Biodegradation of two Azo dyes using *Dietzia* sp. PD1: process optimization using Response Surface Methodology and Artificial Neural Network

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**ABSTRACT**

A two level three factor ($2^3$) central composite design (CCD) was applied for optimization of the selected biodegradation process variables, i.e. initial solution pH (4–8), initial dye concentration (150–400 mg L\textsuperscript{−1}), and time consumed for degradation (14–48 h) for studying the biodegradation of Congo red (CR) and Indigo carmine (IC) using the isolated novel bacterial strain, *Dietzia* sp. PD1. This is the first report of dye degradation for the genus *Dietzia* obtained so far. The optimum dye degradation efficiency of *Dietzia* sp. PD1, obtained from RSM modeling for CR, was found to be 99.97\% (at 177.63 mg L\textsuperscript{−1} of initial dye concentration at pH 5.56 for 42.64 h) and for IC it was found to be 99.95\% (at pH 5.85, concentration of dye 135.62 mg L\textsuperscript{−1} and time 43.29 h) at temperature 303 K and stirring speed 150 rpm. A strong correlation existed between the input process variables and the output parameter for degradation of dye using Artificial Neural Network (ANN). The model developed using Response Surface Methodology (RSM) and ANN showed a close interaction (% deviation ~ 0.6\%) with the experimental values for both the dye degradation. The ability of the isolated *Dietzia* sp. PD1 for degrading two dyes of different chemical structure and properties endorses the possibility of applying it for the treatment of real industrial effluent bearing a mixture of different dyes.

**Keywords:** Biodegradation; *Dietzia* sp. PD1; Congo red; Indigo carmine; Response Surface Methodology; Artificial Neural Network