INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Programme of Study	:	Ph.D.
Thesis Title	:	SYNTHESIS OF ALCOHOLIC BIOFUELS FROM MULTIPLE INVASIVE WEEDS: PROCESS DESIGN, OPTIMIZATION AND INTENSIFICATION
Name of Thesis Supervisor(s)	:	Prof. V.S Moholkar and Prof. Arun Goyal
Thesis Submitted to the Department/ Center	:	November 16, 2018
Date of completion of Thesis Viva-Voce Exam	:	April 16, 2019
Key words for description of Thesis Work	:	Biofuels, ethanol, Butanol, Invasive weeds, Ultrasound, Pretreatment, fermentation, Mathematic modelling.

SHORT ABSTRACT

"In spite of the substantial amount of work done and lime light ushered on biofuel research, still its implacability in commercial scale is very critical. There are various constrain towards execution of biofuel to market. Among them approximately 50% of the total production cost of alcoholic biofuels is contributed by cost of feedstock (30–32%) and cost of pretreatment (19–22%) as stated by Qureshi and Blaschek (2000). Due to this dilemma, existing between food versus fuel economy, recent policy on biofuel by Govt. of India has emphasized on using waste lignocellulosic biomass for biofuel. Conversely, the invasive weeds contributing negative impact to the to the current global economy due to their intrusion to various agrarian and wildlife ecosystem and are in the range of 15–20 tons per hectare (Rajkhowa et al., 2005). My dissertation urges to utilized those invasive weeds as a feedstock for biofuel synthesis by a sustainable process design. All weeds have been screened based on their high holocellulose content. We optimized a single pretreatment process for all the biomass. Large-scale production processes of biofuel (ethanol and butanol) need to be based on mixed feedstock, as sufficiently large quantities of single biomass may not be available throughout year. Ultrasound-assisted bioprocess is introduced in the required step for process intensification and their mechanistic insight of the process has investigated through mathematical modeling of all the important steps. Dilute acid and enzymatic hydrolysis of the mixed feedstock yields pentose and hexose-rich hydrolyzates around 50 g/L, which on fermentation yield Net (Acetone butanol ethanol) ABE solvent yield of 288 g per kg of raw biomass and for ethanol fermentation its 220g per kg of raw biomass. Moreover, application 37 kHz sonication at duty cycle of 10% enhanced the kinetics of fermentation 2-4 fold with reduction in fermentation time. Major distinction of this bioprocess is utilization all this highly invasive weeds as a mixed feedstock which will reduce the cost involve in managing such invasion and in addition it exhibits a sufficient yield with reduce time through intensification of the whole process, which makes it highly viable for commercialization. Correlation of genome size, stomata with cellulose content of the plant and native lignin extraction along with sugar content were few of the additional work carried hand in hand with along this thesis work.