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Synchronous lignin degradation and enhanced reducing sugar production along with fermentation to bioethanol: A single step bioprocessing of mixed lignocellulosic feedstocks

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An avenue for integration of lignin degradation and enhanced reducing sugar production along with fermentation to ethanol in single step was investigated to reduce the total process time and increase biomass to ethanol conversion % (g/g). This venture was driven primarily by the synergistic action between lignocellulolytic enzymes viz. laccase for lignin degradation and cellulase and xylanase for saccharification, along with the synchrony action of fermenting yeast that resulted in 7.5 % (v/v) ethanol concentration in 20 h from a mixture of second generation feedstocks such as *Ricinus communis*, *Lantana camara*, *Saccharum officinarum* tops, *Saccharum spontaneum*, *Ananas comosus* leaf wastes and *Bambusa bamboos*. This single step, green biotechnological approach led to improved biomass to ethanol conversion of 26% (g/g) such that 1 dry tone of pretreated biomass can produce 88 gallons of ethanol. The natural redox mediators of laccase present in the liquid obtained after biomass delignification showed inducing effect upon addition in minimal amounts to integrated system. It was observed that these compounds could accelerate laccase action in synergy with holocellulase without the need for any external mediators. The amount of water required to process 1 tonne of biomass through current technology under study is low in comparison to chemical/physico-chemical processing techniques since, steps such as neutralization and conditioning of hydrolyzate prior to enzymatic saccharification are not required. The efficacy of bioprocess on the biomass was evaluated through FTIR, XRD, SEM, CHNS analyzer, bomb calorimeter to probe the structural, crystallinity, morphological, elemental and energy density variations respectively.

Biography

Avanthi Althuri has completed her MTech from Indian Institute of Technology - Kharagpur and is pursuing her PhD from the same institute under the guidance of Prof. Rintu Banerjee, who also supervised her for MTech dissertation. She completed her MSc dissertation from Osmania University. The manuscripts related to her Master's work have been published in reputed journal. Her current area of research is biomass and biofuels with special emphasis on bioethanol production from holocellulosic stream of lignocellulosic biomass. She is availing DBT scholarship since 2012 and has received GATE fellowship during 2010-12.

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