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Biodegradation of tannery effluent by using tannery effluent isolate

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Abstract
Water is one of the most important constituent of life support system. Metals, pesticide, and large number of complex organic chemicals which are prepared through man made activities, pose serious threat to the life of mankind. Bioremediation is a process that uses naturally occurring or genetically engineered microorganism such as yeast, fungi and back to transform harmful substances. Tannery is one of the emerging sectors in industrialisation. The tannery effluent has high pollution potential. It creates serious threat to human and entire ecosystem. Biological detoxification turns to be similar, cheaper and significant. In present investigation *Pseudomonas sp*. was isolated from tannery effluent and its degradation on efficiency was analysed by comparing changes in the physicochemical and organic analysis of the tannery effluent before and after bacterial treatment. The results revealed that the toxic effects were mostly reduced after treatment, making the treated effluent suitable to be discharged into the environment.

Keywords: Industrialisation, Tannery effluent, Detoxification, *Pseudomonas* sp., physicochemical analysis.

INTRODUCTION

The increasing demands of the world market for semi-finished and finished Indian leather has encouraged the growth of a large number of tanneries in India. Leather industries contributes to be one of the major industrial pollution facing the country and there are about 2165 tannery industries in India and in this 30 industries are situated in Maharashtra. Tannery effluents , being voluminous and highly putressible in nature when discharged untreated , damage the normal life of the receiving stream. Tannery effluent is the collection of water which was formed during various stages of processing of leather and collectively called as composite effluent. The final effluent produced is 3500 lit/100kg. of skin [1]. It induces health Hazards to human and other aquatic organisms. It also makes the land and soil infertile, the ground and surface water turns to be unfit for irrigation and drinking. The liquors contain a high proportion of biologically oxidizable material in solution and also large quantities of putressible suspended matter which may form the bulk of sludge on the bed of a river and particularly in hot weather may deoxygenate the water and decompose, emitting foul smelling gas. Vegetable tanning liquors are dark in colour and may discolour river water. For a long distance from the point of discharge. There are several physical and chemical treatment methods such as electrochemical method employed to remove heavy metals in the effluent. The primary and pretreatment methods were used for the removal of suspected organic and inorganic solids. But the microbial detoxification procedures were found to be important in complete detoxification of the effluent's toxicity [2].

Jochimsen et al. found out that the three step process of biological purification brings the best results in the reduction of COD. During the biological purificationthe majority of biodegradable components were removed.

In the present work the isolate from the effluent was used for Biodegradation study and was found to be significantly effective in the removal of toxic effects of tannery effluent.it is observed that the whole organisms treatment have a fundamental advantage over enzymatic treatment as they transform a broad range of compounds resulting decrease in Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD) and other physicochemical characteristic values [3].

MATERIALS AND METHODS

The tannery effluent sample was collected from the tannery industries. The effluent was serially diluted and spread plated on Nutrient Agar plates and the isolate was identified to be *Pseudomonas* sp. accordingto Bergey's manual of Bacteriology (Holt, 1997). The isolated culture was inoculatd into 80 % of Tannery effluent which contains 20% of mineral salts medium and incubated for 72 hrs. at room temperature. Physico – Chemical analysis for colour, pH, odour, TDS, TS, TSS was carried out before and after treatment.Organic analysis for DO, absorbed oxygen, phenolic content, COD, BOD also carried out before and after treatment.

RESULTS AND DISCUSSION

Table 1 shows, the colour and odour of the sample changed after treatment indicating the consumption of phenolic content by *Pseudomonas* sp. The pH was changed from acidic to alkaline resulting in the reduction of acidity to alkaline resulting in the reduction of acidity of the effluent. TDS, TS and TSS values were also reduced after treatment, signifying the degradation of toxic solid components in the effluent by the isolate. Table 2.shows that the

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effluent mainly lacks in the dissolved oxygen content but due to the bacterial treatment it has gained dissolved oxygen content due to microbial metabolic reactions. Biological oxygen demand which indicated the high pollution level have decreased significantly indicating that pollutants level have been reduced. The phenolic content was found to be decreased after treatment;it indicates the utilization of phenol as a carbon source by the isolate. The decrease in level of CODindicates the reduction of biologically oxidisable and inert organic materials as result of the degradation by the *Pseudomonas* sp. The result revealed that the *Pseudomonas* sp. Isolated from the effluent is efficient enough to degrade the tannic components and it is useful to make the effluent non toxic after treatment , and these waste waters can be reused and certainly this biodegradation study will be helpful to some extent for making a pollution free environment.

Table 1. Physicochemical Analysis of the Effluent Before and After Treatment

Parameter	Before Treatment	After Treatment
Colour	Dark bluish green	Pale green
Odour	Phenolic	-
TDS (mg./lit.)	4.8	8.5
TS (mg./lit.)	6200	4500
TSS (mg./lit.)	1000	500

*TDS – Total Dissolved Solids, TS- Total Solids, TSS – Total Suspended Solids, mg/l- milligram/ litre

Table 2.Organic Analysis of the Effluent before and After Treatment

Parameters	Before treatment	After treatment
Dissolved Oxygen (mg./l)	0.1	1.05
BOD (mg./l)	1375	400
Phenol (mg./l)	500	280
COD (mg./l)	4500	1050

BOD – Biochemical Oxygen Demand, COD – Chemical Oxygen Demand (in mg/l – milligram/litre)

CONCLUSION

Some tanning process contain toxic substance eg. Arsenic, Selenium, sulphides, chromium, etc.

Physical – a. Screening b. Grit Chamber c. Grease trap d. Plain sedimentation

Chemical – a. Neutralization b. Coagulation c. Flocculation

Biological – Aerobic and anaerobic treatment can be provided.

It is observed that chromium is toxic to micro-organisms hence cannot be suitably treated by aerobic or anaerobic biological process. For this electrolytic process has been tried and worked out satisfactorily.

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