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Biohydrogen Production from Cane Molasses by Mutatted *Enterobacter aerogenes* ADH43 in Continous Stirred Tank Reactor System with Varying Dillution Rate and its Application into Fuel Cell for Generating Electricity

Yusnita Liasari [1], Mahyudin Abdul Rachman [2], Harijono [3], Agustin Krisna Wardana [3]
[1] Department of Biotechnology, Surabaya University, Surabaya
[2] Agency for The Assessment and Application of Technology, Puspiptek, Tanggerang
[3] Department of Agricultural Technology, Brawijaya University, Malang
yusnitaliasari@yahoo.com [1]; yudinr@hotmail.com [2]

Abstract

Hydrogen gas (H_2) produced by microorganism (biohydrogen) is acknowledged to be a clean and renewable energy resource for the future because its production does not require a large amount of energy and no COx, NOx, and SOx emission is produced. Besides, the oxidation process of biohydrogen produces water and high energy (122 kJ/g) without waste products, unlike fossil fuel. The aim of this research is to investigate the effect of dilution rate to biohydrogen production in continous stirred tank reactor (CSTR) system . The biohydrogen that was produced was directly inserted into a fuel cell to generate electricity. The substrate used in this research was cane molasses. The mutated bacteria used was Enterobacter aerogenes ADH43 that was a mutant bacteria having a inhibited metabolic pathway for acid production. Facultative anaerobe fermentation was conducted into stirred tank reactor using continuous system at 37 ^{0}C of temperature and 40 rpm of agitation speed, dillution rate of (D) 0.15 ;0.3; 0.45; 0.60 (h^{-1}). Biohydrogen produced was assesed after inserting it into a fuel cell to generate electricity and measuring voltages produced. The result showed that the highest H_2 production was achieved at continuous system resulted in 0.30 h^{-1} of optimum dilution rate. The maximum H_2 volume of 9.76 l H_2/l sugar , the yield of 1.84 mol H_2/mol sugar, and the flow rate of 114.66 ml H_2/minute *were obtained. Furthermore, colony count of 9.81 log cfu/ml, pH of 5.73, maximum electrical current of 0.38 A, electrical power of 2.20 Watt, and electrical voltage of 5.75 volt after given resistance using LED of 25 ohm were also reached.*

Keywords: *H_2 production, Enterobacter aerogenes, molasses, CSTR and Fuel Cell*

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[1] Department of Biotechnology, Surabaya University, Surabaya
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