Biodegradation of Malathion by Acinetobacter baumannii Strain AFA Isolated from Domestic Sewage in Egypt

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Abstract : Bacterial strains capable of degradation of malathion from the domestic sewage were isolated by an enrichment culture technique. Three bacterial strains were screened and identified as Acinetobacter baumannii (AFA), Pseudomonas aeruginosae (PS1), and Pseudomonas mendocina (PS2) based on morphological, biochemical identification and 16S rRNA sequence analysis. Acinetobacter baumannii AFA was the most efficient malathion degrading bacterium, so used for further biodegradation study. AFA was able to grow in mineral salt medium (MSM) supplemented with malathion (100 mg/l) as a sole carbon source, and within 14 days, 84% of the initial dose was degraded by the isolate measured by high performance liquid chromatography. Strain AFA could also degrade other organophosphorus compounds including diazenon, chlorpyrifos and fenitrothion. The effect of different culture conditions on the degradation of malathion like inoculum density, other carbon or nitrogen sources, temperature and shaking were examined. Degradation of malathion and bacterial cell growth were accelerated when culture media were supplemented with yeast extract, glucose and citrate. The optimum conditions for malathion degradation by strain AFA were; an inoculum density of 1.5x 1012CFU/ml at 30°C with shaking. A specific polymerase chain reaction primers were designed manually using multiple sequence alignment of the corresponding carboxylesterase enzymes of Acinetobacter species. Sequencing result of amplified PCR product and phylogenetic analysis showed low degree of homology with the other carboxylesterase enzymes of Acinetobacter strains, so we suggested that this enzyme is a novel esterase enzyme. Isolated bacterial strains may have potential role for use in bioremediation of malathion contaminated.

Keywords : Acinetobacter baumannii, biodegradation, malathion, organophosphate pesticides

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