Utilization of *S. aureus* strain 502A in biodegradation of insecticide acetamiprid from wetland wastewater

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**ABSTRACT**

In the present context of wastewater treatment, biodegradation-based techniques are well known as a low-cost and environment friendly approach, for cleaning up various agro effluents. Likewise, the efficiency of indigenous *Staphylococcus aureus* strain 502 has been investigated in the study for removal of toxic insecticide acetamiprid (ACE) from wetland wastewater. The isolation and enrichment was done in minimal salt media enhanced with 50 mg L\(^{-1}\) of ACE as sole carbon, nitrogen, and energy source, incubated at 35°C in 100 rpm for about 5 d. Central composite design (CCD) was applied to predict the optimal condition of ACE removal. The correlation of the operating variables and the response based on CCD were fitted to quadratic equation. The mathematical model fitting of growth curve of the isolated bacteria was also studied. The strain *S. aureus* 502A was observed to have maximum consumption of 61.68% of ACE in 24 h, analyzed using GC–MS. The rate kinetic analysis was studied using zero-order and three half-order kinetic models. Among the identified metabolites, Benzothiazole, 2-(2-hydroxyethylthio) with an effective peak at retention time 7.00 min was observed to be the end product of ACE biodegradation. Further, toxicological analysis on *Bacillus subtilis* exhibited no inhibition zone, suggesting the non-toxic nature of the degraded metabolite.

**Keywords:** Isolation; Biodegradation; Acetamiprid; Central composite design; Growth model; Rate kinetics; Quantification; Metabolite

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