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5th INTERNATIONAL CONFERENCE ON ADVANCES IN BIOTECHNOLOGY - SUSTAINABLE INNOVATIONS TOWARDS VIKSIT BHARAT VISION

Organized by

POST GRADUATE DEPARTMENT OF BIOTECHNOLOGY

**DWARAKA DOSS GOVERDHAN DOSS VAISHNAV COLLEGE
(Autonomous)**

Re-accredited by NAAC with A⁺⁺ Grade, Affiliated to University of Madras
College with Potential for Excellence, Linguistic Minority Institution
Arumbakkam, Chennai - 106

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ABSTRACT PROCEEDINGS OF

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SUSTAINABLE INNOVATIONS TOWARDS VIKSIT BHARAT VISION
(ICAB SIVBV 2026)**

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OV-E6

OSMOREGULATORY ADAPTATIONS AND EFFICIENT REMOVAL OF MULTI-PYRETHROID RESIDUES FROM HYPERSALINE WASTEWATER USING A HALOTOLERANT MICROBIAL ISOLATE**Kaliamoorthi Ramya**

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Abstract:

Sustainable and cost-efficient bioremediation of the pyrethroid pesticide industry wastewater requires the distribution of halotolerant microbial catalysts capable of maintaining metabolic activity under hypersaline conditions. In this study, a strong bacterial isolate was recovered from industrial wastewater and identified as *Enterobacter ludwigii* through biochemical, molecular, and phylogenetic profiling. The biodegradation kinetics of this strain were evaluated using synthetic wastewater matrices containing a consortium of five pyrethroid pesticides across a salinity gradient (1%-10% NaCl) and varying substrate loadings (50-600 mg/L). Under optimized bioprocess parameters specifically 3% NaCl and 100 ppm substrate concentration the strain exhibited superior biomass proliferation modeled by first-order kinetics and achieved biomineralization efficiency exceeding 90% within an 8-day treatment cycle. GC-MS and enzymatic assays elucidated that the catabolic pathway involves a co-metabolism strategy, resulting in complete detoxification without the accumulation of toxic metabolites. Furthermore, NMR and HPLC analyses confirmed that *E. ludwigii* employs a specialized osmoregulatory mechanism, accumulating osmolytes to mitigate osmotic stress. These results highlight the potential of this novel *E. ludwigii* strain as a high-performance bio-agent for the remediation of pesticide-contaminated saline environments.

Keywords: Pyrethroid, Saline Wastewater, Halotolerant, Osmolyte, Biodegradation.



The frog does not drink up the pond in which he lives – Native American Proverb