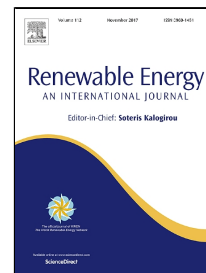


# Accepted Manuscript

Comparison between free cells and immobilized cells of *Candida shehatae* in ethanol production from rice straw hydrolysate using repeated batch cultivation

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1 **Comparison between free cells and immobilized cells of *Candida shehatae***  
2 **in ethanol production from rice straw hydrolysate using repeated batch**  
3 **cultivation**

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12

**Abstract**

13 Ethanol production by xylose-fermenting *Candida shehatae* ATCC 22984 was studied  
14 in repeated batch fermentations of rice straw hydrolysate using both free cells and  
15 immobilized cells. Terracotta beads, coconut bract and corncob were investigated as  
16 supporting materials for cell immobilization. Ethanol production was stable at least 5 cycles  
17 when using cells immobilized on coconut bract. Average ethanol concentrations obtained  
18 from each batch were 16.7 g/L in free-cell system and 17.2 g/L in immobilized-cell system.  
19 Repeated batch using free cell system resulted in a slightly higher volumetric productivity  
20 than the use of immobilized cells. Ethanol that could be produced per ton of dried rice straw  
21 was 120 L using free cell system and 117 L using immobilized cell on coconut bract in glass  
22 column system.

23 **Keywords:** *Candida shehatae*; repeated batch; ethanol; lignocellulose; rice straw;  
24 immobilization

25

26 **1. Introduction**

27 In Thailand, agricultural wastes from agricultures and agro-industries are abundant.  
28 These wastes are mainly lignocellulosic materials. Rice has been an important economic  
29 plant in Thailand. It was estimated that 36.6 million tons of rice grain would be produced in  
30 2016 [1]. Rice straw, which is leftover stem from harvesting, is therefore abundant. In 2013,  
31 Thailand's Department of Alternative Energy Development and Efficiency reported that  
32 15,077,230 ton of rice straw was generated nationwide [2]. Unlike sugarcane bagasse where

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