Tropentag, September 10-12, 2025, hybrid conference

"Reconcile land system changes
with planetary health"

Evaluating the influence of enzymatic hydrolysis pretreatment on rice straw for enhanced biogas generation

Hidayatul Fitri[1], Kateřina Hájková[2], Tomas Kudera[3], Ladislav Kokoska[4], Viktoriia Chubur[5], Hynek Roubik[6]

[1] *Czech University of Life Sciences Prague, Fac. of Tropical AgriSciences, Dept. of Sustainable Technologies, Czech Republic*

[2] *Czech University of Life Sciences Prague, Department of Wood Processing and Biomaterials ,*

[3] *Czech University of Life Sciences Prague, Faculty of Agrobiology, Food and Natural Resources, Drift-Food Research Centre,*

[4] *Czech University of Life Sciences Prague, Fac. of Tropical Agrisciences, Dept. of Crop Sciences and Agroforestry,*

[5] *Czech University of Life Sciences Prague, Sustainable Technologies, Czech Republic*

[6] *Czech University of Life Sciences Prague, Fac. of Tropical AgriSciences, Dept. of Sustainable Technologies, Czech Republic*

Abstract

Lignocellulosic biomass, especially agricultural waste such as rice straw, is a promising feedstock for biofuel production due to its abundance, low cost and renewable nature. However, the accessibility of cellulose is restricted by its complex structure, particularly the presence of lignin, which forms a protective barrier around cellulose and inhibit enzyme action. Pretreatment techniques are required to disrupt the structural integrity, enhance cellulose degradation and improve biofuel generation. The study focused on analysing the changes of the primary structural component, cellulose hemicellulose and lignin, before and after enzymatic hydrolysis. The samples were characterised for the initial composition before the enzymatic pretreatment. Rice straw was pretreated using crude enzyme obtained from white rot fungi for 24 hours under controlled condition. After the treatment, samples are subjected to compositional analysis to determine the level of cellulose using standard analytical protocol. This study evaluates the efficiency of the enzymatic hydrolysis pretreatment in breaking down rice straw by comparing the composition of untreated and treated straw. The results showed that the cellulose content decreased significantly after pretreatment, indicating the successful conversion to simpler sugar, which are crucial for subsequent biofuel production processes. This indicated that enzymatic hydrolysis was effective in breaking down cellulose, demonstrating its viability as a strategy for biomass conversion technology. This study highlights the importance of compositional analysis in evaluating pretreatment of agriculture residues and improving hydrolysis performance to produce biofuels. Understanding the lignocellulosic component provides valuable insight for developing biomass conversion strategies to contribute in more sustainable and effective biofuel production.

Keywords: Agricultural waste, biomass conversion, cellulose degradation, enzymatic hydrolysis pretreatment, lignocellulosic biomass, straw

Contact Address: Hidayatul Fitri, Czech University of Life Sciences Prague, Fac. of Tropical AgriSciences, Dept. of Sustainable Technologies, Kamycka 129, 16500 Prague, Czech Republic, e-mail: fitri@ftz.czu.cz