

Optimisation of Dyes Decolourisation by *Bacillus aryabhatai*

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Abstract : Synthetic dyes are extensively used in the paper, food, leather, cosmetics, pharmaceutical and textile industries. Wastewater resulting from their production means several environmental problems. Improper disposal of their effluents involves adverse impacts and not only about the colour, also on water quality (Total Organic Carbon, Biological Oxygen Demand, Chemical Oxygen Demand, suspended solids, salinity, etc.) on flora (inhibition of photosynthetic activity), fauna (toxic, carcinogenic, and mutagenic effects) and human health. The aim of this work is to optimize the decolourisation process of different types of dyes by *Bacillus aryabhatai*. Initially, different types of dyes (Indigo Carmine, Coomassie Brilliant Blue and Remazol Brilliant Blue R) and suitable culture media (Nutritive Broth, Luria Bertani Broth and Trypticasein Soy Broth) were selected. Then, a central composite design (CCD) was employed to optimise and analyse the significance of each abiotic parameter. Three process variables (temperature, salt concentration and agitation) were investigated in the CCD at 3 levels with 2-star points. A total of 23 experiments were carried out according to a full factorial design, consisting of 8 factorial experiments (coded to the usual ± 1 notation), 6 axial experiments (on the axis at a distance of $\pm \alpha$ from the centre), and 9 replicates (at the centre of the experimental domain). Experiments results suggest the efficiency of this strain to remove the tested dyes on the 3 media studied, although Trypticasein Soy Broth (TSB) was the most suitable medium. Indigo Carmine and Coomassie Brilliant Blue at maximal tested concentration 150 mg/l were completely decolourised, meanwhile, an acceptable removal was observed using the more complicate dye Remazol Brilliant Blue R at a concentration of 50 mg/l.

Keywords : *Bacillus aryabhatai*, dyes, decolourisation, central composite design

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