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Kinetic modeling and metabolite identification of dimethyl phthalate biodegradation by *Bacillus* sp. KS1 isolated from municipal wastewater contaminated soil

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ABSTRACT

Phthalate esters (PEs) have engrossed attention and intensified environmental concern owing to their widespread applications. In the present study, dimethyl phthalate (DMP), a low molecular weight PE, degrading aerobic bacterium was isolated from soil contaminated with municipal wastewater. Based on morphological, biochemical characteristics and 16S rRNA sequencing, the isolate was identified as *Bacillus* sp. KS1. Complete degradation up to 1,400 mg/L of DMP was observed within 168 h. At low concentrations (25–100 mg/L) of DMP, degradation data fitted well with the first-order kinetics, and the half-life was observed as 3 h. Growth kinetic study of the high concentrations of DMP (0–1,400 mg/L) was performed by using various kinetic models where Haldane model was found to fit well with the experimental data (R^2 = 0.9210). Analysis of DMP degradation residual by high-performance liquid chromatography and electrospray ionization-mass spectrometry revealed the presence of phthalic acid as the DMP degradation metabolite. The results obtained in the present study will be significant for exploring an application of *Bacillus* sp. KS1 for bioremediation of PEs.

Keywords: Dimethyl phthalate; Municipal wastewater; Biodegradation; 16S rRNA sequencing; *Bacillus* sp.; Haldane model; Phthalic acid

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