

Bioproducts and Biopolymers from Barley Straw via Pressurized Fluid

Treatment

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Barley straw is one of the most abundant lignocellulosic biomasses in Canada, which can be used as a renewable source of bioproducts and biopolymers. In this study, barley straw was treated by subcritical water (sCW) and pressurized aqueous ethanol (PAE) at 180-220°C, 50-200 bar and 20-100% (v/v) ethanol concentrations to obtain hydrolysates (phenolics, glucose, xylose, and arabinose) and residues rich in biopolymers (cellulose and lignin). Hemicellulose (xylose and arabinose) and cellulose (glucose) were evaluated by HPLC, and total phenolics were quantified by UV-spectrophotometer. Temperature and ethanol concentrations were the most important parameters, which can affect the hydrolysis of bioproducts from barley straw. The optimum conditions to hydrolyze sugars in this study by PAE (20%) treatment were 200°C, 50 bar and 5mL/min for 40 min. The highest yield of glucose, xylose, and arabinose hydrolyzed from barley straw were 0.35 ± 0.01 mg/mL, 0.59 ± 0.03 mg/mL, and 0.45 ± 0.02 mg/mL, respectively. Compared with raw material, the recovery rate of glucose, xylose, and arabinose were 16.5%, 60.55% and 46.4%, respectively. The highest yield of total phenolic removal in this study was 75.38 ± 1.43 mg GAE/g straw, which achieved by PAE (60%) treatment at 220°C, 50 bar and 5mL/min for 40 min. Furthermore, the solid residue was analyzed by FT-IR, TG, XRD and SEM to confirm the removal of non-cellulosic materials. The bioproducts and biopolymers obtained can be used in a number of applications.