RESEARCH PAPER

Asian Journal of Bio Science (April, 2010) Vol. 5 Issue 1 : 73-76

Ethanol production by *Saccharomyces cerevisiae* from wheat and rice bran hydrolysates of *Aspergillus flavus, A. niger* and *Trichoderma viride*

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(Accepted : February, 2010)

The objective of this work was to study the potential effect of three fungal xylanase enzymes for ethanol production. The selection of *Saccharomyces cerevisiae* strains to ferment sugars obtained from the wheat bran and rice bran at temperatures above 35^0C with high ethanol yield has become a necessity. In this work *S.cerevisiae* strains were screened for their ability to grow and ferment xylose in the culture filterate produced by *Aspergillus flavus,A.niger* and *Trichoderma viride*.The results obtained from this study showed that the wheat/rice bran possessed an excellent potential for agro-residue based ethanol production.

Key words : Wheat bran, Rice bran, Ethanol, Yeast, Fermentation

INTRODUCTION

Lignocellulosic biomass can be used to produce ethanol, a liquid biofuel that can replace fossil transportation fuels (such as gasoline). Bioethanol is already used in several countries for e.g. Brazil, USA and Sweden either pure or as a blend with gasoline. The bioethanol used today is mainly produced from lignocellulosic biomass. The process for ethanol production from biomass is more complicated than producing it from sugar or starch. Processes to obtain ethanol from lignocellulose based on enzymatic hydrolysis are promising methods to produce bio-fuel with low cost (Gonsalves, 2006).

Wheat bran and rice bran are major raw material used in many industries. The substrates left over from the production processes are abundant and still contain a high amount of carbon content. Mostly these two brans can be used as animal feed due to its high content of protein and other nutrients which are necessary for animal growth. Use of wheat and rice bran as raw material in ethanol production not only reduces waste material but also lowers the cost of ethanol production.

Several studies were made by researchers and shown that higher ethanol yields could be obtained in simultaneous saccharification and fermentation (SSF) processes compared with separate hydrolysis and fermentation (SHF). *Saccharomyces cerevisiae* is used widely and traditionally for industrial ethanol production because of its ability to produce high concentrations of ethanol from sugars and because of its high tolerance to ethanol and other inhibitory compounds.

Two technologies used to convert cellulose and hemicellulose to fuel ethanol are acid and enzymatic hydrolysis. The most common is acid hydrolysis.

Acidic hydrolysis is an effective method used for raw material pretreatment in ethanol production. Although acids are powerful agents used for biomass hydrolysis, concentrated acids are toxic, erosive and hazardous. Handling high concentrations of acid requires reactors that are resistant to erosion in raw material pretreatment. Diluted acid hydrolysis has been successfully developed for pretreatment of cellulose materials. Diluted sulphuric acid (H_2SO_4) can achieve significant results.

Another method of hydrolysis is enzymatic hydrolysis. Enzymes are naturally occurring plant proteins that cause certain chemical reaction to occur. However, for enzyme to work, they must obtain access to the molecules to be hydrolyzed (Gray *et al.,* 2006).

In this present paper, utilization of xylanase containing xylose produced from *Aspergillus flavus, A.niger and Trichoderma viride* was used as the substrate for the growth of *Saccharomyces cerevisiae* and production of bioethanol.

MATERIALS AND METHODS

Yeast strain and media :

The yeast used in these studies was *Saccharomyces cerevisiae* known as bakers yeast was purchased from Sakthi Sugars, Coimbatore (T.N.). The yeast culture was maintained in medium contained 20g of glucose, 20g of agar, 5g of peptone, and 5g of $MgSO_4.7H_2O$ per liter. The growth medium utilized in the liquid inoculation contained 50g glucose, 5g of yeast extract, 1g of KH_2PO_4, 0.3 g of NH_4Cl and 2g of $MgSO_4.7H_2O$ per liter.