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# Biodegradation of Malathion with Indigenous Acclimated Activated Sludge in Batch Mode and in Continuous-Flow Packed-Bed Reactor

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**ABSTRACT** Acclimated activated sludge was examined for its ability to degrade malathion with and without the presence of glucose as a potential cometabolite substrate. In this study, a packed-bed reactor (PBR) using three kinds of biofilm carriers was employed for efficient degradation of malathion. The results obtained indicate that microorganisms tested were able to degrade malathion. The observed degradation rate of the pesticide in the presence of glucose was the same as without glucose. The activated sludge was found to be able to use malathion as the sole phosphorus source. In contrast, the degradation ability of the activated sludge was lost when the pesticide was used as the sole source of sulfur. The degradation capacity of the PBR was higher than the performance obtained with the batch reactor. The reactor packed with crushed olive kernels exhibited the best performance, allowing a total removal of malathion (10 mg/dm<sup>3</sup>) within 12 h.

**KEYWORDS** activated sludge, degradation, inhibition, malathion, olive kernels, packed-bed reactor

## INTRODUCTION

Untreated wastewater potentially contains a variety of chemical constituents hazardous to human health and the environment. Thus, in addition to proteins, carbohydrates, oils, fats, and urea, fresh wastewater contains a large number of different synthetic organic chemicals originating from commercial and industrial use, of which a vast majority remain unidentified (Graczyk et al. 2009). The intensive use of pesticides leads to major risks of environmental pollution. Organophosphorus pesticides represent the most applied group of insecticides during the last two decades (Bavcon et al. 2007). They are known to reduce the activity of neurotransmitters and hence to cause irreversible effects on the nervous system (Zhao et al. 2011). Malathion (*S*-[1,2-di(ethoxycarbonyl)ethyl] dimethyl phosphorothiolothionate; CAS No. 121-75-5; C<sub>10</sub>H<sub>19</sub>O<sub>6</sub>PS<sub>2</sub>) is one of the most widely used organophosphate insecticides throughout the world

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