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FULL LENGTH ARTICLE

Biodegradation of Textile Industrial Effluent using mixed culture of *Pseudomonas aeruginosa* and Bacillus *subtilis* and adsorption using Casuarinas' tree seeds

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ABSTRACT
The physicochemical characterization of effluent generated from textile industry at Ichalakaranji, Maharashtra was carried out. The effluent was analyzed for Biochemical Oxygen Demand (BOD), Dissolved Solid (DS), Chemical Oxygen Demand (COD), Color, Intensity and heavy metals prior to treatment. The result showed that the effluent was highly polluted using stated parameters. After the treatment the results shows a tremendous decrease in the stated parameters. The COD reduced up to 200 mg/l and BOD up to 20 mg/l which can easily sent to the surface water. Also there is adsorption of heavy metals.
***Key words**: Industrial effluent, biodegradation, adsorption, etc.*

INTRODCTION

The growth of industries leads to the development of the country but unfortunately most of these industries don't have a proper waste management which leads to the environmental pollution. In textile industries, the hazardous compounds releases to the environment at various stage of operation. These pollutants are produced in an effort to improve human standard of living and fashion, but ironically, their unplanned intrusion into the environment can reverse the same standard of living impacting negatively on the environment [1]. The dyes present in textile effluent impart persistent color to the receiving streams. Biotechnology is providing environmentally acceptable methods of modifying or destroying chemical waste so that they are no longer toxic to the environment. Biological decolorization has been employed under either aerobic or anaerobic environment. This usually involves tolerating bacteria or other microbes that can be genetically engineered to provide strains with better contaminant degrading potential than their natural counterparts[2].Most of the physical and chemical methods employ, which in spite of cost, do not always ensure that the contaminants are completely removed but our process come with assurance of dye removal where other process failed to prove that. Color is the first contaminant to be recognized in the dyeing effluents and has to be removed before discharging into the water stream. Aesthetic merit, gas solubility and water transparencies are affected by the presence of dyes even in small amount. The removal of color from wastewater has been rated to be relatively more important than the removal of soluble colorless organic substances, which usually contribute the major fraction of biochemical oxygen demand [3-5].

Biodegradation is biological treatment and is attractive due to the potential to degrade dyes and overcomes the disadvantages imposed by other processes. It produces innocuous end products, reduced operating cost and maintains dye concentration below toxic limit..

MATERIALS AND METHODS

Sample collections

The sample of waste water was collected from the textile zone Ichalakarnji, Maharashtra.

The effluent was analyzed in the laboratory for the COD, BOD, CBOD, TDS, TSS and Color intensity and also for heavy metals [4].

Method of bacterial development

Ever wanted to grow bacteria for science project or just for fun? Its surprisingly simple all you need is some nutrient agar (a special gelatinous growing material), a number of sterilized Petri dishes and some good sources of bacteria.

Anaerobic Degradation

Anaerobic secondary treatment is the biological removal of organic contaminants in the absence of oxygen. Most of the organic matter is converted by bacteria into methane and carbon dioxide gas referred to as biogas. Some of the organic matter is incorporated into biomass or sludge

Aerobic treatment

Aerobic treatment of water is the degradation and purification process in which the bacteria that thrive in oxy-rich environment breaks down and digest the waste. The mixed aerobic microbial consortium uses the organic carbon present in the effluent as their carbon and energy source. The complex organics finally get converted to microbial biomass (Sludge) and carbon dioxide.

Adsorption

Adsorption has been found to be superior to other techniques for water re-use in terms of initial cost, simplicity of design, use of operation and insensitivity to toxic substances. Adsorption has been used extensively in industrial process for separation and purification. The removal of colored and colorless organic pollutants from industrial wastewater is considered as an important application of adsorption processes. Adsorption by activated carbon has a greater tendency for the removal of dyes without introducing any impurities.

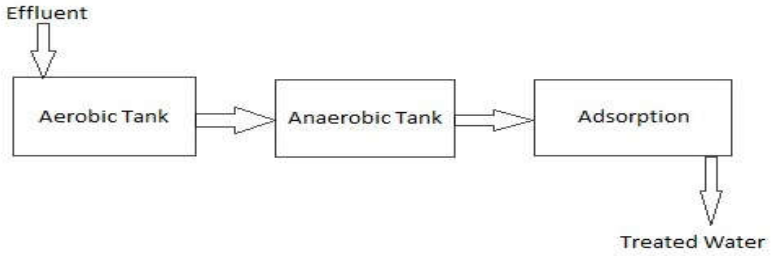

Fig 1. Flow Diagram

RESULT AND DISCUSSION

It is important to know whether the microorganisms that decolorize dyes can bear high concentrations of the compound since the dye concentration in typical industrial effluent can vary between 10-50 mg/l. *Pseudomonas aeruginosa* could decolorize the dyes at concentrations higher than those reported in waste waters and thus it can be successfully exploited for treatment of dye bearing industrial waste waters. *Pseudomonas aeruginosa* had the ability to decolorize 50 mg/l concentration of reactive dyes (e.g. Triphenylmethane) within 7-10 days. *Pseudomonas aeruginosa* showed 60-95% decolorization of 50 mg/l of triarylmethane dyes tested within 24 hrs. These results show that *Pseudomonas aeruginosa* has a higher decolorization potential compare to other bacteria reported previously.

In our study *Pseudomonas aeruginosa* shows some advantages during dye decolorization such as robust growth property and simple growth requirements, which make it a potential strain for biotreatment of textile industrial effluent. Biopolymers have material properties similar to petrochemical plastic such as enhanced flexibility and improved impact strength; they are biodegradable and can be produced from carbon sources.

Table1- Final results of treated water

Sr. No.	Parameters	Effluent Properties	Properties of treated water	% reduction
1	TSS (mg/l)	2000	230	89
2	BOD (mg/l)	3700-4000	870	77.27
3	COD (mg/l)	7500-8200	2450	69.45
4	Odor	Bad	Fishy	-
5	Color	Dark Violet	Colorless	> 90%

CONCLUSION

There are very few reports on biodegradation of textile industrial waste containing dyes. In this study, we describe the isolation and characterization of a strain of *Pseudomonas aeruginosa* capable of efficiently degrading dyes. Degradation of dyes by the isolate was found to be dependent on dye concentration, aeration and pH as well as temperature. Various tests carried out on species of the dyes after degradation as decolorized samples executed lower toxic effects than the raw dyes. Effective dye waste water treatment using this isolate will demand the optimization on medium components and physicochemical

conditions for maximum decolorization. Advantages of this biological process are low cost, rapid degradation and simple handling.

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