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Feasibility Study of Phytoremediation Method for Treating Textile Wastewater

[1]Dr.Balaji. K, [2]Gopalakrishnan.D and [3]Dr.Poongothai. S.

[1] Assistant Professor, Department of Civil Engineering, Annamalai University, Annamalai Nagar, Tamil Nadu.
[2] P.G. Student, Department of Civil Engineering, Annamalai University, Annamalai Nagar, Tamil Nadu.
[3] Professor, Department of Civil Engineering, AnnamalaiUniversity, Annamalai Nagar, Tamil Nadu.

ABSTRACT: Present study investigates the feasibility of phytoremediation method for treating textile wastewater. COD reduction in the textile wastewater will be analyzed for determining the efficiency of phytoremediation method to treat textile wastewater in a designed tank. Plants have the capacity of withstanding high concentration of organic and inorganic chemicals. They convert chemicals to less toxic metabolites. In addition, some plants simulate the accumulation and degradation of chemicals by the rhizophore through the release of the root exudates, enzymes and organic carbon in soil or water.Two main methods have been adopted for environmental clean-up; Bioremediation which uses microbes to immobilizase toxic compounds. Phytoremediation use plants, including tress, grasses and aquatic plants, to remove, hazardous substance from the environment. In this study Rhizophore mucronota have been experimented for the phytoremediation method for treating textile wastewater.

Keywords: Phytoremediation, Feasibility, COD, pH, Chlorine.

1. INTRODUCTION

The textile industry consumes large quantities of water and produces large volume of wastewater from different steps in the dyeing and finishing processes. Waste water from printing and dyeing units is often rich in color, containing resides to reactive dyes and chemical and requires proper treatment before being released into the environment [3]. The toxic effects of dyestuffs and other organic compounds as well as acidic and alkaline contaminants, from industrial establishment on the general public are widely accepted. Increasing public concern about environmental issues had led to closure of several small-scale industries [9]. Phytoremediation is a cost-effective plant-based approach of remediation that takes advantage of the ability of plants to concentrate elements and compounds from the environment and to metabolize various molecules in their tissues. [7]. In phytoremediation system are to clean up contaminated water which includes identification and implementation of efficient aquatic plants uptake of dissolved nutrients and heavy metal by the growing plants and harvest and beneficial use of the plant biomass produced from the remediation system[2]. The recent edition of standard method of examination of water and wastewater for removal of chemical oxygen demand by using Rhizphora Mucronota for treating textile wastewater [1].

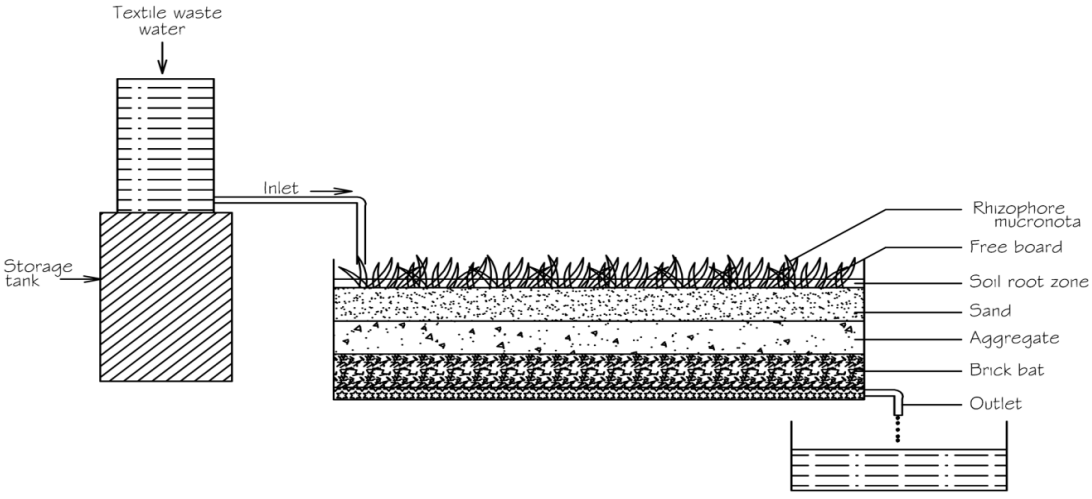
Rhizophoramucronata is a small to medium size evergreen tree growing to a height of about 20to25 meters (66to82 ft) on the banks of rivers. On the fringes of the sea 10 or 15 metres (33to49ft) is a more typical height. The tallest trees are closest to the water and shorter tree are further inland. The tree has a large number of aerial stilt roots buttressing the trunk. The leaves are elliptical and usually and 6 centimetres (2.4 inches) wide. They have elongated tips but these often break off. There are corky warts on the pale undersides of the leaves.Each has a hard cream-coloured calyx with four sepals and four white, hairy petals. The seeds are viviparous and start to develop whilst still attached to the tree. The root begins to elongate and may reach a length of a metric (yard) or more. The propagule then becomes detached from the branch when sufficiently well developed to root in the mud below. The flowers develop in auxiliary clusters on the twigs.

Figure.1 Schematic diagram for Rhizophoramucronata plant species.

2. Experimental setup

The steps in this procedure can be follows:

1) A plexi glass phytoremediation reactor was designed for proper settling and separation textile wastewater.
2) Selection of plants like *Rhizophora mucronata* was done.
3) The textile wastewater flows at constant rate of 1 litre per hour.
4) After 15 days of detention time for the treated wastewater was collected.
5) We can observe only chemical oxygen demand for before and after treatment for wastewater.



3. EXPERIMENTAL RUN

To study the survival of acclimatized mangrove in raw effluent, the preliminary test was conducted. After introducing into the raw textile dye effluent. The aquatic plant was gradually started to change after 5 days and showed complete dryness of leaves and there was no mark of growth (death after 7 days). Hence in the present study, the effluent was diluted in the ratio of 1:3

(tap water: textile effluent) and used for phytoremediation experiments and the same dilution again used for the rest of other two experiments. Among this, the experimental setup treated with Rhizophoramucronata were operated at 12:12 ratio (L:D) photoperiod for plant growth.

The experiments were conducted for a period of 45days, at regular intervals of 15days. After every 15days, the samples were taken from each experimental setup for the analysis of chemical oxygen demand.

Figure.2 Schematic diagram for phytoremediation reactor

4. RESULTS AND DISCUSSION

Table.1 % Removal of COD.

Days	Chemical Oxygen Demand	% of Removal COD
0	960.00	0%
15	830.00	15%
30	540.00	45%
45	270.00	87%

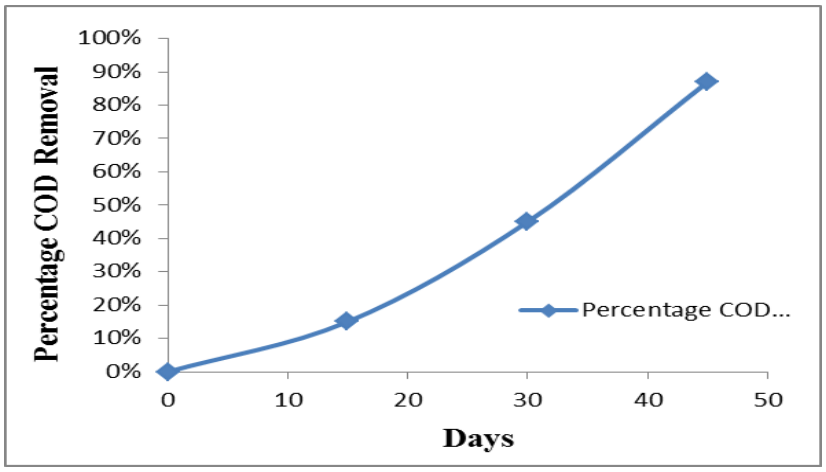


Fig.3 Percentage COD Removal Vs Days

COD of the textile wastewater showed a greater decrease towards the growth of the *Rhizophora mucronata.* Initially the growth of the plant is faster for the first 15 days and gradually the growth of the plant was reduced when compared for the first 15 days consecutively for the next 15 days cycle also. Hence the %removal of the COD was 45% in the first 15 days and started reduced for the next 30 days and achieved to 87% finally at 45 days which is satisfactory for the reduction of COD of the textile wastewater when compared for the other conventional textile wastewater treatment in reduction of COD.

5. CONCLUSION

Rhizophora mucronata species can be used for treating the textile wastewater in reducing the COD, a greater problem in the treatment of textile wastewater and being a greater challenge for the conventional treatment systems. Study concludes that Phytoremediation technique by using the *Rhizophora mucronata* species is the cost effective techniques used for achieving the higher chemical oxygen demand removal percentage of 87% in Textile Wastewater.

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