

***Optimization of a Continuous Dark Fermentation System for Biohydrogen Production from Raja Banana Peel Waste Using Variations in pH and OLR***

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***ABSTRACT***

*The increasing demand for energy and dependence on fossil fuels have encouraged the development of environmentally friendly renewable energy, one of which is biohydrogen. Raja banana peel waste (*Musa paradisiaca* L.) contains carbohydrates and lignocellulosic compounds that have the potential to be utilized as a substrate for biohydrogen production through the Continue Dark Fermentation process. This study aimed to analyze the effect of pH variation on biohydrogen production and quality and to determine the optimum combination of pH and Organic Loading Rate (OLR). The study was conducted using pH variations of 5, 6, and 7 and OLR variations of 70, 80, and 90 mL/day with a mixed-culture inoculum derived from cow manure and tofu wastewater. The observed parameters included biohydrogen volume and Volatile Solid (VS) content. Data were analyzed using Response Surface Methodology (RSM) with the aid of Minitab 21 software. The results showed that pH and OLR variations affected biohydrogen production and quality. The optimum condition was obtained at pH 7 and OLR 90 mL/day, resulting in the highest biohydrogen volume of 24 mL and the highest VS value of 93.84%. Optimization analysis showed a desirability value of 0.95707 for biohydrogen volume and 1.000 for VS. Therefore, pH 7 and OLR 90 mL/day were identified as the optimum conditions for improving the efficiency and quality of biohydrogen production from raja banana peel waste using a Continue Dark Fermentation system.*

*Keywords: biohydrogen, Continue Dark Fermentation, Organic Loading Rate, pH, raja banana peel waste.*