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Second Generation Biofuels: A Futuristic Green Deal for Lignocellulosic Waste

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Abstract : The global demand for fossil fuels is very high, but their use is not sustainable since its reserves are declining. Additionally, fossil fuels are responsible for the accumulation of greenhouse gases. The emission of greenhouse gases from the transport sector can be reduced by substituting fossil fuels by biofuels. Thus, renewable fuels capable of sequestering carbon dioxide are in high demand. Second-generation biofuels, which require lignocellulosic biomass as a substrate and ultimately producing ethanol, fall largely in this category. Bioethanol is a favorable and near carbon-neutral renewable biofuel leading to reduction in tailpipe pollutant emission and improving the ambient air quality. Lignocellulose consists of three main components: cellulose, hemicellulose and lignin which can be converted to ethanol with the help of microbial enzymes. Enzymatic hydrolysis of lignocellulosic biomass in 1st step is considered as the most efficient and least polluting methods for generating fermentable hexose and pentose sugars which subsequently are fermented to power alcohol by yeasts in 2nd step of the process. In the present technology, a complete bioconversion process i.e. potential hydrolytic enzymes i.e. cellulase and xylanase producing microorganisms have been isolated from different niches, screened for enzyme production, identified using phenotyping and genotyping, enzyme production, purification and application of enzymes for saccharification of different lignocellulosic biomass followed by fermentation of hydrolysate to ethanol with high yield is to be presented in detail.

Keywords : cellulase, xylanase, lignocellulose, bioethanol, microbial enzymes
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