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Amylatic Activity of Agaricus and Moulds for the Production of Bioethanol

M. Rakib Uddin[1,*], Kaniz Ferdous[1], Md. Arifur Rahman[1], Anup K. Roy[1], Maksudur R. Khan[1,2]

[1]Department of Chemical Engineering and Polymer Science, Shah Jalal University of Science and Technology, Sylhet, Bangladesh
[2]Faculty of Chemical and Natural Resources Engineering, University Malaysia Pahang, Kuantan, Malaysia
*Corresponding author: mruddincep@gmail.com

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Abstract Fermentation of potato and carambola juice was investigated using Molds and Agaricus as a potential source of amylase. The amylatic activity of Moulds and Agaricus were studied and the effects of different parameters, such as starch concentrations, pH, incubation time, temperature were investigated. The maximum enzyme activity obtained for Moulds were 173 to 178U/g under the optimum conditions of an incubation period of 30min, 1.5 % starch solution, an incubation temperature of 60°C and a pH of 5.0. For Agaricus, the highest amylase production was 14 to 16U/g using 1.5 % starch solution, pH of 6.0 incubated at 75°C for 30 minutes. Reducing sugar was produced by fermentation of potato and carambola juice using mold and saccarification was conducted for production of bioethanol using yeasts. The ethanol produced from potato and carambola was approximately 11% (v/w) and 5% (v/v) respectively.

Keywords: *amylatic activity, mould, agaricus, bioethanol, fermentation*

1. Introduction

In the context of present energy crisis and environmental concerns, ethanol has constantly been an object of interest because of its potential as fuel. The largest single use of ethanol is as a motor fuel and fuel additive. Some Nations already required that gasoline be diluted with ethanol to help conserve fossil fuels [1]. When added with gasoline, ethanol reduces the volatile organic compound and hydrocarbon emissions, carcinogenic benzene and butadiene emissions, and particulate matter emissions from gasoline combustion. It is also used as beverage and starting material for a large number of chemicals. For this reason use of ethanol as fuel is increasing day by day.

Ethanol is produced from a wide range of feedstock at relatively low-cost. It can be synthesized from the petrochemicals, as well as by fermentation process. Due to the fast depletion of fossil fuel, the fermentation process is gaining more attention for the production of ethanol.

Ethanol fermented from renewable sources for fuel or fuel additives are known as bioethanol. Additionally, the ethanol from biomass-based waste materials is also considered as bioethanol. In conventional fermentation processes bioethanol is produced by fermenting grapes, sugar molasses and saccharifying rice, maize, sorghum, malts, potato etc. using the commercial standard amylases [2].

Amylases are the most important enzymes in present-day biotechnology. Although amylases can be derived from several sources, including plants, animals and microorganisms, microbial enzymes generally meet industrial demands. Currently, a large number of amylases are available commercially and they have almost completely replaced the chemical hydrolysis of starch in the starch processing industry [3]. The natural sources, such as, moulds and agaricus possess amylatic activity to certain extent. Their amylase activity should be evaluated to use them as a source of enzyme in fermentation process because they are easily available and they are inexpensive enzyme source.

Amylases can be produced either by submerged fermentation (SmF) [4,5,6] or solid-state fermentation (SSF) [7]. SSF holds tremendous potential for the production of enzymes [8]. It can be of particular relevance in those processes where a crude fermented product may be used as an enzyme source [9]. The selection of a particular strain, however, remains a tedious task, particularly when commercially significant enzyme yields are required. The use of SSF for the production of enzymes and other products has many advantages over SmF [10] and these have been widely discussed in the literature [8,10].

The applicability of the enzymes and their sources depend on some incubation conditions. The amount of amylase production by microorganism is dependent on the factors, such as incubation period, temperature, pH and also the medium substrate concentration.

Potato, a tuber, is a good source of carbohydrates, containing starch, cellulose, hemicellulose and pectic substances which are the main substrates for fermentation [2]. As a result waste potato is used worldwide for the production of ethanol. On the other hand Carambola (*Averhoa Carambola)*, a sour fruit, is a great source of vitamin C with a high amount of moisture content. The starch and sugar content of carambola were 1.41±0.34%