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PHENOL TOLERANCE AND BIODEGRADATION OPTIMIZATION OF *Serratia marcescens* NSO9-1 USING PLACKETT-BURMAN AND BOX-BEHNKEN DESIGN

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Abstract

The phenol degradation capacity of *Serratia marcescens* NSO9-1 isolated from olive mill wastewater was evaluated and optimized in this study. Plackett-Burman design coupled with Box-Behnken methodology was used to evaluate the effects of medium components and significant parameters on phenol degradation by this relevant strain. According to Plackett-Burman-based statistical screening, seven of the eleven components of the medium had a significant effect on the metabolism of phenol degradation. The most important factors were $MgSO_4$, NaCl, $CaCl_2$, and molybdenum salt, which had an effective contribution of 90.12%. Additionally, Box-Behnken methodology using a quadratic model was adopted to investigate the mutual interactions between process parameters. The analysis results indicated that interactions between pH and temperature, pH and inoculum amount, and incubation time and inoculum amount critically affected the response variable. The experimental results showed that under the determined conditions, 41.66% of the maximum removal efficiency of phenol was achieved. The optimal conditions were 8.94, 30.22°C, 4.19 days, and 4.68% (v/v) for pH, temperature, incubation time, and inoculum amount, respectively. The validity and practicability of this statistical optimization strategy confirmed the relation between predicted and experimental values. Using a selective isolation method, the performance of this indigenous strain isolated from olive oil mill wastewater, which contained polyphenolic compounds, is comparable to the reported literature at higher phenol concentrations.

Keywords: Box-Behnken methodology, phenol, Plackett-Burman design, *Serratia marcescens*

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