

Clean Fractionation Techniques for a Forest Residue: Hemicellulose and Lignin as Liquor Phase and Cellulase Digestible Microfibrils at Low Enzyme Loading

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The main objective of this study was to fractionate a forest residue (tulip sawdust) obtaining the highest cellulose digestibility. Following the clean fractionation (CF) techniques, the forest residue was fractionated into three main building blocks: cellulose, hemicellulose and lignin. The CF techniques involved three main steps: selectively hemicellulose solubilization by autohydrolysis, lignin removal from the resulted solids by formosolv process and bleached the cellulose pulp with alkaline H₂O₂ solution. The chemical composition and structural features of the raw and fractionated solids were characterized using HPLC, XRD, DSC, TGA, FTIR-ATR and FESEM. In order to evaluate the degree of CF techniques, enzymatic saccharification was subjected to the cellulose fraction obtained from the CF techniques and raw forest residue as a control at minimum cellulase loading (5 FPU/g of dry substrate). The CF techniques rendered nearly 98% of white cellulose microfibrils with 52 times higher conversion to glucose as compared to the raw substrate.