.1	1.3	2.2
	XOS	1.5	2.7	3.8	4.9
	AOS	0.4	0.8	2.2	2.6
Extraction Yield (%)	GOS	19.5	22.3	7.1	11.5
	XOS	12.3	21.2	29.2	37.4
	AOS	6.3	13.5	42.7	49.2

Results show that hydrothermal extraction is more efficient that the enzymatic extraction applied. The best conditions for the extraction of oligosaccharides from BSG were achieved for 40 minutes with an amount of 3.0g/100g GOS, 10.5g/100g XOS and 2.3g/100g AOS corresponding to a yield of 15.8, 80.5 and 44.3% respectively. For WB the best results were achieved at 50 minutes with hydrothermal extraction: 17.1g/100g GOS, 11.0g/100g XOS and 2.4g/100g AOS with the corresponding yield of 62.2, 87.8 and 42 %.

Conclusions. The hydrothermal extraction is an original method that shows to be fast, efficient and soft; it is also an up-scalable process that enables to recover different types of oligosaccharides either from BSG or WB. The obtained results show that BSG and WB have great potential for oligosaccharide production.

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