Decolourisation Of Textile Dye Containing Effluent By *Micrococcus Spp*

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Abstract
Synthetic dyes are used in several industries including textile, dyeing printing and cosmetic industries. Due to their complex structure they are resistant to be decomposed by conventional treatment technologies. Hence microbial decolorization of dyes could be a viable option as low cost ecofriendly waste water treatment system for these industries. This study presents microbial decolorization of textile dye effluents by *Micrococcus Spp* isolated from different samples collected from fabric industry. In the present study we studied the effect of inoculum size on four different dyes mehtylene blue, crystal violet, eosin yellow and safranine . All the samples were incubated at 30°C 100 rpm. The decolorization was measured as decrease in absorbance maxima at 663 nm,590 nm,518nm, 530 nm for mehtylene blue, crystal violet, eosin yellow, safranine respectively.

Introduction

In today's world one of the main reason of water pollution is disposal of synthetic dyes in the water bodies. The main culprit of it are textile industries. Addition of colour in the water is the main indication of water pollution. The major issues with these synthetic dyes are absorption and reflection of sunlight which hamper the photosynthesis of algae and hence effect the food chain. The dyes are difficult to degrade and they persist in the environment for longer duration of time [9]. The conventional physiochemical methods used for degradation[3],[4],[5] of dyes by industries are not capable of degrading dyes fully and the products thus formed are mutagenic and carcinogenic in nature[8],[1],[2]. These methods are also very costly and hence are not economical in nature. Bacterial decolourisation of dyes is a novel method which is very eco-friendly as well as cost effective in nature.

Material And Methods

All chemicals and glass ware used for the study were of high grade and procured from Hi Media

Collection of sample

Soil samples from various polluted sites like landfill area disposal sites of textile and leather industries located in Jalandhar Punjab were collected.

Isolation of dyes degrading bacteria

1% of the soil sample was inoculated in nutrient broth after two days this nutrient broth was serially diluted upto 10^{-7} dilution and 100 microlitre of these dilution was spread plated on petriplates supplemented with nutrient agar medium from these pure bacterial cultures were isolated with streak plate method. These pure cultures were inoculated in nutrient broth containing 1% dyes. The cultures that exhibited degradation of dyes were selected for further studies

Maintenance and Preservation

Pure bacterial isolates obtained on the Nutrient agar plates were stored in refrigerator and served as stock cultures. Subcultures were routinely made every 7 to 10 days.

Biochemical characterisation of bacteria

The selected pure bacterial culture was identified using standard microbiological and biochemical methods upto species level.

Decolorization assay

Decolorization activity in terms of percent decolorization was determined by following method . 10 ml of sample was centrifuged at 1000 rpm for 10 minutes. Spectrophotometer was used for absorbance measurement. The decrease in absorbance was monitored at 663 nm for methylene blue, 590 nm for Crytal Violet, 518nm for eosin yellow, 530 nm for safranine. Decolorization activity was calculated according to the following formula [14].

$D= [A -A)/A] x 100$

Effect of inoculum size

The effect of Inoculum size on decolourisation of dyes by bacteria was studied by inoculating the nutrient broth containing dyes with various inoculum size i.e. 2%,4%,6%,8%,10%.

Results and Discussion

Decolorization of textile dye effluent is a hazardous environmental problem, which is evident from the amount of research done in this field. Treatment of textile dye effluent by physical and chemical methods is very costly and they produce a large amount of sludge, whereas biological process convert organic compounds completely into water and carbon dioxide, have low cost and are easy to use [7]. In the present study microbial decolourization of textile dye effluent was carried out using *Micrococcus Spp* obtained from the soil samples. These soil samples were collected from the disposal site of effluent for screening efficient microorganisms, (bacteria).

Isolation and Decolorizing Bacteria

Different types of Bacterial isolates were isolated from soil samples collecte from textile industry. The bacterial isolate which showed the best decolorisation result was selected for further studies.

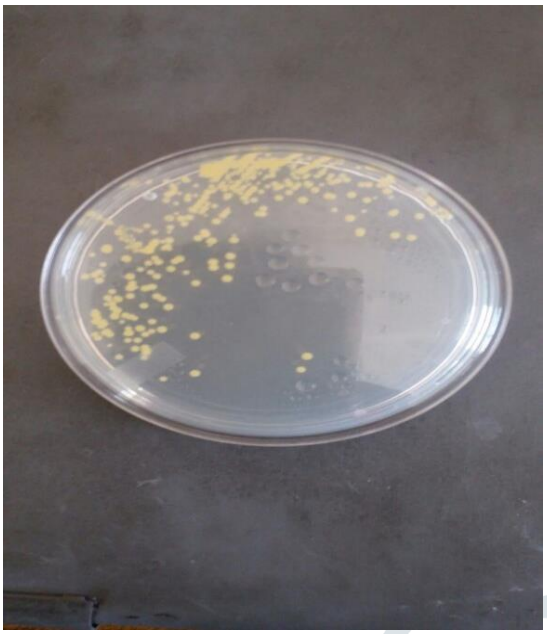

Figure-1 Bacterial isolate from effluent sample

Figure-2 Decolorisation of crystal violet dye by bacteria

Biochemical characterisation of bacteria

The isolated bacteria was characterized biochemically as well as physiologically as *Micrococcus Spp* as described in "Manual of Microbiological method") and Microbiology laboratory manual.

Effect of Inoculum Size

The 2%, 4%, 6%, 8% and 10% of inoculums size of micrococcus spp. was used for to degrade the dyes solution . Decolorization activity of bacteria was found to increase with the increase in inoculums size best results were seen from 6-8 %. M.Ponraj. *et al* used four different bacterial isolates for studying the effect of Inoculum size on decolorization reported high decolorization activity of *Klebsiella* sp. (67.19%) and *Salmonella* sp (53.91%) was found in 6% of inoculums size .[6]

Inoculum Size	**% Decolorization**			
	Safranine	**Crystal Violet**	**Eosin Yellow**	**Methylene Blue**
2	**22.1(±4.164)**	**20.7 (±7.696)**	**27.7(±5.597)**	**26.9 (±4.154)**
4	**46.5(±4.888)**	**37.9 (±4.650)**	**41.3(±6.928)**	**44.1 (±5.992)**
6	**58.2(±6.706)**	**56.3 (±5.789)**	**58.3(±4.981)**	**50.3 (±6.046)**
8	**57(±4.728)**	**47.2 (±5.381)**	**52.8 (±6.504)**	**43.7 (±4.636)**
10	**47.6(±4.445)**	**48.3 (±6.262)**	**43.8 (±7.206)**	**38(±5.753)**

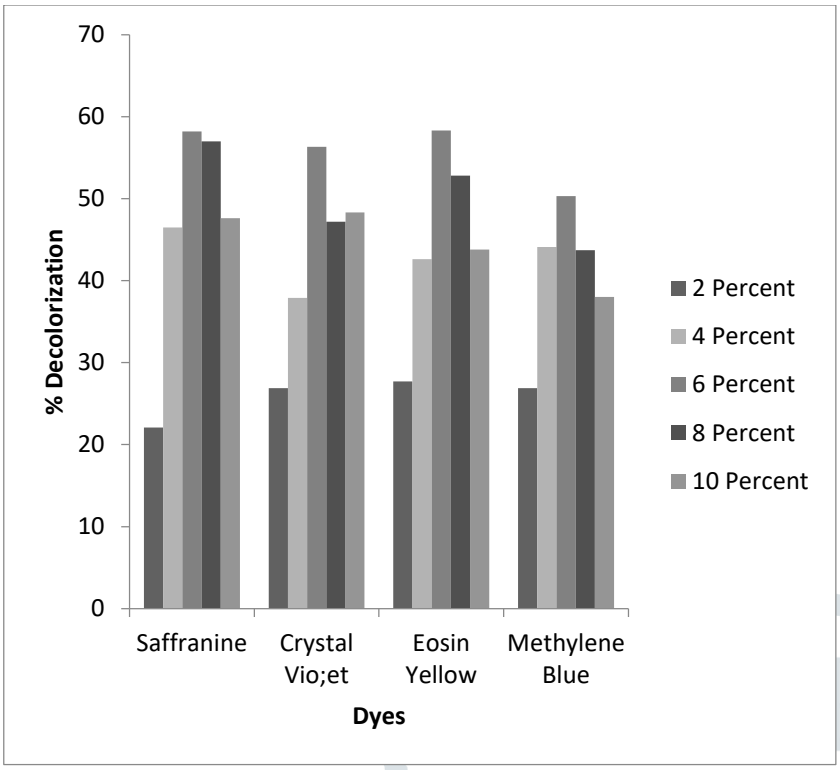

Figure- 1Effect of Inoculum size on Decolorization of dyes *by Micrococcus Spp*

Conclusion

The present study reveals that all the four dyes methylene blue, crystal violet, eosin yellow,safranine are degradable under aerobic conditions by *Micrococcus spp* isolated from textile dye effluent.The bacteria exhibhited maximum decolorization between 6%-8% (v/v) inoculum On the basis of the results further studies can be done to develop a suitable strategy for the treatment of waste water contaminated with dye.

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