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Screening the potential of *Pseudomonas fluorescens* and *Achromobacter pulmonis* as safe dimethoate degrader and plant growth promoting agents

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ABSTRACT

Ability to degrade pesticides by biological approach remains the priority for better eco-systems, once it becomes the pollutant of soil and water. In the present study, dimethoate degrading bacterial isolate Pseudomonas fluorescens and Achromobacter pulmonis found to be producing metabolites after degrading dimethoate which are safe to the environment when screened for mutagenicity assay (Ames test), toxicological studies against fish and earthworm and hence recommended safe for soil inoculation to control thepollutant level of dimethoate by bio-degradation. These isolates also been checked positive for the plant growth promoting features when tested for indole acetic acid production, hydrogen cyanide production, siderophore and others. Study highlighted the introduction of two bacterial isolates capable of doing pesticide degradation as well as plant growth promotion if inoculated to soil contaminated with dimethoate.

Keywords: Dimethoate, Degradation, Plant Growth Promotion and Ames test.

INTRODUCTION

Organophosphorus pesticides are the major pesticides used in agricultural production and now it has become a major pollutant to the ecosystem (Zhang et.al. 2012). In a view, focus has been made to degrade dimethoate by using approach like pulsed electric field with 20 $KVcm^{-1}$ for 260 µs. Result showcased reduced toxicity of the treated sample with reduction in pesticide level (Zhang et.al. 2012). Dimethoate degradation has also been achieved by UV irradiation using TiO_2/Polymer films. It has been achieved when under optimum loading of TiO_2 of 4g/l at a UV irradiation time of 180 min was given. The degradation products were then analysed by gas chromatography-mass spectra (GCMS) (Priya et.al. 2011).

In another approach pesticide degrading microorganisms such as *Bacillus safensis FO-36bT, Bacillus subtilissubsp.inaquosorumKCTC13429T* and *Bacillus cereus strain ATCC14579T* were found to be degrading dimethoate with α and β-half-lives (days) recorded to be 9.5, 11.0, for *B. safensis*, 4.33,9.99 for *B.cereus* and 4.16,9.27 for *B.subtilis*. They also recorded by-products of degradation by GC and GC-MS (Ishaget.al.2016).

Liang et. al. (2009) reported a bacterium *Raultella sp.X1* able to degrade 75% of dimethoate when used in co-metabolism approach.

Attempt has been made to degrade the dimethoate by transferring genes available in plasmid (engineered) of Rhizobiumto *Pseudomonas sp.* by which positively cloned and expressing *Pseudomonas sp.* showcase better dimethoate degradation (Shinde et.al.2018).