Short Communication

Sm-like protein enhanced tolerance of recombinant Saccharomyces cerevisiae to inhibitors in hemicellulosic hydrolysate

Lan Gao, Liming Xia

Key Laboratory of Biomass Chemical Engineering of Ministry of Education, Department of Chemical and Biological Engineering, Zhejiang University, Hangzhou 310027, China

ABSTRACT

A current challenge of the cellulosic ethanol industry is to improve the resistance of inhibitors present in biomass hydrolysates. RNA-binding protein gene lsm6 was cloned from industrial Saccharomyces cerevisiae ZU-E8, which is able to conferment glucose and xylose, and transformed into ZU-E8 via expression vector pRS426. The positive transformant ZU-910 with over-expressing lsm6 was identified on the culture plates using high concentration of acetate and re-screened by fermentation test. Fermentation by the recombinants was performed in a medium containing 80 g/L xylose and 2 g/L acetic acid or 20 g/L NH4Ac/NaAc. After 96 h shaking-flask fermentation, ZU-910 utilized 90.2% xylose with an ethanol yield of 26.9 g/L, which was 8.5- and 10-fold higher than ZU-E8. Further, in the corn stover hemicellulosic hydrolysate fermentation, both the xylose conversion and ethanol production by ZU-910 was larger by 50% and 40% than ZU-E8. ZU-910 has also enhanced tolerance against furfural and SO4^2-. © 2012 Elsevier Ltd. All rights reserved.

1. Introduction

Saccharomyces cerevisiae is a promising candidate for industrial bioethanol production due to its robustness and high ethanol productivity (Karhumaa et al., 2007). Genetic engineering has enabled S. cerevisiae to utilize xylose through heterologous expression of genes for xylose reductase (XR) and xylitol dehydrogenase (XDH) from Pichia stipitis, and over-expression of the endogenous gene for xylulokinase (XK) (Chu and Lee, 2007; Eliasson et al., 2000; Jeffries, 2006). However, efficient fermentation of hemicellulosic sugars is critical for ethanol bioconversion (Van Vleet and Jeffries, 2009).

Corn stover is regarded as the best lignocellulosic resource for large-scale ethanol production in China because (Zhao and Xia, 2010) it is a cheap, renewable feedstock, which is drought resistant. In the bioconversion of lignocellulose to ethanol, pretreatment is an essential procedure, but produces toxic compounds including...