VALORIZATION OF WHEAT BRAN BY SUBCRITICAL WATER FRACTIONATION

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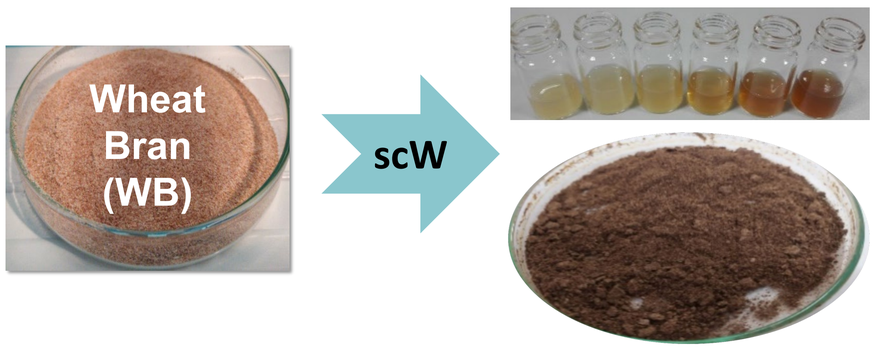
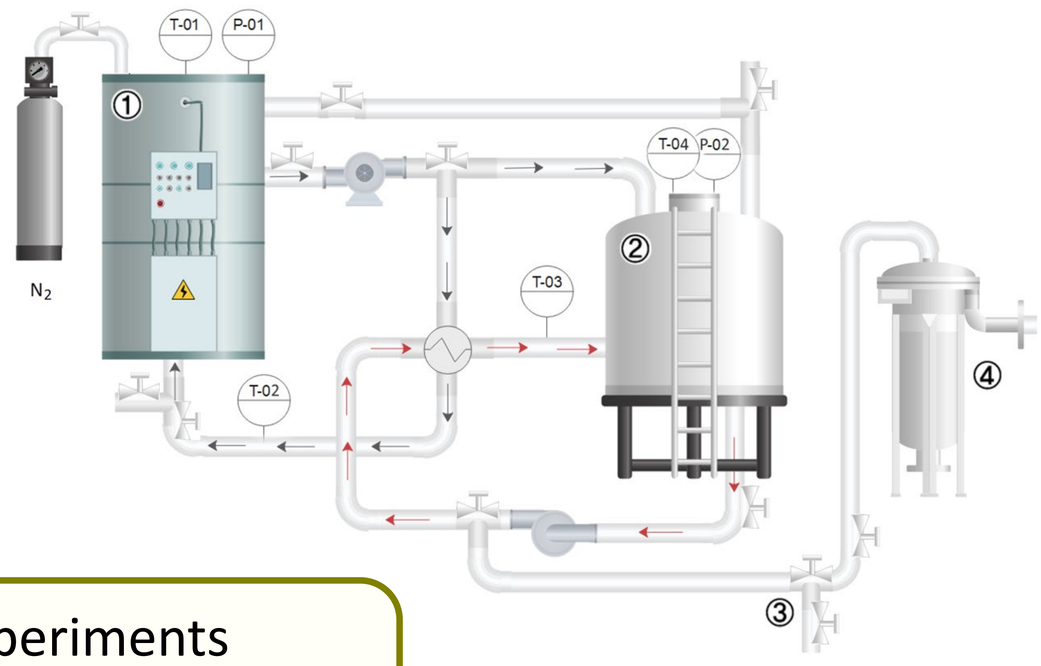


	Raw wheat bran		Residue after scW treatment	
Component	**WB1**	**WB2**	**WB1 residue**	**WB2 residue**
Extractives	**21.29 ± 0.19**	**16.45 ± 0.08**		
Water	16.43 ± 0.15	12.65 ± 0.04		
Ethanol	4.86 ± 0.04	3.8 ± 0.04		
Glucanes	**40.35 ± 0.55[a]**	**31.76 ± 0.71[b]**	**25.03 ± 0.24**	**28.96 ± 0.57**
Starch	30.85 ± 0.20	23.31 ± 0.12	6.83 ± 0.08	0.8 ± 0.12
β-glucane	6.41 ± 0.21	4.17 ± 0.14		
Cellulose	3.09 ± 0.14	4.28 ± 0.45	18.20 ± 0.24	28.16 ± 0.45
Hemicellulose	**28.32 ± 0.09**	**29.73 ± 0.33**	**27.09 ± 0.55**	**12.31 ± 0.48**
Xilane	18.14 ± 0.05	17.31 ± 0.19	17.68 ± 0.41	9.96 ± 0.35
Arabinane	9.36 ± 0.03	10.48 ± 0.10	8.31 ± 0.08	1.69 ± 0.12
Acetate	0.82 ± 0.01	0.63 ± 0.04	1.10 ± 0.06	0.69 ± 0.01
Lignin	**8.03 ± 0.38**	**12.81 ± 0.29**	**25.3 ± 0.69**	**35.5 ± 0.12**
Ácid insoluble	6.60 ± 0.34	8.58 ± 0.22	17.38 ± 0.46	31.52 ± 0.06
Ácid soluble	1.43 ± 0.04	4.23 ± 0.07	7.92 ± 0.23	3.98 ± 0.06
Ash	**3.76 ± 0.14**	**1.45 ± 0.04**	**0.83 ± 0.16**	**0.92 ± 0.15**
Proteins	**17.17 ± 0.8[a]**	**20.12 ± 0.02[b]**	**23.4 ± 0.8**	**22.21 ± 0.31**
Lípids	**5.3 ± 0.1**	**5.1 ± 0.1**		

a. Water soluble glucose and protein included: 5.54 % and 5.45 %, respectively
b. Water soluble glucose and protein included: 5.30 % and 1.90 %, respectively

Diagram of pilot-scale subcritical water plant designed and built in Hiperbaric (https://www.hiperbaric.com/es/). 1: boiler preheater and water tank; 2: 25 L discontinuous extractor; 3: liquid sample collector; 4: filtration tank

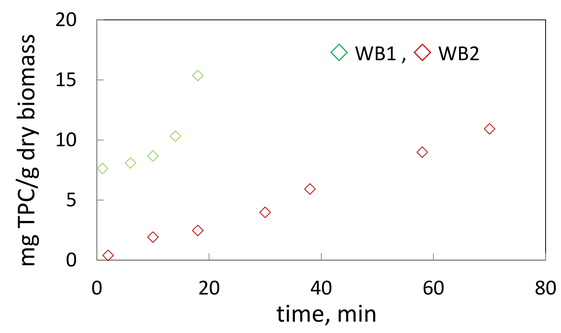


Experiments

Two experiments, named WB1 and WB2, have been carried out under the following conditions:

- **WB1:** Biomass load in the reactor 2.5%, for a water volume of 20 L. Average treatment temperature = 179 ± 4 ºC. The particle size of the biomass fraction was between 0.25 and 0.125 mm. Treatment time = 25 min.
- **WB2:** Biomass load in the reactor 15%, for a water volume of 20 L. Average treatment temperature = 167 ± 3 ºC. The particle size of the biomass fraction was between 0.5 and 0.25 mm. Treatment time = 75 min.

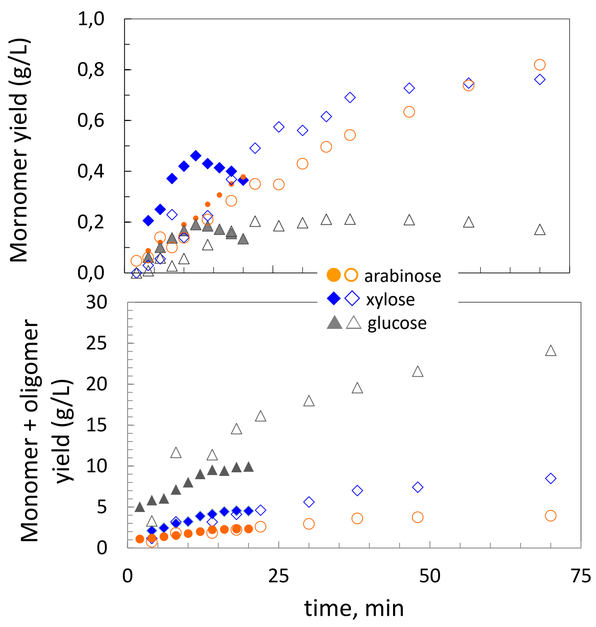
scW soluble phenolic compounds



The high TPC value of the extracts could be due to the formation of compounds related to Maillard reaction. Browning of PLE sample could be visually observed.

scW soluble carbohydrates

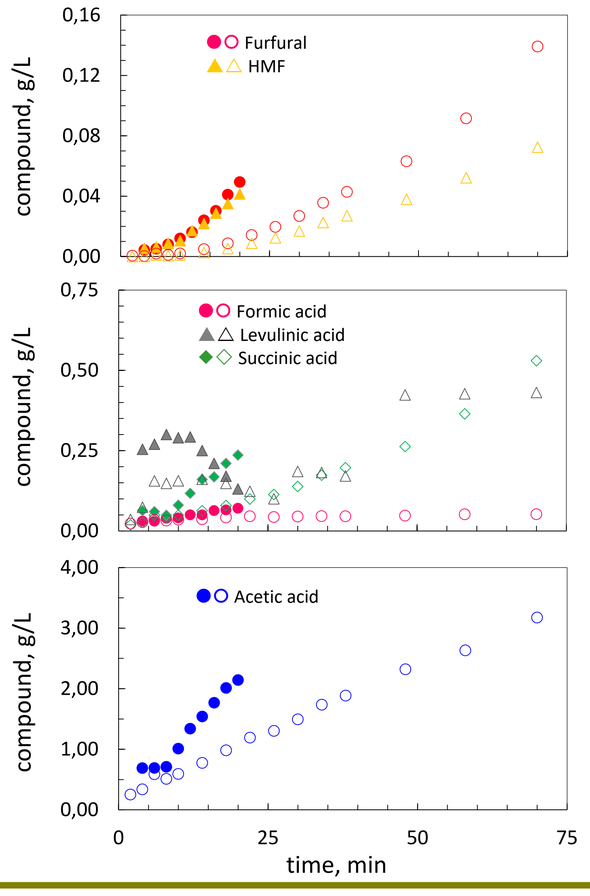
MONOMERS AND OLIGOMERS



Most of the carbohydrates are hydrolysed as oligomers. Arabinose from hemicellulose presented the highest monomeric sugar yield

full symbols: WB1
empty symbols: WB2

DEGRADATION PRODUCTS

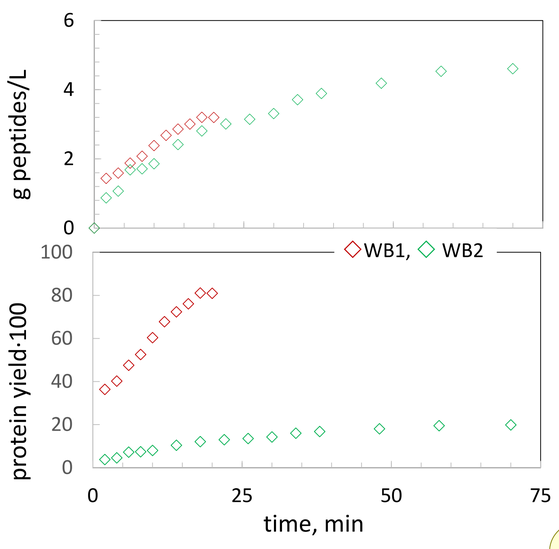


A sharp increase in sugar degradation products can be observed at the time monomer sugars concentration in the reactor start to decrease.

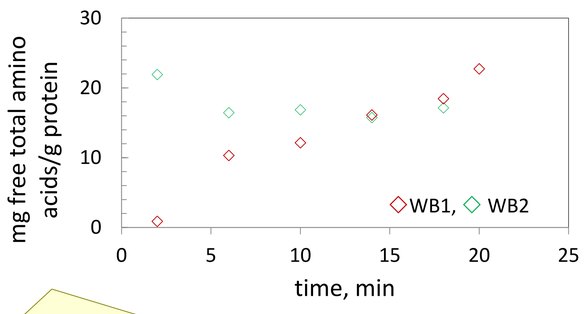
full symbols: WB1
empty symbols: WB2

scW soluble protein fraction

PROTEIN HYDROLYSIS



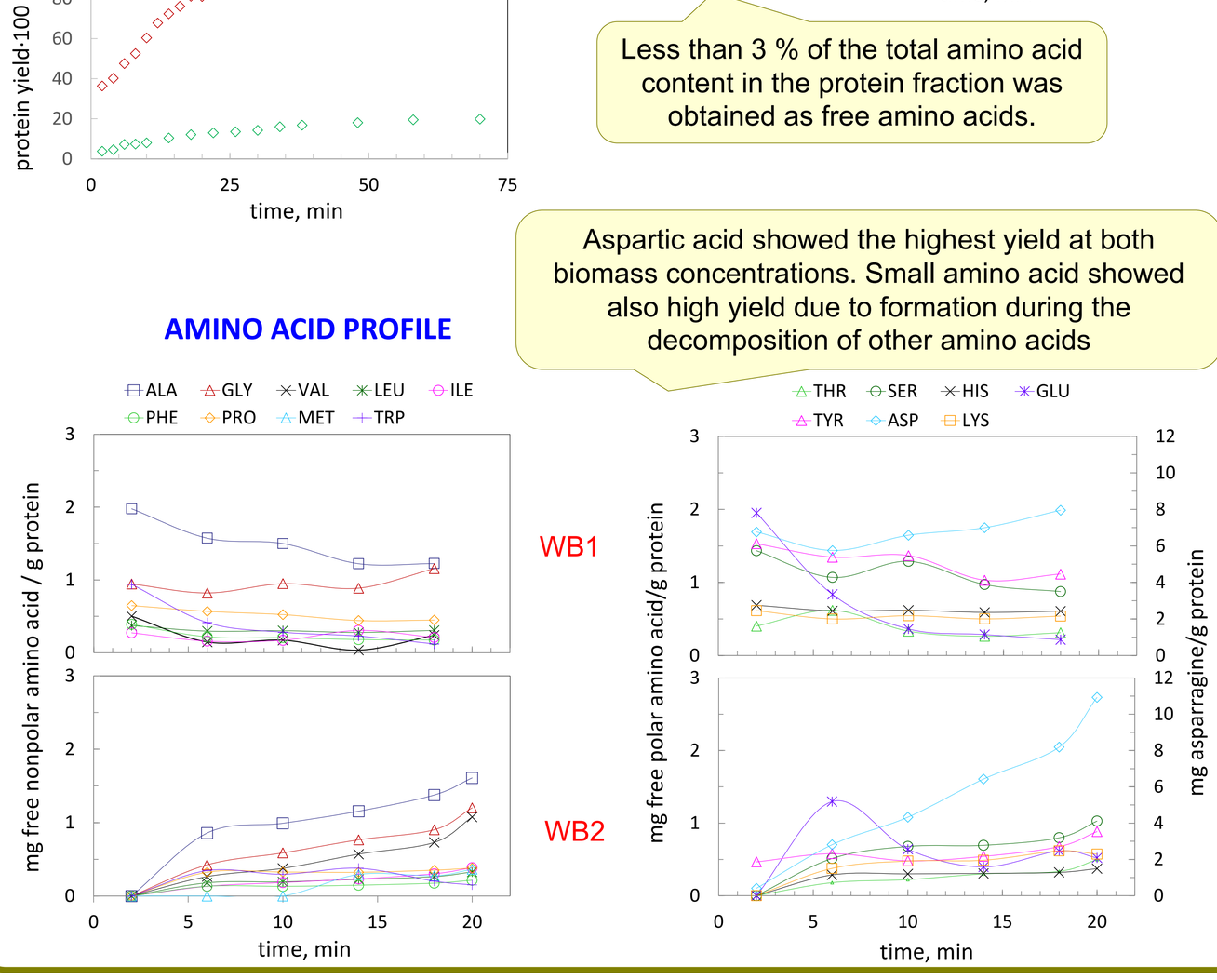
TOTAL AMINO ACIDS PRODUCTION



Less than 3 % of the total amino acid content in the protein fraction was obtained as free amino acids.

Aspartic acid showed the highest yield at both biomass concentrations. Small amino acid showed also high yield due to formation during the decomposition of other amino acids

AMINO ACID PROFILE



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