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Comparative Analysis of COD reduction of Three Reactive Cold Dye Waste Waters with the white rot fungus *P. Sajor kaju*

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Abstract- Dyestuffs removal from industrial wastewater requires special advanced technologies, since dyes are usually difficult to remove by any traditional methods. Reactive cold dyes have high amount of TDS almost in lacs. Thus, rendering any microbial growth for degradation of molecules of pollutants. In this study white rot fungus *P.Sajor kaju* has been applied for COD reduction in three dye wastewater namely Red M5B, Yellow M8G and Magenta MB. The COD was measured using open reflux method. Maximum reduction was noted in Magenta MB with 64%, followed by Yellow M8G with 56% and Red M5B with 45% in 24 hours.

Keywords: Dye degradation, COD removal, white rot fungus, *P. Sajor kaju*, Reactive dyes

1. INTRODUCTION:

Certain reactive dyes possess xenobiotic and carcinogenic properties [1]. Releasing waste water of such dyes into water bodies develop aesthetic and serious health issues. dyes also generate ample amount of secondary pollution i.e. sludge, which needs further treatment for safe disposal [2]. Legislation has tightened the hands of industrialists and instructed them to follow stricter rules for disposal of dye waste water. From available methods to treat these dye waste waters, physicochemical methods decrease the dye percent in effluent, but do not degrade the dye structure. Whereas, Biological treatment seems much viable as it degrades the dye molecules and converts them into simpler and non-hazardous compounds [3]. Biological treatment is quite economic and can offer excellent result if applied correctly and monitored continuously. Reactive dyes in usage, are capable of forming covalent bonds with fibre molecules and are considered to be the most effective and permanent ones [4]. Majority of reactive dyes and their degraded products are having mutagenic and carcinogenic properties. The oxygen consumption of dye effluent is generally high and incurs heavy operational costs [5]. Complex molecules of reactive dyes pose a challenge to traditional waste water treatment technologies due to higher instability and potential carcinogenic properties. At present, there are a series of physiochemical and biochemical methods used to treat dye effluents, which include physicochemical flocculation with flotation, irradiation, katox treatment involving activated carbon and air mixtures precipitation, adsorption, photocatalysis, chemical oxidation, membrane separation and biodegradation [6].

2. MATERIALS AND METHODS

2.1 *Materials and apparatus*

Calcium Carbonate, Calcium sulphate, Dextrose, yeast extract, Autoclave, weighing balance having 5-digit accuracy. All the chemicals used are of analytical grade.

2.2 *Methodology*

The white rot fungi *P.sajor kaju* was procured from institute of Microbial Type Culture Collection, Chandigarh, India. It was maintained in Yeast Extract Agar (YEA) media and stored at 4˚C. The fungus was inoculated in nutrient medium of Yeast extract broth to get a mass for COD removal. The culture was enriched for three days and only after that was utilised for inoculation. Samples of three reactive cold dye waste waters namely Magenta MB, Yellow M8G and Red M5B were taken for COD reduction experiment. All the samples were inoculated with 1 gram of *P.sajor kaju* culture/100 ml sample in 250 ml Erlenmeyer flasks, the flasks were incubated under static conditions at 37ºC. All the samples were taken in triplicate. A control set, without the inoculation was there for analysing the comparative reduction. A portion was taken from

samples for periodic analysis at 12 hours and 24 hours.

3 RESULTS AND DISCUSSION:

The control set was analysed for COD determination of raw dye waste waters. The samples were taken from the flasks at 12 hours for checking the COD reduction. COD analysis was done by standard method. Magenta MB showed 33%, Yellow M8G showed 22% and Red M5B showed 13% after 12 hours of incubation. After 24 hours Magenta MB had maximum COD reduction followed by Yellow M8G and Red M5B. 64% COD removal was achieved in Magenta MB waste water, Yellow M8G got 56% reduction while Red M5B waste water reflected 45% reduction in COD value.

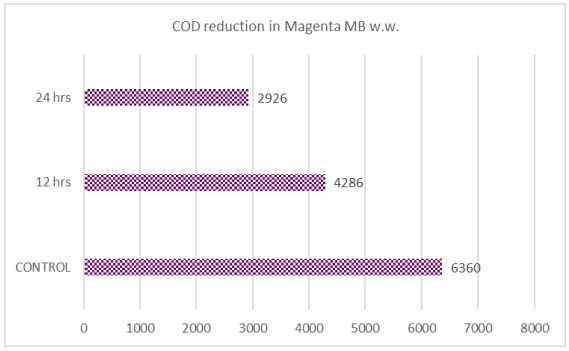

Fig:1 COD value of Magenta MB waste water for control, 12 hrs and 24 hrs

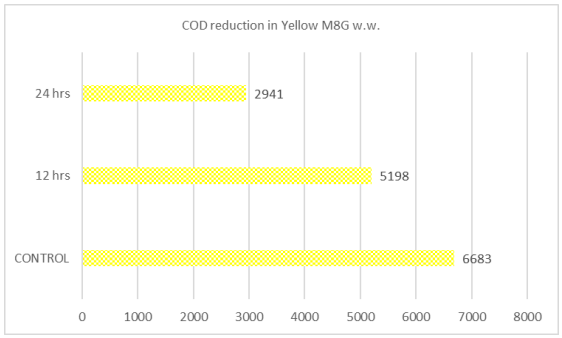

Fig:2 COD value of Yellow M8G waste water for control, 12 hrs and 24 hrs

Fig:3 COD values of Red M5B waste water for control, 12 hrs and 24 hrs

Table:1 Results of COD reduction for controlled set, after 12 hrs and 24 hrs incubation

Sample	COD Control (mg/L)	COD after 12 hrs (mg/L)	COD after 24 hrs (mg/L)
Magenta MB waste water	6360	4286	2926
Yellow M8G waste water	6683	5198	2941
Red M5B waste water	6715	5822	3675

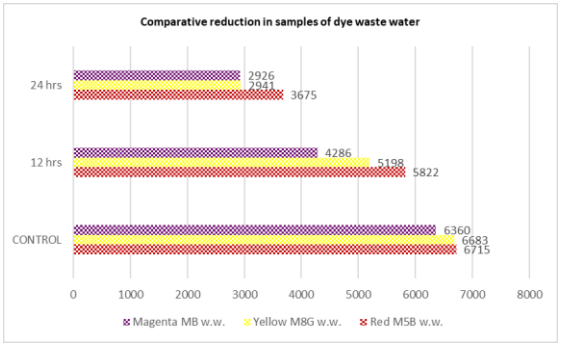

Fig:4 COD values of all three samples for control, 12 hrs and 24 hrs

4 CONCLUSION:

From the samples taken, the extent of COD removal is not constant with all the dyes. Degradation depends on factors like media, inoculation conditions, composition of waste water of dyes and laccase production [7]. Fungi from the Basidiomycetes group are called white rot fungi. It is a hetereogenous group of microorganisms but a common trait found among them is to degrade lignin and other wood components [8]. They are capable to degrade a number of pollutants including various types of dyes. White rot fungus showed some capacities to remove dyes from industrial effluents. The white rot fungus can degrade aromatic hydrocarbons, chlorophenols and polychlorinated biphenyl. The fungus produces laccase enzyme, which belongs to the group of phenoloxidases [9]. These copper containing enzymes are oxidative enzymes. The COD reduction of Red M5B, Yellow M8G and Magenta

MB waste water reflects the degrading activity by *P. Sajor kaju*. This technique can be enhanced with optimisation of parameters for achieving maximum COD reduction.

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