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Enhanced ethanol production from sugarcane tops via co-fermentation of pentoses and hexoses

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Utilization of renewable energy as a sustainable alternative to rapidly decreasing crude reserves has enhanced biofuel production globally. Various progresses have occurred in the field of bioethanol fermentation technology since it can be used as a direct substitute for fossil fuel in transportation. Research efforts nowadays are directed towards cheap sources of ethanol such as lignocellulosic substrates that are cost competitive and sustainable. Sugarcane which is abundantly available in India produces 0.25-0.3 MT of sugarcane tops (an agricultural waste left after harvest) for every 1 MT of sugarcane and has been used as the substrate of interest. Some of the major challenges in bioethanol production are the recalcitrant lignin, high cost of holocellulase and inadequate or non-utilization of pentose fraction during fermentation that has grave impediment in attaining a cost effective and viable process. Efforts were made to overcome the mentioned obstacles by adapting an eco-friendly biotechnological process. Pretreatment and saccharification were conducted using in-house produced laccase and holocellulase respectively. In the present study, the potential of ethanol production from sugarcane tops was assessed by subjecting the enzymatically pretreated substrate to co-fermentation. C6 and C5 utilizing strains were used for simultaneous fermentation of hexose and pentose sugars of the pretreated sugarcane tops. Co-fermentation was able to increase the ethanol yield and reduce the fermentation time. The effect of several key factors was investigated besides fermentation time, including hexose: pentose strain ratio, substrate loading, temperature and inoculation size since these process parameters play a major role in making the process economical. Thus, sugarcane tops subjected to co-fermentation was able to increase the substrate loading to 25% (w/v) giving maximum ethanol titre of 7.56 % (v/v) in 22-24 h.

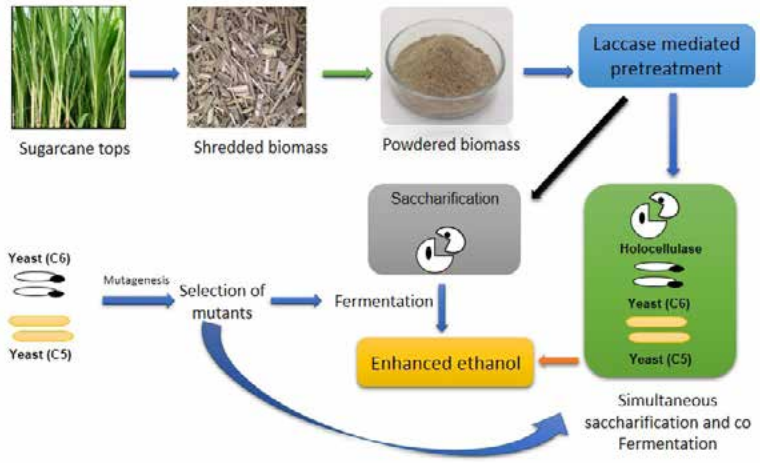

Fig 1: Schematic representation of ethanol production from sugarcane tops

Biography

Knawang Chhunji Sherpa is currently pursuing her PhD at PK Sinha Centre for Bioenergy, Indian Institute of Technology, Kharagpur, India. Her research work is focused on second generation bioethanol using sugarcane tops as lignocellulosic biomass.

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