Fermentative hydrogen production from indigenous mesophilic strain Bacillus anthracis PUNAJAN 1 newly isolated from palm oil mill effluent

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A R T I C L E   I N F O
Article history:
Received 16 January 2017
Received in revised form 12 May 2017
Accepted 16 May 2017
Available online 7 June 2017

Keywords:
Hydrogen production
Bacillus anthracis
Palm oil mill effluent
Fermentation
Sustainable energy

A B S T R A C T
In the present study, a new mesophilic bacterial strain, identified as Bacillus anthracis strain PUNAJAN 1 was isolated from palm oil mill effluent (POME) sludge, and tested for its hydrogen production ability. Effect of physico-chemical factors such as temperature, initial pH, nitrogen source and carbon sources were investigated in order to determine the optimal conditions for hydrogen production. The maximum hydrogen yield of 2.42 mol H2/mol mannose was obtained at 35 °C and initial pH of 6.5. Yeast and mannose were used as the main carbon and nitrogen sources respectively in the course of the hydrogen production. Apart from synthetic substrate, specific hydrogen production potentials of the strain using POME was calculated and found to be 236 ml H2/g chemical oxygen demand (COD). The findings of this study demonstrate that the indigenous strain PUNAJAN 1 could be a potential candidate for hydrogen using POME as substrate.

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Introduction
Excessive consumption of conventional fossil fuel which is associated with CO2 emissions has put an emphasis on the quest for an alternative fuel production which must be renewable, cost-effective and eco-friendly [1]. In this prospect the production of hydrogen using biodegradable wastes is considered as a suitable alternative due to its high energy mass density (112–122 kJ/g) [2,3]. Typically, the hydrogen production from non-fossil fuels source uses three methods viz. thermochemical processes, radiolytic processes, and water electrolysis [4]. However, these processes require electricity and thus are expensive and energy-exhaustive [5]. Because of these limitations the biological hydrogen production is attracting more attention due to its dual-advantage of utilising renewal sources as well as operation under the ambient temperature and atmospheric pressure [6]. The biological conversion is a cost effective and sustainable process, hence it is considered as the promising treatment technology for biowaste. There are two well-known systems for microbial hydrogen production: photochemical and fermentative. The

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http://dx.doi.org/10.1016/j.ijhydene.2017.05.120
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