BIO-ETHANOL PRODUCTION FROM HUSKS OF DIFFERENT SMALL MILLETS

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Introduction: The burning of fossil fuels at the current rate is likely to create an environmental crisis globally through the generation of carbon (IV) oxide (CO$_2$), methane (CH$_4$), and a significant quantity of nitrous oxides. Most of these harmful gases are formed due to incomplete combustion of fossil fuels. As a result of this, there is a growing international quest for an alternative energy source. Ethanol produced from biomass through fermentation contains 35 per cent O$_2$ that may result in a more complete combustion of fuel and thus reduces tailpipe emissions (Chandel et al., 2007). The world interest has been shifted to utilization of agricultural wastes for bioethanol production. The long-term benefits of using waste residues as lignocellulosic feedstock will be to introduce a sustainable solid waste management strategy for a number of lignocellulosic waste materials. (Mtui, 2009).

Lignocellulosic waste materials obtained from energy crops, wood and agricultural residues represent the most abundant source of renewable biomass. Several agricultural wastes have been tested for their bioethanol-producing potential. With this background the present study is undertaken to utilize certain agricultural residues mainly millet husks for the production of bioethanol. Rabah et.al, 2011 showed the rumen of ruminant animals served as a source for isolation of bacteria used in the hydrolysis of millet husks and guinea corn husks prior to fermentation.

Objectives of the study
1. To isolate and screen the strains for bio-ethanol production from different biomass sources.
2. To determine the physico-chemical properties of feed stocks used in bio-ethanol production.
3. To standardize the pre-treatment methods for feed stocks for bio-ethanol production.
4. To evaluate husks of different small millets for their bio ethanol production potentials.

Methodology of the work

Isolation and screening of microorganisms for bioethanol production: Microorganisms involved in ethanol production will be isolated from different sources viz., rotten fruits, millet husk etc. and will be screened for ethanol production. The most efficient organism will be selected for fermenting the husks of millets.

Feed stock preparation and characterization: Husks from different millets will be collected from the department of post-harvest engineering, UAS, GKVK campus, Bangalore-560065. The physico-chemical properties like particle size, pH EC, Org.-C, N, P, C/N ratio, cellulose, hemicellulose, and lignin will be determined. The amount of reducing sugars will also be determined.

Optimization of pre-treatment conditions for millets husk: The feed stock materials will be subjected to certain pre-treatment protocols and the best pre-treatment will be used for hydrolysis and fermentation. Some of the pre-treatment methods that will be followed are Microwave alkali and acid pretreatment, Steam-explosion, Lime Pretreatment, Acid Hydrolysis, Alkali hydrolysis and Pretreatment controls using water

Enzymatic hydrolysis: Neutral cellulase enzyme used enzymatic hydrolysis of feed stocks

Fermentation and distillation of bioethanol: Production and evaluation of bioethanol by fermentation of millet husks using promising microbial isolates.
Conclusion

The study clearly indicates the husk collected from three different millets (foxtail, little and barn yard) are useful in the production of ethanol by subjecting them to different pre-treatments and fermentation processes. This study also gives information about best pre-treatment among all other pre-treatments useful for increasing the bioethanol yield in the millets biomass.

Future line of work

Production of bioethanol from different substrates (agricultural biomass, vegetable and fruit waste, industries waste) so as to decrease the use of fossil fuels and thus decreasing global warming.