Fermentation of pentoses and hexoses by ethanologenic *Escherichia coli* from detoxified lignocellulosic teak wood hydrolysates with a high concentration of phenolic compounds

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Tectona grandis L. (Teak wood) residues were pretreated thermochemically at 140°C and using sulfur dioxide as catalyst. The slurry was sequentially saccharified using cellulases to obtain a high concentration of sugars: containing pentoses and hexoses, 80 g/L total sugars. The deconstruction method generated a high concentration of soluble phenolic compounds (SPC), above 12 g/L, which are very toxic to any ethanologenic microorganism. Hence an efficient methodology to detoxify the syrup was applied. The syrup with high concentration of SPC was processed by overliming with calcium hydroxide, reducing the phenolic compounds by 76%. Centrifugation was applied to separate Ca-lignosulfonates from the syrup, but still contained 3 g/L of SPC and 6 g/L of acetate. The syrups were fermented with a previously metabolically engineered ethanologenic bacteria: *Escherichia coli* strain MS04. The obtained bioethanol/sugars yield was above 90%, reaching 35 g/L of ethanol in the fermentation broth with a volumetric productivity of 0.45 g_{ETOH}/Lh. This demonstrates not only the robustness of the pretreatment and saccharification processes for obtaining a syrup with high sugar concentration, but also the efficacy of ethanologenic *E. coli* to ferment a partially detoxified medium containing high amounts of phenolic compounds. Furthermore, the SPC were recovered as insoluble Ca-lignosulfonates, a valuable co-product used in the cement industry or in the synthesis of fine aromatic-chemicals. To the best of our knowledge, this is the first relevant approach for bioethanol production from residual teak wood biomass.

Keywords: teak wood, *Escherichia coli*, ethanol, detoxification, saccharification, soluble phenolic compounds, Ca-lignosulfonate.
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