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Optimization of atrazine degradation process by *Bacillus paramycoides* strain in a batch system, and assessment of growth kinetics, bacterial toxicity, phytotoxicity and chlorophyll

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The herbicide atrazine is commonly to boost the agricultural production but also raises serious environmental concerns. For a safe environment from the point of effective mineralization, a potentially atrazine-degrading bacteria is required. In this regard, potential bacterial species was isolated from the agricultural field where atrazine was being used as herbicide from long time and batch experiment was performed to evaluate its potential to degrade atrazine. Various biodegradation-affecting parameters such as atrazine concentration (1-25 mg/L), pH (5.0-9.0), and inoculum dose (5-10%) were optimized with the help of the Central composite design of the Response surface methodology (RSM). The maximum atrazine degradation was obtained at pH 7.0, Inoculum concentration of 10 %, and atrazine concentration of 13 mg/L. Various kinetic growth models were also studied and based on the Andrew-Haldane model, the inhibition constant (K_i) and maximum specific growth rate (μ_{max}) of atrazine were found to be 5.5 mg/L and 0.18 h^{-1} respectively. Chlorophyll content and Phytotoxicity assessment were also carried out for *Vigna radiata* seeds. To evaluate the toxicity of Bacteria, *Pseudomonas fluorescens* was utilized, and it was found that the toxicity was lower in the case of treated wastewater.

Keywords: Biodegradation, Central composite design (CCD), Herbicide, Inhibition constant, Mung bean, Response surface methodology (RSM), *Vigna radiata*