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Distillery Wastewater Treatment by Soil Aquifer Treatment System Using Tree Stems as Adsorbents

Shashikala.C.K[1], Nagarajappa D.P. [2], Shivakeshavakumar P.[3]

[1]PG student, Department of Studies in Civil Engineering, university B. D. T. College of Engineering, Davangere, Karnataka, India.
[2]Professor and chairman, Department of Studies in Civil Engineering University B.D.T. College of Engineering, Davangere, Karnataka, India.
[3]Professor, Department of Studies in Civil Engineering, Proudadevaraya Institute of Technology Hospet, karanataka, India.

Abstract - *Because of poor water management, the huge amount of wastewater created at all stages of sugar production is highly polluted. This form of effluent is released into the environment, either in surface water or on land. As a result, wastewater treatment for disposal and reuse is required for a healthy and sustainable environment. For improved wastewater management, many treatment procedures are used. For better distillery wastewater management, a soil aquifer treatment system is used in this study. The adsorbent is neem stem and coconut stem powder, which are utilized in the experiment. Due to the high ligno-cellulose content of coconut stem powder, it was shown to be extremely effective for wastewater treatment. When compared to other materials used as adsorbents, coconut stems are renewable, accessible in large quantities, and less costly. The results of this study demonstrate that distillery wastewater may be treated utilizing a SAT system using coconut stem powder as an adsorbent. Color (Pt. Co) 91.65 percent, Turbidity (NTU) 93.46 percent, TDS (mg/l) 89.88 percent, BOD (mg/l) 71.75 percent, and COD (mg/l) 76.96 percent. As a result, the SAT system is an effective wastewater treatment technology that may be utilized on land.*

***Key Words*: Soil Aquifer Treatment, Distillery Wastewater, Coconut Stem powder, Neem Stem powder, Soil.**

1.INTRODUCTION

To have healthy populations downstream, we need clean water upstream. Society benefits from wetlands and streams because they trap floodwaters, recharge groundwater supplies, filter pollutants, and offer habitat for fish and animals. Industrial wastewater are generally far more hazardoud than municipal wastewater treatment facility.In the analysis of distillery effluent samples, physico – chemical parameters such as p^H ,colour,turbidity,TDS, BOD and COD were found to be high in organic pollutants. Although all physical and chemical characteristics were reduced when PTDE was diluted by 50% or 75% with water. In this study helps to inexpensive and effective biosorbent that is easily available in large quantities for treatment of wastewater. Natural materials that are available in large quantities or certain waste from agricultural operations may have potential to be used as low cost adsorbents,as they represent unused resources,widely available and are environmental friendly. Adsorption technique was many materials for water purification in these ways, and it is popular with everyone due to its processing effect , economical and low secondary contamination to the surrounding.SAT is generally a low tech , self contained wastewater treatment system. In addition, the water regained from a SAT system is clean and smell free, as it is from a well ,a lake or a stream or a low zone as opposed to a sewer or sewage treatment facility.Adsorption is a mass transfer process in which a material is transported from the liquid to solid phase and gets bonded by physico – chemical adsorption. Physical and chemical properties of adsorbate and adsorbent , p^H, temperature and changing depth of adsorbent are some of the aspects to consider in the adsorption process. It is possible to utilize low cost adsorbents made from natural materials that are readily available and ecologically acceptable. Utilized adsorbents may be used as filter material and therefore disposed of simply and safety. Because of its all encompassing nature, modesty and ease of operation ,adsorption is regarded the finest wastewater treatment technology.

2. MATERIALS AND METHODOLOGY

2.1 Collection of Soil

In this study one type of soil was used. A soil was taken from DCM township in Davangere to preserve the field environment. In the field DCM township , Davangere a red sandy clay soil sample was obtained using the core cutter method.

2.2 Collection of Wastewater

The primary treated distillery effluent was diluted and it is used as a source of wastewater for experiment. Big plastic can were used for collection of sample. Sample of industrial wastewater was taken from the sugarcane industries Duggavati at temperature 33^0C. The characteristics of wastewater throughout the experiment was managed by preservation in refrigerator.

2.3 Preparation of Adsorbent

Gather the coconut and neem stems. After gathering the stems, clean them with water many times until there are no dirt particles left. After washing the stems, we must dry them in the sun for three days until they are completely dry. After the stems have dried, gather them and it was powdered by wood cutting saw, then wash the powder with purified

water. After the washed powder has been dried in the oven for 9 hours, sieves of various sizes should be used.Keep it in an airtight container.

2.4 Experimental Set Up

To investigate the behaviour of the SAT system when used in conjunction with natural adsorbent in the treatment of primary treated distillery wasted wash wastewater with and without adsorbent columns. For the experiment, four columns of PVC pipes were employed. Each column is 120cm long with a 10cm inner diameter. The outlet is located at the bottom of the column, while the overflow pipe is located on the side of the column at the top. A 60 micron mesh is installed within the bottom of each column to prevent dirt and effluent from escaping. While filling the soil in the column, the field density of soil is maintained. Wastewater is collected in the feeding tank and stored at the top of the column. Wastewater from the feeding tank is allowed to flow into the column to be treated. To keep the water flowing, a 30cm ponding depth is given above the earth. The operation is repeated at various heights of adsorbent in the column, with the soil depth remaining constant at 80cm throughout the experiment.soil are put in the column by calculating the capacity of the pipe in relation to the depth of adsorbent filling.

3. Results and Discussions

3.1 Soil Classification for Experiment

Experimental experiments were undertaken to determine the behaviour of the Soil Aquifer Treatment (SAT) system in treating wastewater without and with adsorbent. As an adsorbent, Red Sandy Clay and two different stem powders were employed. Place in the soil mass that will be utilised in the experiment. It is important to observe the performance of the soil aquifer treatment (SAT).

3.2 Removal Efficiency

Table 1: SAT System Performance In Treating Industrial Wastewater With Adsorbent 20% Height from Bottom.

Sl. No	Parameter	Removal Efficiency(%)	
		Neem Stem	Coconut Stem
1	Colour(Pt Co)	82.99	90.28
2	TDS(mg/l)	81.02	89.38
3	TURBIDITY, (NTU)	54.24	80.39
4	BOD(mg/l)	59.25	69.135
5	COD(MG/l)	62.38	69.91

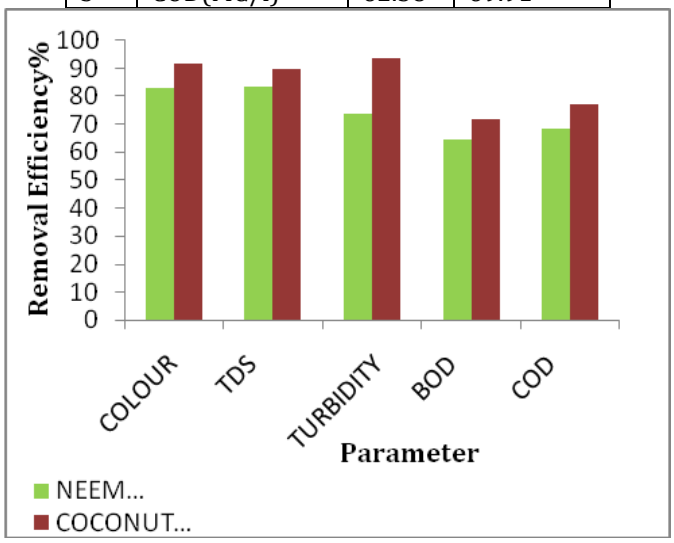

Figure 1: Comparison between Two Adsorbents, Positioning of Adsorbents 20% Height from the Bottom

From table 1 and fig 1 the highest removal effectiveness was found in Coconut stem adsorbent powder with sandy clay soil, while the lowest removal efficiency was found in Neem stem powder.

Table 2: SAT System Performance In Treating Industrial Wastewater With Adsorbent 40% Height from Bottom.

Sl. No	Parameter	Removal Efficiency(%)	
		Neem Stem	Coconut Stem
1	Colour(Pt Co)	83.31	91.25
2	TDS(mg/l)	81.52	89.88
3	TURBIDITY, (NTU)	60.78	86.92

4	BOD(mg/l)	61.11	71.60
5	COD(MG/l)	62.38	74.14

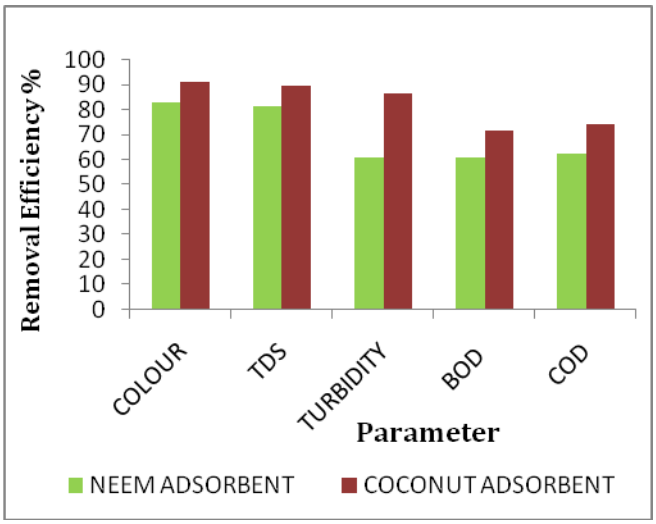

Figure 2: Comparison between Two Adsorbents ,Positioning of Adsorbents 40% Height from the Bottom.

From table 2 and fig 2 the highest removal effectiveness was found in Coconut stem adsorbent powder with sandy clay soil, while the lowest removal efficiency was found in Neem stem powder.

Table 3: SAT System Performance In Treating Industrial Wastewater With Adsorbent 60% Height from Bottom.

Sl. No	Parameter	Removal Efficiency(%)	
		Neem Stem	Coconut Stem
1	Colour(Pt Co)	83.15	91.65
2	TDS(mg/l)	83.52	89.88
3	TURBIDITY, (NTU)	73.85	93.46
4	BOD(mg/l)	64.50	71.75
5	COD(MG/l)	68.50	76.96

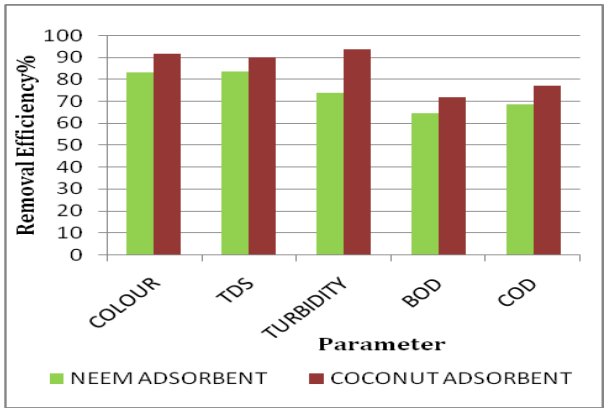

Figure 3: Comparison between Two Adsorbents , Positioning of Adsorbents 60% Height from the Bottom.

Table 3 and fig 3 represents the most removal efficiency was done by position of adsorbents 60% Height from the bottom with Coconut stem adsorbent powder and sandy clay soil, while the lowest removal efficiency was found in Neem stem powder.

4. CONCLUSIONS

With several experiments, all characteristics such as type of soil, different stem powder adsorbents, and layer of soil in conjunction with adsorbent, and initial concentration of pollutants in wastewater were taken into consideration. Based on the analysis of the data, the following findings were reached.

- Coconut stem powder has proved to be a promising material for the removal of contaminants from distillery wastewater
- Not only coconut stem powder is an abundant cheap adsorbent, but also it is highly efficient for removing pollutants from wastewater.
- Novel technologies for the treatment and reuse of industrial wastewater have been developed, One of the approaches with a high infiltration system is SAT.
- In this studies found that SAT treatment of wastewater produces good beneficial outcomes using two different stem powder as adsorbents.

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