

## Accepted Manuscript

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PII: S0960-8524(17)32230-7

DOI: <https://doi.org/10.1016/j.biortech.2017.12.085>

Reference: BITE 19340

To appear in: *Bioresource Technology*

Received Date: 7 November 2017

Revised Date: 23 December 2017

Accepted Date: 26 December 2017

Please cite this article as: Zhang, Q., Wei, Y., Han, H., Weng, C., Enhancing bioethanol production from *water hyacinth* by new combined pretreatment methods, *Bioresource Technology* (2017), doi: <https://doi.org/10.1016/j.biortech.2017.12.085>

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## Enhancing bioethanol production from *water hyacinth* by new combined pretreatment methods

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**Abstract** This study investigated the possibility of enhancing bioethanol production by combined pretreatment methods for water hyacinth. Three different kinds of pretreatment methods, including microbial pretreatment, microbial combined dilute acid pretreatment, and microbial combined dilute alkaline pretreatment, were investigated for water hyacinth degradation. The results showed that microbial combined dilute acid pretreatment is the most effective method, resulting in the highest cellulose content ( $39.4 \pm 2.8\%$ ) and reducing sugars production ( $430.66 \text{ mg} \cdot \text{g}^{-1}$ ). Scanning Electron Microscopy and Fourier Transform Infrared Spectrometer analysis indicated that the basic tissue of water hyacinth was significantly destroyed. Compared to the other previously reported pretreatment methods for water hyacinth, which did not append additional cellulase and microbes for hydrolysis process, the microbial combined dilute acid pretreatment of our research could achieve the highest reducing sugars. Moreover, the production of bioethanol could achieve  $1.40 \text{ g} \cdot \text{L}^{-1}$  after fermentation, which could provide an extremely promising way for utilization of water hyacinth.

Keywords: fossil fuel; pretreatment; water hyacinth; bioethanol; *Phanerochaete chrysosporium*

### 1. Introduction

Fossil fuels have been excessively exploited and depleted due to accelerating

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