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Characterization of textile effluent and decolorization by using fungi

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ABSTRACT

The textile industries by for the most passionate user of synthetic dyes are in need of ecoefficient solutions for its colored effluents. This study was under taken for the possibility of application of aspergillus niger for biotechnological treatment of textile effluents. Effluent from erode, three samples namely N1, N2, andN3. Its physiochemical properties were investigated. BOD, COD, TDS also assayed. Effluent was also analyzed for P, Ca, Fe, Cl, S using volumetric and spectro photometric method and textile effluent was decolorized by aspergillus niger. This study proved that aspergillus niger could effectively be used for effluent treatment.

KEYWORDS

Decolorization:
aspergillus niger;
Physiochemical;
Biological oxygen demand;
Chemical oxygen demand;
Total dissolved solids.

INTRODUCTION

Textile dyes are extensively used for dyeing in various industries and they may cause serious environmental pollution because of their toxicity and genotoxicity[1]. In Tamil Nadu, Erode district is having number of textile industries, and results in water pollution contributed by untreated effluent discharge, which contains high concentrations of consumed metal based dyes, phenol, aromatic amines etc., Decolorization of textile industry effluent is normally based on physiochemical methods. There are more than 8000 chemical products associated with the dyeing process listed in the color index. Azodye component in the effluent may be regarded as hazardous to the environment and they are resistant to biological degradation. They are not easily removed by connectional waste water treatment system. Decolorization techniques primarily depended on using physical or chemical treatment process occasionally in conjugation with or with biological treatment. Microbial treatment may be a suitable alternative for decolorization by microorganisms. Different species and strains of fungi differ in the degree of dye decolorization. Heterophilic fungi mucur aspergillus can remove soluble and insoluble metal species from solution and are also to heavy metal carious from solid waste biological dye removal techniques are either on particular biodegradation of dyes by pure caltales of fungi. The present work was under taken to study the decolorization effect on textile effluent using aspergillus niger.

MATERIALS AND METHODS

Sample collection

The study area characterized in this study was in

and around erode district. The 3 sampling sites were different points, and samples were taken from 6 inches below the surface of waste water. Effluent water was sampled in dry, sterile BOD bottles, which was kept in an ice box during transportation.

Physiochemical analysis

Temperature, pH, colour, and odour of the samples were recorded on the spot. Turbidity is measured by nephelometer method. Electrical conductivity, total dissolved solids and chemical oxygen demand was carried out according to standard methods[3]. Acidity, alkalinity, hardness was also measured.

Metal and mineral analysis

Calcium, phosphate, sulphur, silica, chlorine, Iron were analyzed by volumetric and spectrphotometric methods.

Decolorization of dye

Textile effluent was found to be slightly alkaline. The textile effluent was taken in a series of conical flask (i.e. from 50ml, 100ml, 150ml and 200ml). Each flask was inoculated with one loop of aspergillus niger and the decolorization was observed for series of days until it get decolorized fully[5].

RESULTS AND DISCUSSION

The physiochemical characterization of effluent is given in TABLE 1. Temperature was varied between 23°to27°C. This indicate the absence of any thermal pollution. The effluent odour was fruity odour. pH of effluent water varies for samples. N1 was slightly acidic, N2 and N3 was alkaline. Turbidity was maximum for N1 sample, N2 was less, N3 satisfactory. Acidity and alkalinity varies from 65mg/ml to 124mg/ml. N3 showed high alkalinity values throughout the period. N1and N2 was having high hardness was varied 35-145mg/l. N3 was suitable for drinking purposes as it has low hardness when compared with the other two which was high. The surface water standard for dissolved oxygen is 3mg/l. Dissolved oxygen is observed higher than this value and N3 showed higher value compared with the other 2 samples. The BOD, COD, TDS was given in TABLE 3. N1and N2 was showed high COD and BOD and N3was showed high TDS. The chlorine was varied from 22-180mg/l. sample N2and N3 was having high amount of chlorine. Sulphate and nitrate was varied from 14-165mg/l and 1-3mg/l. N2 sample was having high levels of sulphate and nitrate. Calcium was varied from 28-37mg/l. Sample N1 and N2 was having higher than N3. The N1, N2 and N3 samples in 150ml, 200ml took 7daysfor complete decolorization. Above result shows that aspergillus niger may be used as one of biological tool to decolorize the textile effluents.

Textile effluent from erode was highly colored, alkaline and fruity smelling in nature. Increased pH is due to excessive use of carbonate, bicarbonate, H_2O_2 and NaOH during bleaching process. N3 sample had the least electrical conductivity and high total dissolved solids, and high pH. The COD and BOD levels were higher in N1 and N2 sample compared to N3.

Decrease in BOD and COD levels suggest the fact that the process of bioremediation is in progress. High BOD and COD levels are another indicator of an increased load of organic pollutants in the effluent[6, 7].

TABLE 1 : Physiochemical characteristics of effluent water

Characteristics	Sample N1	Sample N2	Sample N3
Color	Reddish brown	Green	Brick red
Temperature (°C)	26.9	26.1	25.5
pH	6.34	7.45	7.3
Turbidity	19.3	1.7	8.1
Conductivity	1.36	0.82	0.25
Hardness	93.75	93.75	70
Dissolved oxygen	5.65	4.78	7.05
Acidity	0.26	0.43	0.22
Alkalinity	72	82	104.5
Chemical oxygen demand	56.3	45.12	32.37
Biological oxygen demand	77.4	77.7	27.9
Total dissolved solids	66.5	122.9	137.9
Chlorides	56.1	43.5	43.8
Sulphates	37.5	66	33.3
Nitrates	1.5	1.3	1.6
Ca^2++	31.8	31.8	23.8
Mg++	61.8	61.8	37.4
Silica	6.55	5.95	7.10
Iron	3.12	2.92	2.8

CONCLUSION

The result of this work suggests that it may be possible to decolorize textile effluent system by using aspergillus niger. We can conclude that the aspergillus niger can be used as decolorizing agent in the treatment of textile effluent.

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