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"Distillery Wastewater Treatability Studies by using Soil Aquifer Treatment in Conjunction with Natural Adsorbents"

Tippanagouda T. B.[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, 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 - *soil aquifer treatment is one of the process used for treating distillery wastewater. SAT is used for treating the various wastewaters. SAT system provided maximum removal efficiency. Six different leaves powder is used as adsorbent the six different leaves includes almond, neem, peepal jackfruit banyan, peepal trees leaves crushed and combined together to form single adsorbent. the studies were carried out with varying adsorbent heights at 20%,40% and 60% with varying soil depths in four different columns and maintained ponding depth was 30 cm. and soil properties were determined and soil used was red clayey sand and the parameters analyzed were pH, color, TDS, Turbidity, COD and BOD. Without adsorbent maximum removal efficiency for color 87.36%, for TDS 69.95%, Turbidity 60.91%, COD 48.44%, and for BOD 56%. The maximum removal efficiency with adsorbent at 20% height from bottom , for color 82.87.5%, TDS 74.24%, Turbidity 86.57%, COD 48.38% and BOD 56%. The maximum removal efficiency with adsorbent at 40% height from bottom for color 82.32%, TDS 80.25%,Turbidity 89.77%,COD 54.68% and BOD 56% and the maximum removal efficiency with adsorbent at 60% height from bottom, for color 88.25%, for TDS 74.24%, for Turbidity 89.64%,for COD 55% and for BOD 58%.*

***Key Words*: SAT, Mixed Leaves Powder, Distillery Wastewater, Red Clayey Sand, Ponding Depth And Removal Efficiency.**

1.INTRODUCTION

Water is Natural and very much essential for every human life. It is one of the most necessary things for plants and creatures on the earth. Our earth's surface covers over 70.9% of water, of which 97% of the Water is secured by seas and oceans,0.60% of by other area surface water bodies like waterway, lakes and 2.4% of water by polar ice tops and water is a key to life now a day's scarcity of water is more because of deforestation, increasing population, increasing temperature day by day and changes in people's standards of living to solve and Overcome these problems certain changes are to be made to maintain and increase the suitable environment. Purification of wastewater through a soil an alternative technology for purifies the wastewater. Soil has a special property of adsorbing impurities and filter wastewater and also pretreated wastewater. The wastewater can be treated by chemical and biological methods. The European Environment Agency believes that wetlands across the globe provide services worth €2.5 billion per year, including as water filtration and carbon absorption. Water is a basic service, a basic material, and one of the regulating services that keeps our planet functioning while also controlling temperature and weather.

Soil aquifer treatment for wastewater reuse is a cost-effective and ecologically favorable tertiary treatment. When unclean water is recharged, the unsaturated region and aquifer act as natural filters, reducing the concentration of various contaminants due to physical, chemical, and microbiological processes. The SAT is the most common method of artificial recharging because it does not necessitate a high level of technology. It's simple to use and maintain, and it can treat replenished water to an exceedingly high standard. The SAT system is a tried-and-true way of increasing the quality of wastewater. It improves people's living conditions. SAT stands for "geo-purification." Aquifer storage has a higher storage capacity than surface water reservoirs, requires less acreage, is less expensive, prevents evaporation, and can give extra purification to the treated effluent by recharging through unsaturated soil layers. SAT aids in the polishing of storm water and treated wastewater, as well as providing natural storage capacity for reuse or groundwater recharge. SAT is designed to be the best, most cost-effective, tolerable, and reclaimable method for producing higher-quality water from treated wastewater effluent for both portable and non-portable purposes.

1.1 About Wastewater

Waste water is contaminated water which includes various impurities, toxic materials etc. In simple way wastewater is water that can be contaminated by various human activities Wastewater is produced from various combination of industrial, domestic, agricultural and commercial activities. The wastewater has various characteristics and they depending on the source. The waste constitutes various hazardous materials, heavy metals, and the tremendous increase in heavy metals will cause serious and Harmful effect on human health and our environment. Wastewater

treatment Process for removing pollutants from wastewater and converting it into an effluent that may be returned to the water cycle with little environmental effect or utilized directly. The kind of wastewater to be treated distinguishes wastewater treatment plants. As the globe faces rising fresh water demand and difficulties connected with wastewater disposal, water recycling and reuse has become a key component of current water management methods. . Wastewater is any water that has been contaminated by human use.

1.2 Industrial Wastewater

Industrial wastewater is a wastewater which is generated from various industrial activities .an industrial wastewater is one of the most important pollution source in our environment and it has a substantial impact on water contamination. Industrial effluent was dumped into lakes, rivers, and coastal regions throughout the previous century. As a result, our ecosystem faces a major water contamination problem. It also has severe consequences on human health and the environment. Textile, sugarcane, soap, pulp, and tannery industries are only a few of the main sectors that contribute significantly to water pollution in our environment. Industrial wastewater contains a variety of physicochemical properties. After the bio methanation process, bio methanated distillery wasted wash is a nutrient-rich liquid organic waste derived from molasses-based distillery businesses. Because the wasted wash is high in organic molecules, it can cause substantial changes in the biological characteristics of soils, which can have a major impact on soil fertility. A field experiment was used to investigate the impact of various quantities and techniques of waste wash application on soil microbial activity.

2. MATERIALS AND METHODOLOGY

2.1 Wastewater Sample Collection

Waste water sample collection is very much necessary. Here the wastewater is collected from sugarcane industry Duggavati.

Details of Wastewater sample

- Collection location – sugarcane industry duggavati.
- Collection season – summer
- Date and time- 6th April 2021 at 3 pm
- Temperature - 33ºC

2.2 Characterization of Wastewater

The untreated distillery wastewater is analyzed for color, Total dissolved solids, Turbidity, Chemical oxygen demand and Biological oxygen demand.

2.3 Adsorbent Preparation

Collect the Almond leaves,peepal leaves,teak tree leaves banyan tree leaves, jackfruit leaves and neem tree leaves. Collected from trees available in our college campus. After collecting the leaves are rinse away with water few times till no dirt particles. After washing the leaves we have to dry those leaves sunlight for 3 days till they becomes fully dry. After drying the leaves, collect and crush those leaves in a gunny bags and make those crushed leaves into powder form by using domestic grinder it becomes powder again wash that powder by using distilled water. The washed powder is should be dry in oven for 9 hours and then sieves of different sizes. Store in air tight container.

2.4 Preparation of Soil

The dry density of soil in field and dry density of that soil used to fill in the column is maintained almost same. This condition is achieved by calculating the weight of soil used for filling in the column. The weight of soil is obtained by multiplying field dry density of particular soil sample with the volume of the column. The amount of water to be added to soil is obtained by multiplying weight of soil and moisture content of that soil sample. Then the soil is mixed properly by adding the measured amount of water. In four layers soil is filled in column and each layer is compacted.

2.5 Experimental Setup

To investigate the behavior of the SAT system in conjunction with natural adsorbent in the treatment of distillery spent wash wastewater with and without adsorbent columns. The experiment necessitates the use of four columns of PVC pipes. Each column has a 120cm length and a 15cm inner diameter. The outlet should be at the bottom of the column, with the overflow pipe on the side of the column. A 60 micron mesh is installed within the bottom of each column to prevent soil 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 tower 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 soil.

3. RESULTS AND DISCUSSIONS

3.1 Optimum Removal Efficiency for Red Clayey Sand in Performance with SAT System with varying adsorbent heights.

Parameters	Time	0%	20%	40%	60%
Color	390	87.36	87.5	82.32	88.2
TDS	360	69.95	74.2	80.25	74.2

Turbidity	360	60.91	86.5	89.77	89.6
COD	390	48.44	48.3	54.68	55
BOD	390	56	56	56	58

Table 3.1 shows the performance of SAT system without adsorbent, with adsorbent at 20% height from bottom, at 40% height from bottom and at 60% height from bottom the maximum removal efficiency values were recorded as follows without adsorbent color 87.36%,at 20% height 87.5%, at 40% height 82.32%, and at 60% height 88.25%, without adsorbent for TDS 69.95%,at 20% height 74.24%,at 40% height 80.25%, at 60% height 74.24%, without adsorbent for turbidity 60.91%, with adsorbent at 20% height 86.57%, at 40% height 89.77%, at 60% height 89.64%, without adsorbent for COD 48.44%,with adsorbent at 20% height 48. 38%, at 40% height 54.685,at 60% height 55%, and also without adsorbent for BOD 56%, with adsorbent at 20% height 56% at 40% height 56% at 60% height 58%.

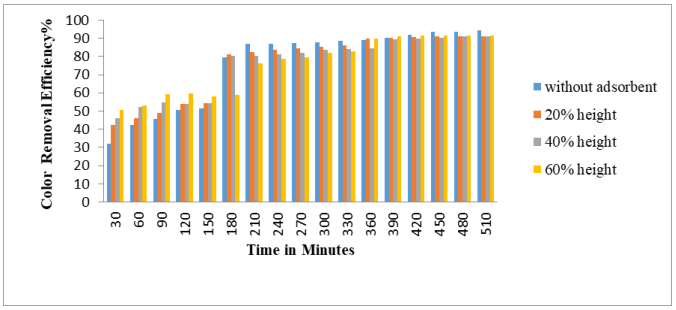

Fig 4.2 Removal Efficiency of Color for Red clayey sand Without Adsorbent and with Adsorbent At 20%, 40%, and 60% Heights from Bottom.

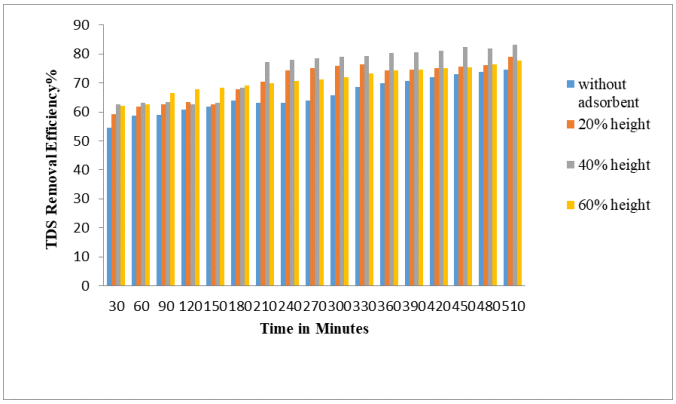

Fig 4.3 Removal Efficiency of TDS for Red clayey sand Without Adsorbent and with Adsorbent At 20%, 40%, and 60% Heights from Bottom.

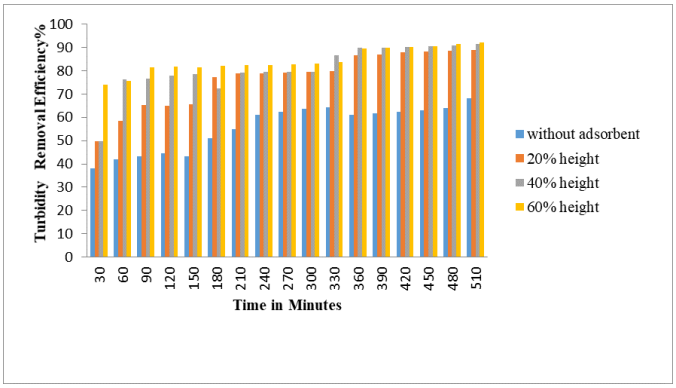

Fig 4.4 Removal Efficiency of Turbidity for Red clayey sand Without Adsorbent and with Adsorbent At 20%, 40%, and 60% Heights from Bottom.

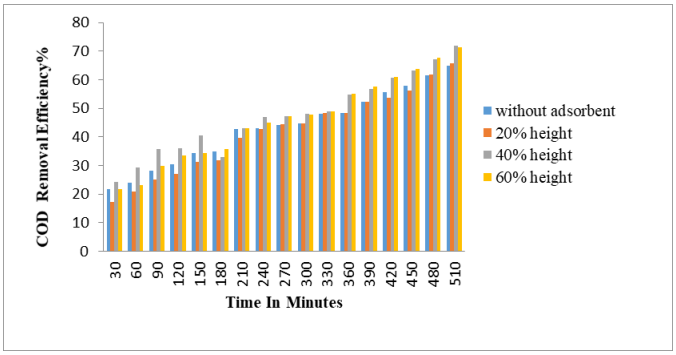

Fig 4.5 Removal Efficiency of COD for Red clayey sand Without Adsorbent and with Adsorbent At 20%, 40%, and 60% Heights from Bottom.

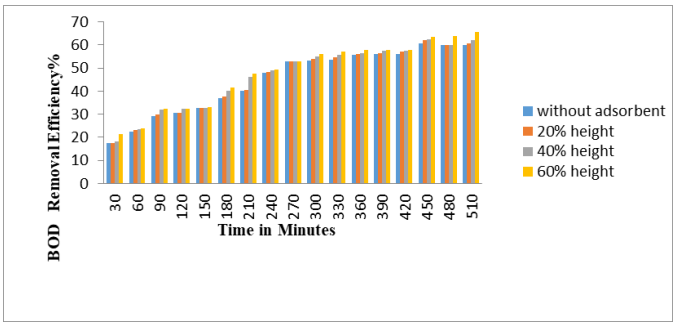

Fig 4.6 Removal Efficiency of BOD For Red clayey sand Without Adsorbent and with Adsorbent At 20%, 40%, and 60% Heights From Bottom.

4. CONCLUSIONS

With different experiments, all parameters are investigated such as kind of soil, different leaves powder adsorbents, layer of soil in conjunction with adsorbent, and beginning concentration of pollutants in wastewater for SAT system capability assessment in treating diluted distillery spent wash. Based on the analysis of the data, the following findings were reached. SAT process behavior with adsorbent in treating diluted distillery spent wash was

more efficient in sandy soil than compared to red clayey soil.

Removal efficiency of various parameters for red clayey sand with adsorbent are as follows color(Pt Co) 88.25%, for 390 minutes at 60% height from bottom, TDS(mg/L)80.25%, for 360 minutes at 40% height from bottom, Turbidity (NTU)89.77% for 360 minutes at 40% height from the bottom of the column, for COD(mg/L) 55% for 390 minutes at 60% height from the bottom and BOD(mg/L)58% for 390 minutes at 60% height from the bottom. Red clayey sand without adsorbent the removal efficiency are color(Pt Co) 87.36%, TDS(mg/L) 69.95%. Turbidity 60.91%, COD(mg/L)48.44% and BOD(mg/L) 56%.

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