



Short Communication

One-step fermentation of pretreated rice straw producing microbial oil by a novel strain of *Mortierella elongata* PFY

Ri-sheng Yao*, Peng Zhang, Huai Wang, Sheng-song Deng, Hui-xia Zhu

Department of Pharmaceutical Engineering, School of Medical Engineering, Hefei University of Technology, Hefei 230009, China

HIGHLIGHTS

- ▶ A novel strain of *Mortierella elongata* was screened.
- ▶ This strain can directly utilize pretreated rice straw without adding cellulase.
- ▶ The strain produced microbial oil in fermentation process.
- ▶ Cellulose in pretreated rice straw was utilized efficiently as the principal carbon source.

ARTICLE INFO

Article history:

Received 2 July 2012

Received in revised form 30 August 2012

Accepted 31 August 2012

Available online 7 September 2012

Keywords:

Mortierella elongata PFY

Lipid production

Rice straw

Fermentation

ABSTRACT

A fungus strain producing microbial oils utilizing pretreated rice straw was isolated from soil. This strain was identified as *Mortierella elongata* PFY based on the morphology and internal transcribed spacer sequence. Using pretreated rice straw as substrate, the average yield of total lipids was 7.07% after 7 days fermentation. The GC–MS detection demonstrated that the lipids were composed of saturated fatty acids and polyunsaturated fatty acids. This work presents one new way to make the waste biomass (rice straw) valuable.

© 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Microbial oils, also called single cell oils (SCOs), were produced by some microorganisms such as *Mortierella* sp. (Papanikolaou et al., 2004; Jin et al., 2008) and microalgae (Aggelis and Komaitis, 1999; Mata et al., 2010). Microbial oils might contain some polyunsaturated fatty acids (PUFAs) like arachidonic acid, conjugated linoleic acid and γ -linolenic acid (Higashiyama et al., 2002; Ahmed et al., 2006) and these fatty acids are essential for the human body. In order to produce PUFAs, the common carbon sources such as glucose are required. Thus, the production of microbial oils was limited by the high cost of material in the practice of industrial process. As a result, efforts have been focused on some inexpensive or renewable materials such as straw for microbial oils production (Huang et al., 2009).

Rice straw is a compact complex of microfibrils of polysaccharides covered with lignin and it is difficult to be utilized directly.

Generally, the process for obtaining biogas, ethanol and other products from rice straw is: pretreatment, enzymatic hydrolysis or dilute-acid hydrolysis and fermentation (Abedinifar et al., 2009; Yang et al., 2010). And to utilize rice straw more efficiently, a combination of multi-strain for example *Mucor indicus*, *Rhizopus oryzae*, and *Saccharomyces cerevisiae* has also been studied (Karimi et al., 2006; Rudolf et al., 2008). And, usually adding cellulase or microorganisms that can produce cellulase is needed in the process of fermentation using pretreated straw as a substrate.

In this work, a simple research was designed to determine if the new *Mortierella elongata* isolated from soil can use pretreated rice straw as a substrate for fermentation, since it was cheaper than other available carbon sources. The composition of lipids was assayed and the composition of lignocellulose was also studied.

2. Methods

2.1. Isolation of the organism and maintenance

Samples were collected from soil at suburbs of Hefei, Anhui Province, China. 10^6 times of soil dilution was plated on cellu-

* Corresponding author. Address: Department of Pharmaceutical Engineering, School of Medical Engineering, Hefei University of Technology, Tunxi Road No.193, Hefei 230009, China. Tel.: +86 0551 2901771; fax: +86 2904675.

E-mail address: yaors@163.com (R.-s. Yao).