UNIVERSITI TEKNOLOGI MARA

BIODEGRADATION OF REACTIVE BLACK 5 DYES USING *LACTOBACILLUS DELBRUECKII*

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the results of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulations for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

The application of dyes in industry are highly increased with the increasing of the market demands especially in textile and printing industry. As a result, in textile industry, the large quantity of dyes waste was released during dyeing and finishing steps. The wastewater produced from these processes is not treated properly before being discharged to the environment. Since the dyes that have been used in this process have a recalcitrant structure which is difficult to treat, an effective treatment method needs to be developed in order to reduce the environmental impact of the effluent. Therefore, many researchers are trying to find the most applicable and efficient method in order to treat the dyes waste. Currently, biological method of dyes degradation has been studied extensively and believed to be a potential technology to treat textile wastewater. In this research, the effect of pH, temperature and initial dye concentration on the degradation of Reactive Black 5 dyes using microbial (*Lactobacillus delbrueckii)* was investigated. The bacteria was incubated in the presence of Reactive Black 5 dyes in different temperature (25 – 40) °C, pH (3-9) and initial dye concentration (50 – 250) mg/L for 24 hours. After 24 hours of incubation, the growth of bacteria and degradation of dyes were analysed using UV-Vis Spectrophotometer. From the analysis, the highest percentage for colour degradation was 90.5 %. Temperature and pH had a significant effect on the growth of bacteria and also degradation of the dyes. The optimum pH and temperature for degradation of dyes were 7.0 and 37 °C respectively. Whereas for the effect of initial dye concentration, the bacteria were able to degrade the dyes up to a concentration 200 mg/L with 90.5 % of colour degradation percentage. The degraded metabolites that appeared after the degradation process were detected by UV-Vis spectrophotometer as well as Fourier Transform Infrared spectroscopy. The results suggested that *L. delbrueckii* exhibited degradation activity through biodegradation, rather than inactive surface adsorption. In order to determine the kinetic activity of microbial growth and dyes degradation, Monod and Michaelis-Menten models have been used. For Monod model, the value of μ_{max} and k_s were found to be 0.087 h^{-1} and 22.47 mg/L, respectively. While, for Michaelis-Menten, the value of V_{max} and k_m were 42.55 h^{-1} and 597.87 mg/L, respectively. This result showed great potential of *Lactobacillus delbrueckii* to be applied in degradation of dyes waste from textile industry.

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