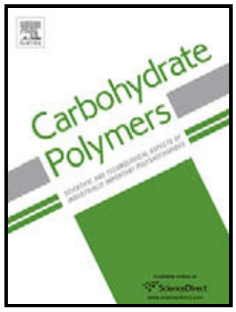

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Influence of hydrothermal treatment on the structural modification of spent grain specific carbohydrates and the formation of degradation products using model compounds

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Highlights

- Hydrothermal treatment was used to break and solubilize arabinoxylan and β-glucan
- Increasing treatment temperatures induced a reduction in weight-average molar mass
- Suitable process conditions were found to obtain high-molecular-weight dietary fiber
- Temperatures > 180 °C caused an advanced formation of thermal degradation products

Abstract

Brewer's spent grain (BSG) constitutes various valuable carbohydrates that may contribute to a healthy diet. These components may be obtained from BSG via hydrothermal treatment (HT), a procedure for dissolving water-inextricable carbohydrates. The objective of this study was to investigate HT as an environmentally friendly technology for extracting high-molecular-weight fiber with proven beneficial effects on human health. Cellulose, β-glucan, and arabinoxylan (AX) served as model substances and were subjected to auto-hydrolysis at different temperatures and reaction times. The results were evaluated in terms of structural and chemical characteristics. When the treatment temperature was increased, the original weight-average molar mass of AX (370 kDa) and β-glucan (248 kDa) decreased gradually (<10 kDa), and the molar mass distribution narrowed. Further investigations focused on the heat-induced formation and elimination of monosaccharides and undesirable by-products. The concentrations of by-products were successfully described by kinetic models that can be used to optimize the hydrolysis process.