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BIOREMEDIATION OF TEXTILE INDUSTRY EFFLUENT CONTAMINATED SOIL

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Abstract:
Increasing industrialization and urbanization leads to environmental pollution. The discharge of toxic effluent from textile industries adversely affect water resources as well as soil fertility. Toxic effluent contains dyes which directly affects water and soil. The bacterial species represent a promising tool for application in bioremediation of textile industrial effluents and the biodegradation potential observed would increase the applicability of these microorganisms for treatment of textile effluents before disposal to appropriate channel. The aim of this research is to determine the bioremediation potentials of bacteria isolated from Textile Industry effluents. Textile industries produce considerable amounts of effluent characterized by large amounts of suspended solids, fluctuating pH, high temperature, and a mixture of dyes. unprocessed textile wastewater can cause rapid tiredness of dissolved oxygen, if it is directly discharged into the outside water sources hence they are toxic to biological life. The high alkalinity and traces of chromium, where it was employed in dyes, adversely affect the aquatic life as well as interfere with the biological treatment process.
Keywords: Bioremediation, reactive dyes, Bacteria, Contaminated Soil

Introduction:

The lifelong industrial development has lead to a corresponding increase in the amount of wastewater generation leading to a significant decline in levels and quality of the natural water in the environment. Textile industries consume approximately 800 tons of dyes per annum and use up to 1.5 liter of water per kg of dye processed which is one of the largest pollutants of the environment. However, there is increasing fear on the impact in effective treatment of textile effluents as they introduce secondary pollutants during the remediation process which is quite costly to run, maintain, and clean up. Research on biological treatment has offered simple and cost effective ways of bioremediation of textile effluent.

Bioremediation is the use of organisms to break down and thereby detoxify dangerous chemicals in the environment; it employs both plants and microorganisms. The presence of dyes in the effluent poses a biggest problem since they are recalcitrant and toxic. A very small amount of dye can be visible in water, thus decreasing the transparency of the water which leads to reserve of sunlight penetration and consequently photosynthesis. Both aerobic and anaerobic processes have been successfully used for degrading the textile effluent. Most studies on metabolism of organic contaminants have been performed with bacteria especially in context of bioremediation. Bacteria generally are easier to culture and they grow more rapidly than fungi. They are more amenable to molecular genetic manipulation. Bacteria such as Pseudomonas and Bacillus have been shown to degrade the azo or reactive dyes from textile industry effluent in a process known as bioleaching. Of all the technologies that have been investigated, bioremediation has emerged as the most desirable approach for cleaning up many environmental pollutants.

Material and Methods:

This research involved Sampling of site in Yavatmal. Some physicochemical analysis were carried out at the site before and after bioremediation. However, Isolation, characterization of selected bacterial isolates and biodegradation potential of bacterial isolates was carried out in the Laboratory of Microbiology. The samples were collected from the discharge and drainage pipes of the said site. Each sample was collected from the effluents paths of flow. The samples were collected during the dying step, chemical dying, and mechanical dying. Chemical dying involves wet unit processes, while mechanical dying involves dry unit operations, the previous process involves rinsing, washing, printing and dyeing processing which corresponding to the highest effluents volume discharge and hence the deteriorating environmental situation

Analysis of physicochemical Parameters

The pH was determined by placing a pH query into the sample in a 200 ml conical flask and allowed to equilibrate for 4 minutes and pH meter was read and recorded accordingly. The temperature of water and effluent was also determined on the field by lowering a mercury thermometer into the sample and allowed to equilibrate for 6 minutes and reading was taken

to the nearest degree Celsius. The electrical conductivity was determined by placing a conductivity probe into the sample in a 200 ml conical flask and allowed to equilibrate for about 4 minutes and the electrical conductance in micro second per centimeter was recorded.

Before sampling, glass fiber filters were prepared first by soaking them in distilled water, drying them at 102°C and weighing and recording their weight. Sample bottles were dried, and weighed glass fiber filters were poured onto a filtering flask. Sample bottle was shaken first, and then water was poured on the pump. The amount of water needed to filter may change according to water conditions. 150 ml of sample was filtered with paper with porosity 0.9 mm. Filtered, was recorded with volume of water filtered. Filter paper was dried 102°C to 104°C, and was allowed dry at room temperature, and weighed. It was dried, and re-weighed. This was repeated until the filter reached a constant weight. Final end weight was recorded.

Conclusion

Although Bioremediation is a challenging process to the textile, the result of this study recommends a great potential for bacteria to be used to remove pollutants from textile effluents. Interestingly, the evidence for bacterial bioremediation of effluent from textile wastewaters was established. The reduction in COD, TSS, TDS and adsorption of metal ions are substantial. The removal efficiency in the level of pollutants and heavy metals adsorption covered way for the adoption of the bacteria. These findings established that the bacteria were adaptive in nature and can degrade contaminants. The ability of the bacteria to adapt and degrade effluents from textile at high concentration gives it an advantage for treatment of effluents from textile industry.

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