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Performance evaluation of Malathion biodegradation in batch and continuous packed bed bioreactor (PBBR)

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Abstract:

The aim of this work was to study the biodegradation of Malathion in batch and continuous packed bed (Polyurethane foam; PUF) bioreactor (PBBR). After 10 days, 89% Malathion removal was observed in batch PBBR. Continuous PBBR was operated at various flow rates (5–30 mL/h) under optimum condition over a period of 75 days. Inlet loading rates and elimination capacities were observed in the range of 36–216 and 7.20–145.4 mg/L/day with an average removal efficiency of more than 90 % under steady state conditions. GC/MS analysis confirms phosphorodithionic acid, O,O,S-trimethylester and diethylmercaptosuccinate as metabolites. Biodegradation of Malathion under inhibitory and non-inhibitory conditions was studied using Monod and Andrew-Haldane models and the kinetic constants were calculated and found to be μ_{max} : 0.271 per day; K_s : 126.3 mg/L using Monod and μ_{max} : 0.315 per day; K_s : 151.32 mg/L; K_i : 594.75 mg/L using Andrew-Haldane models.

Keywords: Continuous packed bed reactor, kinetic parameter, Malathion, removal efficiency, GC-MS

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