Waste and Biomass Valorization
https://doi.org/10.1007/s12649-022-01920-9

ORIGINAL PAPER

Kinetics of the Release of Sugars from the Enzymatic and Physico-Chemical Pre-treated Sugarcane Bagasse and Residual Forest Biomass

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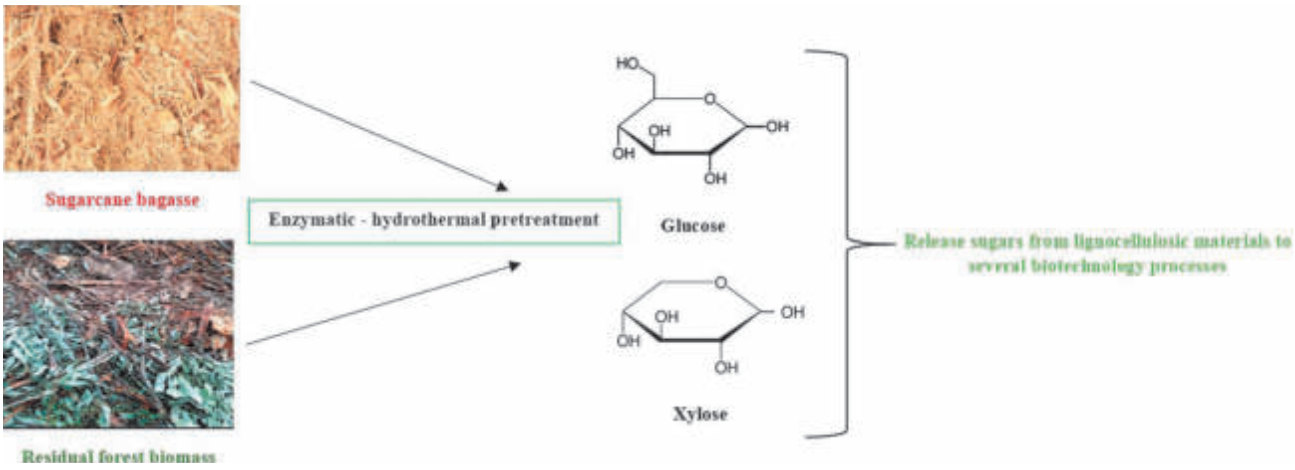
Received: 28 February 2022 / Accepted: 29 August 2022

Abstract

Several pre-treatments are used to release sugars from lignocellulosic materials that are used to produce second-generation ethanol (2G). This study aimed to evaluate the kinetic release of glucose and xylose through the enzymatic and physical treatments of sugarcane bagasse and residual forest biomass, focusing on the ratio between hexose and pentose. Enzymatic hydrolysis after hydrothermal pre-treatment under different conditions, at 170, 170 and 190 °C, 170 and 190 °C with sulfuric acid, and 170 and 190 °C with the Organosolv solvent, all of them for 10 min, were performed with sugarcane bagasse and residual forest biomass, and the kinetic parameters of sugar release were evaluated. The results indicated that compared to hydrothermal and combined hydrothermal and dilute acid hydrolysis, organosolvation process led to higher release of glucose in hydrolysates from both biomasses, with a maximum yield of 14.12 and 33.33 g L^{-1}, respectively. On the other hand, the highest glucose/xylose ratio (about 19), which will facilitate its subsequent use for fermentation, was obtained from sugarcane bagasse after hydrothermal treatment at 170 and 190 °C. This ratio was higher for all treatments when compared to untreated biomass, which indicated that temperature and acid affected xylose instead of glucose.

Graphical Abstract



Keywords Sugarcane bagasse · Residual forest biomass · organosolvation process · Enzymatic pretreatment · Glucose and xylose released and hydrothermal process

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Published online: 12 September 2022