Bioethanol production from tofu waste by simultaneous saccharification and fermentation (ssf) using microbial consortium

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Abstrak

Tofu waste can be used as a raw material for bioethanol production due to its high carbohydrate content in the form of starch. A microbial consortium, consisting of Aspergillus niger and Saccharomyces cerevisiae. The study’s first objective wasto capture the amount of sugar produced from starch hydrolysis using single cultures of Aspergillus niger.The study’s second objective wasto determine the amount of ethanol produced by the SSF technique. Aspergillus niger was used to produce an amylase enzyme that hydrolyzes starch into simple sugar.Then, Saccharomyces cerevisiae was used to produce bioethanol from the sugar produced earlier.The synthesis of bioethanol consists of two main stages, hydrolysis and fermentation. In previous studies, the hydrolysis and fermentation processes were performed separatelyusing a separated hydrolysis and fermentation (SHF)technique. This studyprocesses via a simultaneous saccharification and fermentation (SSF) technique which produced higher substrate efficiency, cell yield, and product yield compared to the SHF process.The characterization process showed that tofu waste flour was mainly composed of carbohydrates, which comprised 52.82±0.01% (dw) and had a starch content of 35.1±0.2% (dw). Sugar from the starch of the tofu waste was produced by batch system cultivation for 84 hours using Aspergillus niger. The highest sugar production (14.48 g/L) was achieved during the 48th hour. Then, Saccharomyces cerevisiae was used to convert the produced sugar into bioethanol. The production of bioethanol by SSF using a microbial consortium for 72 hours was 7.69 g/L of bioethanol, with a yield of bioethanol per substrate use (Yp/s) of 0.23 g ethanol/g substrate and a substrate conversion efficiency of 88%.