INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	**Ph.D.**

Thesis Title: **Lignocellulosic bioethanol production from delignified rice straw using tailor-made crude recombinant hydrolytic enzyme cocktail and *Saccharomyces cerevisiae* MTCC170**

Name of Thesis Supervisor(s)	:	**Prof. Arun Goyal**
Thesis Submitted to the Department/ Center	:	**School of Energy Science and Engineering**
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Key words for description of Thesis Work	:	Rice straw, Deep eutectic solvent, Delignification, crude recombinant enzyme cocktail, D-optimal mixture design, Saccharification efficiency, Pre-saccharification simultaneous saccharification and fermentation, Ethanol yield, Ethanol productivity.

SHORT ABSTRACT

The thesis work includes a review of the literature on lignocellulosic bioethanol production from rice straw. Screening of suitable pretreatment methods for rice straw biomass from various chemical and physico-chemical pretreatment methods for maximum lignin removal in the pretreated rice straw was carried out. Further, the selected pretreatment method i.e. DES solvent system of ChCl and acetic acid (AA) was statistically optimized for maximal delignification and retainment of the total carbohydrate content (TCC) in the pretreated RS considering three significant pretreatment parameters; ChCl: AA molar ratio, time and temperature. For the efficient saccharification of choline chloride: acetic acid-pretreated RS, enzyme cocktail was formulated using crude (unpurified) recombinant bacterial hydrolytic enzyme cocktail consisting of cellulases (cellobiohydrolase, CtCBH5A and cellulolytic chimeric enzyme, CtGH1-L1-CtGH5-F194A with a bi-functional activity of β-1,4-endoglucanase and β-1,4-glucosidase) and xylanases (endo-1,4-β-xylanase, CtXyn11A and exo-1,4-β-xylosidase, BoGH43A) for the optimal proportion of each constituting enzyme for the efficient saccharification of choline chloride: acetic acid pretreated rice straw (CApRS) biomass. Finally, the CApRS biomass was used for bioethanol production using the formulated crude recombinant enzyme cocktail and *Saccharomyces cerevisiae* MTCC170. Pre-saccharification and simultaneous saccharification and fermentation of delignified CApRS biomass for bioethanol production were statistically optimized considering pre-saccharification time, enzyme dosage and fermentation temperature as a significant variable for maximizing ethanol yield and ethanol productivity.