COMPARATIVE STUDY OF HEMICELLULOSE EXTRACTION WITH TWO ALKALINE TECHNIQUES FROM MAIN BREWING RESIDUE BREWER'S SPENT GRAIN

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Introduction. The main residue of beer production process is brewer's spent grain (BSG) which is an 85% of the total residues, and its principal use is as animal feeding (1). One of the major components present in BSG are fibers such as hemicellulose (1). Hemicellulose is a polysaccharide with heterodimers like arabinoxylans, glucomannans, etc. which are part of vegetable walls (2,3). Is classified as soluble fiber, which has human health benefits like prebiotic effect, therefore could be used as functional ingredient (3). Although some extraction processes like acid hydrolysis with sulfuric acid are not ecological, can be toxic and corrosive (4). The objective of this work is to extract hemicellulose from brewing residue by comparing two different methods in order to define performance, sustainability, and management security.

Methodology. The extraction techniques are based on methodology from *Yadav, et al.* and *Taşar, Ş. & Özer, A.* presented in Figure 1. Once the fractions were obtained both techniques were scale up with the objective of evaluate their reproducibility.

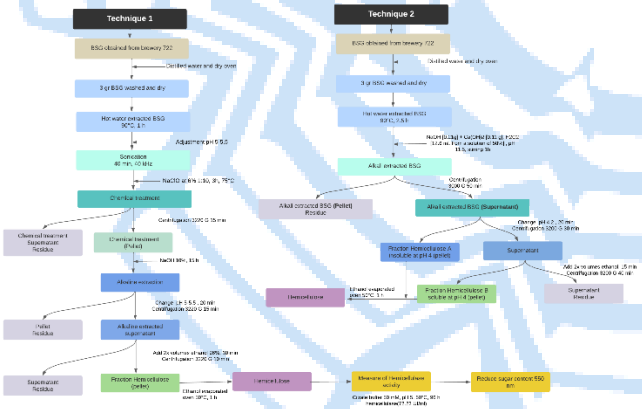

Fig. 1. Techniques diagrams of hemicellulose extraction and enzymatic test.

Results. In both methods the solid fraction obtained present a slightly yellow tone (Figure 3). There was a notable difference between the extraction yields between both methods (Table 1), the second method obtained higher extraction yields. After scaling up both methods, results suggested that are reproducible in extraction yields and physical aspect of the fractions.

Fig. 2. Initial BSG and final hemicellulose fraction extracted from each technique

The presence of hemicellulose was confirmed in both final fractions. Although the second method resulted to obtain a major fraction percentage, less time and higher hemicellulase activity is important to use another technique like a chromatography to quantify the hemicellulose content.

Table 1. Resume and comparison of results from extraction techniques

Extraction technique	*Final extracted fraction (g)*	*Percentage according to initial material (%)*	*Final fraction obtained after scaling up (%)*	*Reduced sugar concentration (mg/mL)*	*Total time of extraction (h)**
Technique 1	0.072	24	24.6	0.570	22
Technique 2	1.050	35	34.7	0.953	7

* Do not consider preparation of equipment and material

Conclusion. The use of both methods resulted in successful hemicellulose extraction from BSG, although is needed further research to quantify the hemicellulose content as well as a try to optimize the process in terms of time and materials. Besides the development of this procedures promotes circular economy, a reduction in environmental impact, the reagent management is safer and are useful to obtain compounds that could help to take care of our health.

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