

Pretreatment of tulip tree using enzymatically-generated peracetic acid to enhance accessibility of cellulases

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Tulip tree biomass is receiving increased attention for its excellent growth, higher absorbance of carbon dioxide and especially higher content of sugar components than other species. Peracetic acid is a lignin-selective reagent that fragments the aromatic polymer. The enzyme *Pseudomonas fluorescens* esterase F162L variant generated 140 mM peracetic acid from hydrogen peroxide and ethyl acetate in 10 min. Optimization of the time and temperature for pretreatment of tulip tree biomass with this enzymatically generated peracetic acid increased the amount of lignin removed and increased the amount of cellulose converted to sugars in subsequent cellulase-catalyzed hydrolysis. This pretreatment of tulip tree biomass with peracetic acid altered the lignin structure, swelled the cellulose surface and increased the porosity. The removal of structural barrier, lignin; by using enzymatically-generated peracetic acid significantly improves the accessibility of enzymes to cellulose. Further investigation is required to reduce the cellulases loadings by hydrolysis of hemicellulose.