Article : Treatability studies of tannery effluent by bacteria

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ABSTRACT :

The tanning industry was designated as “Red category” due to the high pollution contributed by its solid and liquid wastes. It generates huge amount of wastes that frequently accumulate in the environment and spoil the entire environment. Tannin which is present in the effluent are soluble phenolic compounds with high molecular weight ranging from 500 mg/l to 3000 mg/l and can combine with proteins, cellulose, gelatin and pectin to form an insoluble complex. Tannins inhibit the growth of micro organisms resist microbial attack and are recalcitrant in the environment. The present study focused mainly on the biological method of removal of tannin from the effluent which involved in the bioremediation process. The microorganism such as bacteria, fungi and yeast are selected to asses the biodegradation capacity of tannin. The treatability studies of microbes are carried out to reduce the toxicity of the effluent.

INTRODUCTION :

Every human society be it rural, urban disposes different kinds of byproducts and waste product into biosphere in large quantities. The industrial effluents are the major pollutants that pollute not only the water bodies but also the entire biosphere. The quantity of effluent released from the tanneries is about 30-35/l kg of leather produced. These waste producs serious consequences of pollution on fresh water streams and lands for agriculture (Moore 1953). The tanning industry was designated as “Red category” due to the high pollution contributed by its soild and liquid wastes. It genetrates wastes that frequently accumulate in the environment (Taylor et al., 1987). Therefore our environment was under increasing pressure from solid and liquid emanating from the leather industry. The leather processing and manufacturing involves a variety of aggressive chemicals and also consumer large quantity of water of which about 90% is discharged as waste water. The water treatment system of the industry was found to in effective both in performance and in economics (Sztajer and Zboinska 1988).

Tanning is one of the industrial processes and the discharge of untreated water into open land causes great deterioration of ground water quality and various sub processes in tannin like bathing, pickling, tanning, dyeing and fat liquoring cause water pollution (Bolton and Klein 1971). The high concentration of Nacl and chromium affect ground water quality seriously with in a short period where the effluent is discharged on land. Hence control of their contamination in the environment received great attention (Browing 1969).

The tannery effluent waste s ranked as high pollutants among all other industrial waste (Eye and lawerance 1971).Teh tannery waste water contains vegetable tannins, high amount of proteins that excretes BOD, chlorides, Trivalent chromium, nitrogen, phosporus, sulphate and sulphides are the inorganic constituents present. The presence of colour, oil and dturbity of tannery makes not useful for domestic purposes. The receiving bodies of water slowly increase in chlorides and hardness. Presence of ammonia, sulphides, tannin and chromium in the water bodies cause pollution and are high toxic to the aquatic lifes. The physico chemical characteristics and the impact of tannery effluent on water bodies are analyzed found that the population of phytoplankton and zooplankton decreased both in tannery effluent discharge point and downstream of Kalingrarayan canal (Saravana babu et al 1990). Also the tannery effluent has serious impact on cultivation of creals. Only the treated effluent is safe for the disposal it to the environment.

In the present investigation the biological method of treatment of tannery effluent was studied also the role of microbes in the treatment of effluent was also investigated.

Methodology :

Initial anlaysis of effluent (Apha 1995)

The raw analysis of effluent was carried out by analyzing the physico-chemical parameter of the effluent. The physicochemical parameter of effluent includes analysis of calcium, TDS, Hardness, COD, BOD, lime, D. O and tannin content is carried out

. Isolation of Bacteria from effluent.

The isolation of bacteria was carried out by serial dilution techiquue. The various dilutions ranging from 10 2 to 10 6 is prepared from effluent. The nutrientagar plates are prepared. The dilutions 10 4, 10-5, 10-6 is plated and incubated at 37°C for 24-48 hrs.

Biochemical Characteristics :

The biochemical test is carried out to identify the bacterial strains. The biochemical test includes indole, methyl red, VP, citrate, urease, oxidase and starch hydrolysis test are carried out to identify the bacteria.

Treatability of isolated bacteria :

The isolated bacterial strains from the effluent were taken and cultured in broth fro more concentration of innoculum. The bacterial strain was treated with the effluent. And the effluent was kept for incubation period of 10 days under the shaking condition.

Result and discussion :

In the present study, the raw effluent from the vegetable tanning industry near Erode was collected and their physico-chemical character was analyzed. Generally it was found that the values above the tolerant limit. The mean pH value of the raw effluent was 8, which is slightly alkaline in nature. The dissolved solids and suspended solids and suspended solids were high and the mean value was 3160 mg/ml and 144mg/ml respectively. The mean and COD values are higher and found to be 19.85mg/ml and 30.2mg/ml respectively and are lower than the tolerance limits. The chloride, sulphate and alkalinity values are found to be 19.9, 7.8 and 50mg/ml respectively. The tannin content which is a major pollutant in the effluent showed that it was about 60% in the effluent.

The bacterial colonies are isolated from the tannery effluent and also from the sludge at dilutions ranging from 10-4 to 10-6. The growth of the colonies decreases when the dilution factor increases. The two major dominant isolates such as Pseudomonas, Bacillus are found to be dominant. Where as Klebsiella was found to be subdominant form.

The analysis of the treated effluent with bacterial strain was carried out. The pH value of the effluent was found to be more or else similar when inoculated with isolates. The acidity value was greatly reduced by P.Putida to 50mg/l.

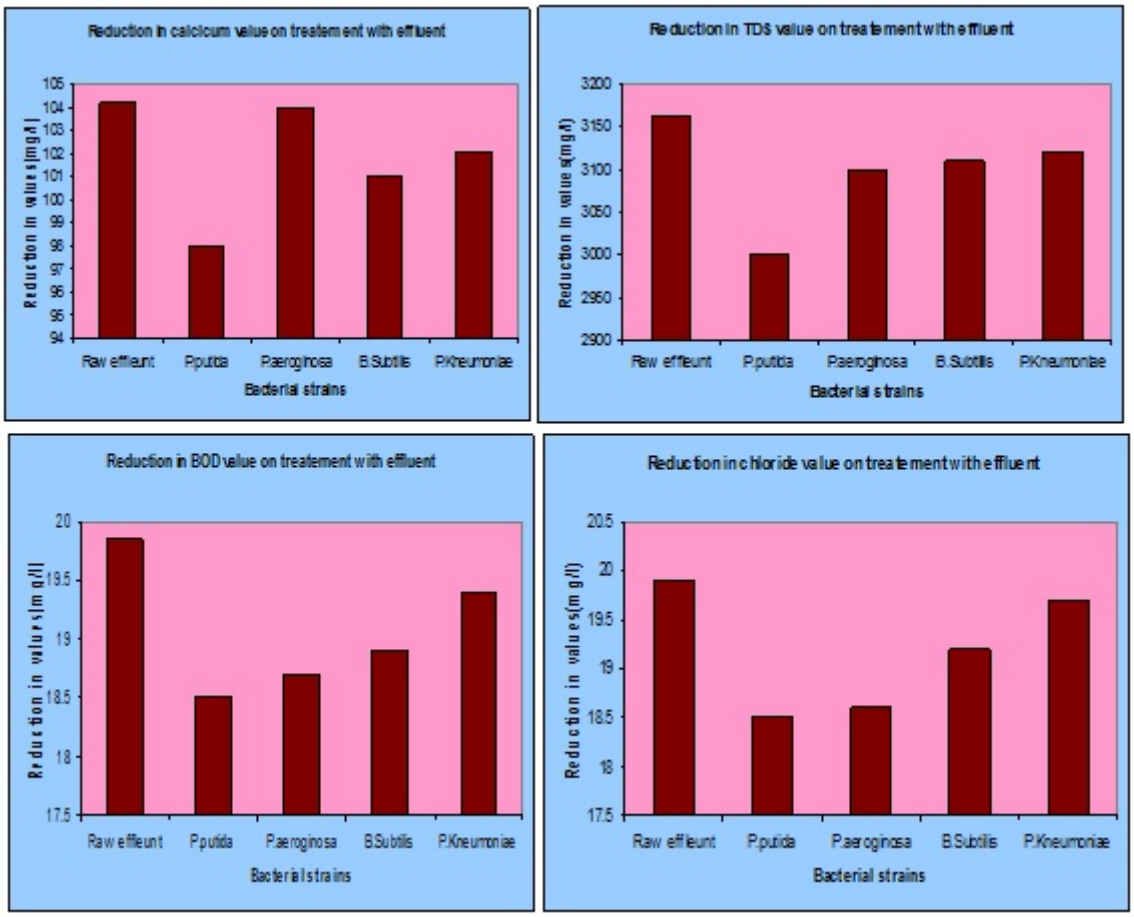
The alkality value was reduced to 250mg/l by P.Putida where as Bacillus and Kelbsiella were reduces to 260mg/l. The TDS value of the effluent was reduced by P.aeroginosa to putida.125mg/l. The dissolved oxygen content was reduced by P.aeroginosa. And it reduces the value from 1.31 to 1.07mg/l. Also chloride, calcium, COD, BOD values are reduced by P.putida

Analysis of Raw tannery effluent

Parameters	Values
pH	*8*
Acidity	*50*
Alkalinity	*300*
Calcium	*104.2*
Magnesium	*104.9*
Hardness	*220*
D.O	*1.13*
BOD	*30.2*
COD	*19.85*
TDS	*3160*
TS	*144*
Sulphate	*7.8*
Lime	-
Chloride	*19.9*
Tannin	*60*

Analysis of treated effluent - Bacteria

Parameters	Values			
	P.p	*P.a*	*B.s*	*K.p*
pH	*8*	*8*	*8*	*8*
Acidity	*50*	*50*	*48*	*48*
Alkalinity	*230*	*260*	*265*	*280*
Calcium	*98*	*104*	*101*	*102.1*
Magnesium	*101*	*105*	*103*	*102*
Hardness	*180*	*182*	*101*	*102.1*
D.O	*1.09*	*1.07*	*1.24*	*1.32*
BOD	*18.5*	*18.7*	*18.9*	*19.4*
COD	*27.9*	*28.1*	*34.2*	*34.8*
TDS	*3000*	*3100*	*3110*	*3120*
TS	*130*	*128*	*140*	*139*
Sulphate	*1.09*	*1.07*	*1.24*	*1.32*
Lime	-	-	-	-
Chloride	*18.5*	*18.6*	*19.2*	*19.7*
Tannin	*13.4*	*10.7*	*11.1*	*10.7*



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