Chemical and structural changes of pretreated empty fruit bunch (EFB) in ionic liquid-cellulase compatible system for fermentability to bioethanol

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3 BIOTECH
Volume: 8 **Issue:** 5
Article Number: 236
DOI: 10.1007/s13205-018-1253-8
Published: MAY 2 2018
Document Type: Article
View Journal Impact

Abstract

The pretreatment of empty fruit bunch (EFB) was conducted using an integrated system of IL and cellulases (IL-E), with simultaneous fermentation in one vessel. The cellulase mixture (PKC-Cel) was derived from Trichoderma reesei by solid-state fermentation. Choline acetate [Cho]OAc was utilized for the pretreatment due to its biocompatibility and biodegradability. The treated EFB and its hydrolysate were characterized by the Fourier transform infrared spectroscopy, scanning electron microscopy, and chemical analysis. The results showed that there were significant structural changes in EFB after the treatment in IL-E system. The sugar yield after enzymatic hydrolysis by the PKC-Cel was increased from 0.058 g/g of EFB in the crude sample (untreated) to 0.283 and 0.62 +/- 06 g/g in IL-E system after 24 and 48 h of treatment, respectively. The EFB hydrolysate showed the eligibility for ethanol production without any supplements where ethanol yield was 0.275 g ethanol/g EFB in the presence of the IL, while lower yield obtained without IL-pretreatment. Moreover, it was demonstrated that furfural and phenolic compounds were not at the level of suppressing the fermentation process.

Keywords

Author Keywords: Structure; Pretreatment; Cellulase; Ionic liquid; Hydrolysis; Lignocellulose
KeyWords Plus: ENHANCED ENZYMATIC-HYDROLYSIS; ETHANOL-PRODUCTION; SPECTROPHOTOMETRIC DETERMINATION; ACID PRETREATMENT; ACETIC-ACID; SACCHARIFICATION; BIOMASS; OIL; FERMENTATION; BAGASSE

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Funding

Funding Agency	Grant Number
Ministry of Higher Education (MOHE) in Malaysia	FRGS-13-088-0329

View funding text

Publisher

SPRINGER HEIDELBERG, TIERGARTENSTRASSE 17, D-69121 HEIDELBERG, GERMANY

Journal Information

Impact Factor: Journal Citation Reports

Categories / Classification

Research Areas: Biotechnology & Applied Microbiology

Web of Science Categories: Biotechnology & Applied Microbiology

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