RESEARCH PAPER

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Biodegradation of synthetic dyes by *Bacillus subtilis* under static condition

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Due to industrial development, the amount and variety of hazardous substances added to the environment has increasing drastically. A significant number of synthetic compounds which are not related to natural ones persist in the environment and create health hazardous for human beings. *Bacillus subtilis* was isolated from Match box industrial effluent disposal site. It was characterized and exploited for its dye degradation potential on synthetic dyes (Acid scarlet 3R Conc., Brown Ex – 399, Crystal violet, Green G Conc., Swiss pink) under static condition dose.

Key words : Synthetic dyes, *Bacillus subtilis,* Bioremediation, Decolourisation

INTRODUCTION

Bioremediation is a pollution control technology that uses biological systems to catalyze the degradation or transformation of various toxic chemicals to less harmful forms. Among the biological techniques, it has evolved as the most promising one because of its economical, safety and environmental features, since organic contaminants become actually transformed and some of them are fully mineralized by this technique (Vaidya and Datye, 1982). The bioremediation process involving the use of microbes to detoxify and degrade environmental contaminants has received increasing attention as an effective biotechnological approach to cleanup a polluted environment (Khan and Anjaneyulu, 2005).

Synthetic dyes are extensively used in textile dyeing, paper printing, colour photography, pharmaceutical, food, cosmetics and other industries. Approximately 10,000 dyes and pigments are industrially used and over 0.7 million tons of synthetic dyes are produced annually worldwide (Mc Mullan *et al*., 2001). During processing up to 15% of used dye stuffs are lost in industrial effluents (Vaidya and Datye, 1982; Wong and Yu, 1999). Major classes of synthetic dyes used are azo, anthraquinone and triphenyl methane. In addition to their visual effect and adverse impact in terms of chemical oxygen demand (COD), many synthetic dyes show their toxic, carcinogenic and genotoxic effects (Michaels and Lewis, 1985; Chung *et al*., 1992).

Conventional waste water treatment plants are unable to perform a complete dye removal, 90% of reactive textile dyes persist after activated sludge treatment (Pierce, 1994). Other physico-chemical methods of waste water decolourisation have short comings due to high costs and operational problems with less efficiency. Now-a-days, effective biological process would be of great value, due to their inexpensive, eco friendly nature and lesser sludge producing properties.

A number of biotechnological approaches have been suggested by recent research as of potential interest towards combating pollution by dyes in an eco friendly manner. They include the use of bacteria and fungi often in combination with physico -chemical processes.

Dyeing factory effluent that alters the color and quality of water bodies has been proved to be hazardous to aquatic organisms (Khan and Jain, 1995). Toxic compounds from the dye effluent get into aquatic organisms, pass through food chain and ultimately reach man and cause various physiological disorders like hypertension, sporadic fever, renal damage, cramps, etc.

Biological treatment of textile effluents may be either aerobic, anaerobic or a combination of both, depending on the type of microbe being employed (Keharia and Madamwar, 2004). The ability of microorganisms to decolorize and metabolize dyes has long been known and the use of bioremediation based technologies for treating textile waste water has attracted interest (Mc Mullan *et al*., 2001). Several microorganisms have been found to decolorize and mineralize textile dyes. The present study was undertaken to evaluate the effectiveness of *Bacillus subtilis* for the degradation of synthetic dyes.

MATERIALS AND METHODS

Textile dyes :

The commercially available textile dyes such as Acid