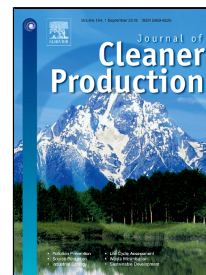


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Photohydrogen production from dark-fermented palm oil mill effluent (DPOME) and statistical optimization: Renewable substrate for hydrogen



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1 **Photohydrogen production from dark-fermented palm oil mill effluent (DPOME) and**
2 **statistical optimization: Renewable substrate for hydrogen**

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16
17 **Abstract**

18 Biological hydrogen production through photo-fermentative process using dark
19 fermented palm oil effluent (DPOME) is a cost effective and environmentally benign process.
20 In this study, effect of various factors like light intensity, agitation rate and dilution of DPOME
21 on the hydrogen productivity of *Rhodospseudomonas palustris* were investigated using batch
22 system. Investigation methods like response surface methodology (RSM) and Box-Behnken
23 design were employed to investigate the optimum conditions for enhanced photo-fermentative
24 hydrogen production. The regression analysis suggested that hydrogen yield was well fitted by
25 a quadratic polynomial equation ($R^2 = 0.92$). The hydrogen production was investigated by
26 varying the intensity levels of these three independent variables, in which all have significant
27 influences on hydrogen yield. The set of 19 experimental runs were conducted to optimize
28 these variables. The highest hydrogen yield of 3.07 ± 0.66 H₂ yield mol-H₂/mol-acetate was
29 obtained under the optimum condition of light intensity 250 W/m², agitation rate 200 rpm, and
30 30% dilution of DPOME. The experimentally obtained hydrogen yield found out to be in a
31 good agreement with predicted yield which was about 2.80 mol-H₂/mol-acetate. In short,
32 results suggest that experimental strategy using RSM approach along with Box-Behnken
33 design can be a promising approach to achieve enhanced biological hydrogen production.

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