Decolorization of palm oil mill effluent by Klebsiella Pneumonia ABZ11: remediation efficacy and statistical optimization of treatment conditions

ABSTRACT

Colorants contained in palm oil mill effluent (POME) are recalcitrant and carcinogenic in nature. The commonly applied ponding treatment methods have been reported inefficient for remediating the concentration of the colorants before discharge. The need for sustainable and efficient treatment technique is crucial in order to preserve the environment. In this view, this study reported the first attempt to decolorize POME using a proliferate Klebsiella Pneumonia ABZ11 at varied inoculum sizes of 5–25% (v/v), initial color concentration (650–2,600 ADMI) and treatment time of 5-40 h. The treatment conditions were optimized using Response Surface Methodology. At optimal conditions of 20% (v/v) inoculum size, initial-color concentration of 2,600 ADMI, initial pH of 7 and 35 h treatment retention time, over 80.40% color removal was achieved with insignificant disparity compared with the model predicted value of 81.538%. Also, the Monod model excellently described the decolorization kinetic process with 0.9214 coefficient of correlation (R^2), and the calculated maximum growth µmax) and half-saturation constant (K_s) were 7.023 d–1 and 340.569 ADMI d–1, respectively. This study revealed that the Klebsiella Pneumonia ABZ11 was highly prolific and such feature may favor a synergistic biodegradation process.

Keyword: POME; Decolorization; Colorants; Klebsiella pneumonia ABZ11; Kinetic-model; Optimization