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Microbial removal of xylene using free and immobilized *Streptomyces* sp. AB1: bioreactors application

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ABSTRACT

Xylene is a hydrophobic and aromatic organic compound widely used as a solvent in various industries and medical technologies. While its use is of a practical and economic significance, it is also considered as a highly toxic compound and a severe source of pollution, especially when it is discharged into nature. The aim of our study was to contribute toward xylene biodegradation using microorganisms that belong to the *Streptomyces* group. These microorganisms have been subject of an increasing interest in basic research and in biotechnology applications. Our current research is primarily focused on the biodegradation and removal of xylene using free and immobilized *Streptomyces* sp. AB1 strain, isolated from the Mitidja plain soils (north of Algeria). The follow up of xylene removal kinetics showed higher elimination rates in medium containing xylene as the sole source of carbon (200 and 300 mg l^{-1}). Biodegradation percentage varies between 80 and 99%. GC spectra showed changes during incubation time which is an indication of a microbial attack. Production of biodegradation metabolites was also detected in the medium. In a similar way, the *Streptomyces* sp. AB1 strain was encapsulated in sodium alginate beads, the result of these investigation shows high xylene removal rate (90%) from contaminated water and that *Streptomyces* sp. AB1 can regenerate sodium alginate beads without loss of sorption capacity.

Keywords: Xylene; Biodegradation; Streptomyces; Alginate-immobilization

1. Introduction

Environmental contamination by aromatic organic compounds from petrochemical and energy-producing industries is continually increasing. Among aromatic compounds such as benzene, toluene, and xylenes are the most severe contaminants because of their considerable use, their low water solubility, acute toxicity to the liver, kidney, and the central nervous system [1], and genotoxicity, these compounds have been

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