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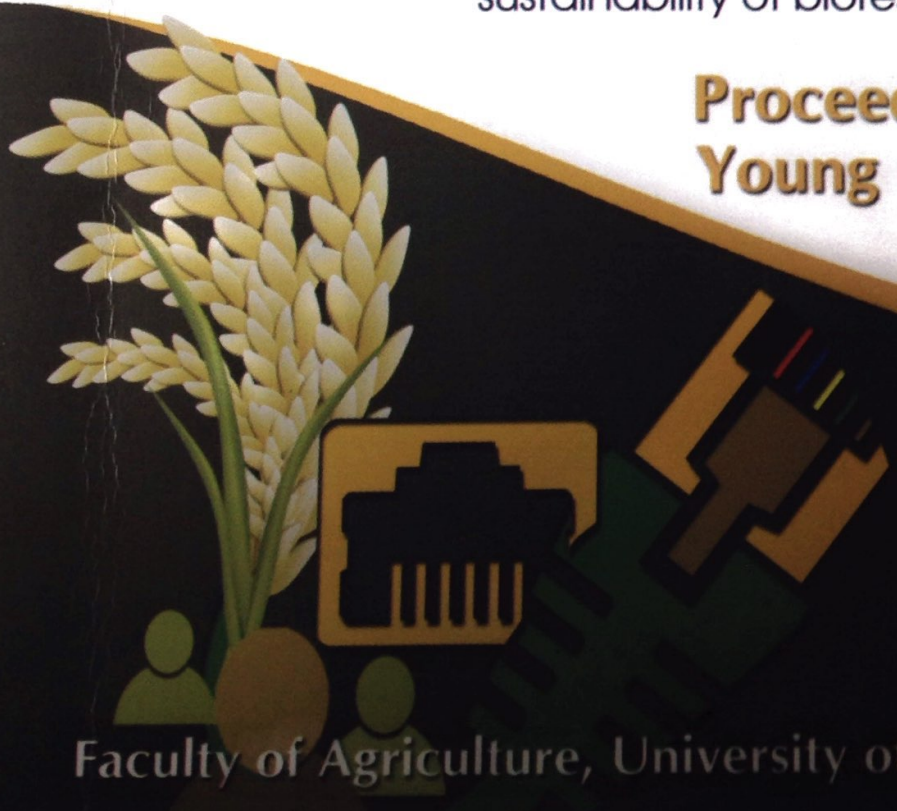

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# Biological Pretreatment of Sugarcane Bagasse for Cellulosic Ethanol Production

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**Abstract**

Usage of fossil fuels results in net increase of carbon dioxide in the atmosphere which is leading to global warming. Second generation biofuel production from lignocellulosic biomass is a promising alternative. Sugarcane bagasse is the most abundant lignocellulosic material. Complex polysaccharide structure of bagasse needs to go through multiple steps to convert to ethanol such as pre-treatment, enzymatic degradation of cellulose to glucose (saccharification), fermentation and distillation. From those, the most important and difficult step is pretreatment. Biological pretreatment exhibits the most feasible method according to cost and energy usage. This study focused on investigating the biological pre-treatment of sugarcane bagasse for bioethanol production using lignocellulolytic microorganisms. The microorganisms were isolated from environment and some microorganisms were obtained from NIFS Bioenergy Laboratory. Isolated fungi and bacteria were screened for their lignocellulolytic enzyme production potential. Total cellulase, laccase, manganese peroxidase and lignin peroxidase assays were conducted to crude enzyme extracts. The most efficient enzyme producer-isolates were used to pre-treat sugarcane bagasse which was prepared in different ways *vis*: sterilized bagasse, washed sterilized bagasse and heated bagasse, (at 100°C for one hour). According to the results, fungi showed the highest potential of pretreatment for sugarcane bagasse. *Earliella scabrosa* which is a basidiomycetes has indicated the highest laccase activity (0.7636 Units/ml) on sugarcane bagasse. This was nine times higher than the laccase activity showed by the same basidiomycete on commercial cellulose. Higher lignin content of sugarcane bagasse should be the reason for this result. *Aspergillus niger* has given the highest total cellulase activity (0.5704 FPU/ml) on sugarcane bagasse which can be used for hydrolyzing bagasse. Moreover, *Aspergillus niger* showed the highest cellulase activity (0.8765 FPU/ml) on heated bagasse. Furthermore, the genetic improvement of microbial isolates could be carried out for selective degradation of lignin and saccharification of cellulose into reducing sugars.

**Keywords:** *Aspergillus*, Biological pre-treatment, Lignocellulolytic enzymes, Sugarcane bagasse

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