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Eukaryotic Expression Systems in Non-Mammals Yeast and Fungi in Biologics Production

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Abstract

The current focus of research is on improving the bioaccessibility of functional components bound to cereal bran cell walls. Phenolic acids, biopeptides, dietary fibre and novel carbohydrates are the main bioactive components in cereal bran that have significant biological activities. Their bioaccessibility is limited due to the bound form in which these bioactive compounds exist in the bran matrix. The purpose of this paper is to thoroughly examine the functionality of an integrated technology that consists of bran substrate pretreatment techniques followed by fermentation bioprocesses to improve the bioaccessibility and bioavailability of the functional components. The integration of specific physical, chemical and biological pretreatments with fermentation strategies applied to previously-pretreated cereal bran substrate provides a theoretical foundation for the high-value utilisation of cereal bran and the development of related products.

Keywords: Pretreatment • Cytological • Preservation • Cancer

Introduction

Simultaneously, cereal by-products such as cereal bran are frequently devalued and used in animal feed, where they are perceived as waste. However, the chemical composition of cereal brans is complex and incorporating them into the human daily diet could result in a variety of health benefits. Cereal bran contains a variety of bioactive compounds, including dietary fibre, phytosterols, biopeptides, novel carbohydrates and polyphenols such as phenolic acids and flavonoids, in addition to the usual nutrients such as proteins, vitamins, minerals and fats. Bioactive compounds have been shown to have a wide range of biological functions, including anti-inflammatory, anticancer, antibacterial and cardiometabolic protective effects. Furthermore, they have been linked to a lower risk of chronic diseases such as chronic gut inflammation, obesity, cardiovascular disease and cancer.

Cereal bran pentosans, also known as arabinoxylans, are the most abundant hemicellulose in the bran cell wall and have an impact on the water distribution, starch retrogradation and rheological properties of fermented grain-based foods. Arabinoxylans are made up of a linear chain of (1-4)-linked D-xylopyranosyl with -L-arabinofuranosyl substituents. The variety of these molecules is determined by the fraction of un-, mono- and di-substituted xylose and arabinose residues attached to the chain. The complexity of the arabinoxylan molecule influences its ability to interact with other cell wall chemicals, influencing the physicochemical and functional properties of the macromolecules. Arabinose residues, which replace the arabinoxylan molecule, are frequently made up of phenolic acids like ferulic, caffeic and p-coumaric acid. Arabinoxylan is a biomolecule with high antioxidant activity and free radical scavenging properties [1].

Description

Biodrying is a technique used to reduce the moisture content of various types of waste in order to produce refuse-derived fuel. Municipal solid waste, food waste, agricultural and industrial waste, among others, have all been tested. The successful development of the thermophilic phase during biodrying is critical to achieving a more efficient process that removes the greatest amount of water in the shortest amount of time. According to Xin et al., there is a significant relationship between water removal and bioheat generation, a high matrix temperature and air flow. The different heat transfer mechanisms that occur in this bioprocess, namely the heat received from solar radiation and the exothermic heat generated, must be studied in detail in order to model the thermal behaviour of a biodrying pile [2].

Orozco et al. worked on biodrying modelling. Although this work focused only on the centre of the pile, they reported several interesting conclusions, including their determination that some of the metabolic heat is used to raise the temperature of the pile and that almost all of the energy for the pile's biodrying is provided by ambient convection and solar radiation, but that the drying rate is accelerated by high values of the wet bulb temperature caused by microbial heat. As a result, it became necessary to create a mathematical model capable of predicting the temperature profile at any point in a waste pile, with biodrying performed under natural convection and solar radiation conditions [3,4].

Higher extraction yields in AEP and EAEP have frequently been achieved by using single-stage extractions, which require more water. To maximise the process extractability of many food matrices, a low solids-to-liquid ratio (SLR) has been used in general. Low SLR (i.e., more water) has been shown to promote protein solubilization and, to a lesser extent, lipid washing or extractability. For example, increasing the amount of water used in the single-stage EAEP of soybeans from 1:10 to 1:5 resulted in lower extractability of lipids and proteins from soybean flakes, as evidenced by an increase in the lipid (from 5 to 10%) and protein (from 12 to 20%) contents of the insoluble fraction. While previous research has revealed the impact of AEP and EAEP on the overall extractability of lipids and proteins from chickpea full-fat flour for many other legumes and oilseeds, there is little information on the effects of key extraction parameters such as SLR, the amount and type of enzyme and the extraction pH on the overall extractability of lipids and proteins from chickpea full-fat flour. As a result, there is a lack of economic analysis to compare the processing feasibility of current processing practises (upstream lipid removal by solvent extraction followed by aqueous extraction of chickpea proteins) with the use of AEP and EAEP, which extract chickpea lipids, proteins and carbohydrates simultaneously without the use of flammable solvents [5].

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Conclusion

The moisture content from day 30 to 35 (which decreased from 40 to 30%) further limited the microbial activity (which was already ending, according to the biomass modelling), causing the rate of heat generation to be the slowest of the entire process and, as a result, the temperature decrease in the pile's centre and midpoints to be more pronounced than in the previous two stages, now from 40 to 30%.

Due to the turning performed on day 30, the modelling of the temperature profile in the centre and midpoints did not represent these experimental results; as a result, the modelled results were 35-38% lower than the experimental ones and the experimental cooling slope was three times higher than the modelled slope; however, the model served as a support to explain all of this behavior.

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Conflict of Interest

There are no conflicts of interest by author.

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