



## DECOLOURISATION OF TEXTILE DYE, REM-RED BY *MICROMONOSPORA* SPECIES

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### ABSTRACT

The potential for *Micromonospora* spp. (Non *Streptomyces* Actinomycete) isolated from Vasant Sagar Dam, located in Sangli district of Maharashtra, was studied to decolorize dye wastewater from textile industry (Rem-Red and Rem-blue). *Micromonospora* spp. successfully decolorised the textile wastewater containing two dyes, Rem-red and Rem-blue. Decolourisation studies were carried by inoculating intact cells and cellular extracts of *Micromonospora* spp. The maximum decolourisation was observed at pH 7.0 at five days incubation period at room temperature.

### INTRODUCTION

Comprising over 70% of the earth surface, water is undoubtedly the most precious natural resource that exists on our planet. Without water, life on earth would be non-existent. Environment and life have close relationship on earth. For full enjoyment of life, human beings must protect these natural divine resources but rapid industrial development and population explosion have made the problem of environmental pollution more acute day by day in developing countries like India, where all efforts are directed primarily towards industrial development. Unfortunately proper attention has not been paid by most of the industries to install suitable treatment plants to treat their industrial wastes for safe disposal. In addition, increase in population at geometric rate and rapid urbanization have made the problem of domestic sewage disposal unmanageable. This has resulted in colossal pollution of all running waters. In spite of enforcement of Water Pollution Prevention Act, the population has been exposed to different hazards emanating from consumption of polluted waters.

To protect the environment, some extra efforts are needed to be taken. Several organizations at national and international level are trying to increase awareness about pollution and to protect the natural resources. But still all these activities are in their infancy. By using available means we are trying to reduce pollutonal load.

Textile industry is one of the most important and water intensive industries, which consumes large quantities of water for various processes and discharge equally large volumes of wastewaters containing variety of pollutants and colouring matters. Textile wastewater is highly coloured which mainly block the penetration of sunlight thereby retarding the growth of aquatic animals and plants; it also contains the dissolved toxic substance and carcinogens (Walsh 1980, Chung 1992).

It is, thus, imperative to treat the textile wastewater suitably prior to its discharge in the environment (river or sewer) to avoid public health hazards. There are many non-biological methods generally used to treat coloured textile wastewater but biodegradation by using microorganisms is an attractive method. It does not produce any products causing any biomagnification problem.

## MATERIALS AND METHODS

The soil samples were collected from nearby area of Vasant Sagar Dam and water used for this study was collected from Vasant Sagar Dam in sterile containers and transported to laboratory and kept in refrigerator till use. For decolourisation studies pure textile dyes (Rem-red and Rem-blue) were used.

**Isolation of *Micromonospora* spp.:** The *Micromonospora* spp. were isolated from the samples by using Glycerol Aspargine Agar having composition:

Glycerol	10.0 g
K <sub>2</sub> PO <sub>4</sub>	1.0 g
L-asparagine	1.0 g
Agar Agar powder	20.0 g
Trace salt solution	1.0 mL
Distilled water	1000 mL
pH	7.4

### Trace Salt Solution:

FeSO <sub>4</sub> .7H <sub>2</sub> O	0.1 g
MnCl <sub>2</sub> .4H <sub>2</sub> O	0.1 g
ZnSO <sub>4</sub> . 7H <sub>2</sub> O	0.1 g
Distilled water	1000 mL

After isolation the same medium was used to grow the organism for further studies.

After growth, *Micromonospora* spp. were separated from the medium, washed with sterile distilled water and added in Minimal Medium containing dyes (Rem-red and Rem-blue)

### Composition of Minimal Medium

KH <sub>2</sub> PO <sub>4</sub>	3.0 g
Na <sub>2</sub> HPO <sub>4</sub>	6.0 g
NaCl	5.0 g
NH <sub>4</sub> Cl	2.0 g
MgSO <sub>4</sub>	0.1 g
Glucose	8.0 g
Agar Agar powder	20.0 g
Distilled water	1000 mL
pH	7.0

(Magnesium sulphate solution should be separately autoclaved and added to the rest autoclaved medium at 121°C for 15 min)

## RESULTS AND DISCUSSION

The *Micromonospora* spp. used in this study showed good decolourisation of textile dye (Rem-red) generally present in textile wastewaters. Table 1 reveals that at dye concentration of 10, 20, 30, 40, 50 mg/100mL when incubated at periods of 24, 48, 72, 96, 120 hours, the % T obtained were 92, 92, 94, 95, 97; 77, 80, 83, 85, 88; 65, 69, 74, 76, 80; 55, 55, 67, 69, 74 and 50, 52, 63, 63, 70 respectively. Increase in dye concentration decreased the percent colour removal but increase in incubation period showed increased decolorization.

Attempts were also carried out to treat the dye solution at different salt concentrations. It is

Table 1: Percent transmittance (T) obtained at different dye concentrations.

Dye concentration (in mg/100 mL)	Percent Transmittance (T) after (in hours)				
	24	48	72	96	120
10	92	92	94	95	97
20	77	80	83	85	88
30	65	69	74	76	80
40	55	55	67	69	74
50	50	52	63	63	70

Table 2: Percent transmittance (T) at different salinity (at constant dye concentration of 10mg/100mL).

Salinity (%)	Percent Transmittance (T)
0.5	85
1.0	92
3.0	80
5.0	80
8.0	73
10.0	70

Table 3: Percent transmittance (T) at different pH values.

pH	Percent Transmittance (T)	
	1 <sup>st</sup> Day	5 <sup>th</sup> day
2	18	32
5	41	58
7	59	99
9	43	80
12	20	57
14	12	40

Table 4: Percent transmittance (T) at different temperatures.

Temperature (°C)	Percent Transmittance (T)	
	1 <sup>st</sup> Day	5 <sup>th</sup> day
0	18	36
8	31	42
25	60	94
37	58	89
55	28	49

Table 5: Percent transmittance (T) at different inoculum concentrations (in mg).

Inoculum Size (mg)	Percent Transmittance (T)	
	1 <sup>st</sup> Day	5 <sup>th</sup> day
100	28	36
200	39	53
300	48	68
400	51	80
500	52	85
600	55	85

revealed from Table 2 that at salt concentration of 0.5% and 1.0% the percent T were 85 and 92 respectively but at 3.0%, 5.0%, 8.0% and 10.0% salt concentration, the % T was decreased. It indicates that the organism works best at salt concentration between 0.5% and 1.0%.

The *Micromonospora* spp. showed good dye decolourisation at pH 7.0, which was 59% T after 1<sup>st</sup> and 99% T after 5<sup>th</sup> day of incubation (Table 3). It is revealed from Table 4 that organism works best when incubated at 25°C temperature. The inoculum size also affects the decolourization capacity. It was observed that good colour reduction obtained at inoculum size of 500mg/100 mL dye solution.

From the above results it is concluded that the *Micromonospora* spp. is extremely efficient in decolorizing the Rem-red dye solution at pH 7.0 when incubated at room temperature.

## REFERENCES

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