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SUBSTRATE INHIBITION KINETICS OF MALATHION BIODEGRADATION AND THE EFFECT OF MOLASSES AS COSUBSTRATE

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Abstract

Malathion is a toxic, wide-spectrum organophosphorus pesticide. The removal of this pesticide from water is one of the major environmental concerns. In this study, the biodegradation of malathion using batch activated sludge was studied. The effect of initial malathion concentration (5 to 140 mg/L) on the degradation process was investigated. The biokinetic parameters ($r_{s\ max}$, K_s and K_i) were estimated. Identification of dominant bacterial flora was also achieved. In addition, two kinds of additional carbon sources, i.e., glucose, and molasses (5000 mg/L) were tested to choose a favourite carbon source for malathion cometabolism of activated sludge. Metabolites resulting from biodegradation were also investigated. Results showed that local activated sludge used in this study could effectively degrade malathion. There was a decrease in specific substrate consumption rate at initial malathion concentration of 120 mg/L due to inhibitory effect of the pesticide on its own degradation with $K_i = 192$ mg/L. In the presence of molasses at 5000 mg/L used as cosubstrate, 92% of the initial dose of insecticide (60 mg/L) was degraded within 75 h. Results from GC-MS analysis revealed that malathion monocarboxylic acid was the major degrading compound.

Key words: activated sludge, degradation, inhibition, malathion, molasses

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