

Subcritical water hydrolysis of rice husk for obtaining fermentable sugars

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Abstract: Agricultural and agroindustrial waste biomasses are suitable raw materials for obtaining fermentable sugars and fuel alcohol by fermentation. In the case of rice husks, more than 50% of its dry mass is composed of cellulose and hemicellulose. Therefore, this study presents subcritical water extraction of rice husks under semi-continuous mode in a 50 mL reactor. Reaction temperatures ranging from 180°C to 260°C and water to husks (W/H) ratio of 7.5 g water/g husks and 15 g water/g husks were studied under 25 MPa for 15 min. A total of 12 assays were performed in duplicate. For each assay, 13 samples were collected. The results taken into account were the yield of reducing sugars in the hydrolyzed medium and the mass of solid residue after the hydrolysis. At 180°C and W/H of 15 g water/g husks, only 0.85 ± 0.03 wt.% reducing sugars was obtained. Otherwise, at 220°C and W/H of 7.5 g water/g husks, 16.6 ± 1.9 wt.% reducing sugars was obtained. The yields of sugar increased when the temperature increased from 180°C to 220°C, but they decreased when the temperature further increased to 260°C as a consequence of degradation of monosaccharides. Additionally, in the best condition of reducing sugars (220°C and W/H of 7.5 g water/g husks), the solid residue remaining inside the reactor after subcritical water hydrolysis of rice husks was 63% (dry mass basis). Fourier transform infrared spectroscopy was also used to characterize the solid residue.