

ABSTRACT

Water resources around the world are under increasing pressure from the rapidly growing demands of rising population and industrialization. It is not only the depletion of quantity but also the quality is deteriorating due to indiscriminate discharge of untreated industrial waste waters and sewage generated from the community. Therefore treatment of wastewater for disposal and reuse is necessary for safe and sustainable environment. Several treatment techniques are adopted for better management of wastewater. In the present study Soil Aquifer Treatment System is adopted for wastewater reclamation for potable and non-potable uses. Textile Mill wastewater was used for experimentation to assess the treatment efficiency of SAT system in treating these wastewaters under varied experimental conditions. Clayey sand and silty sand are the two soils used for experimentation along with the Peepal leaf and Almond leaf has the adsorbents. Removal efficiency of chloride BOD and COD was maximum in clayey sand in conjunction with peepal leaf has adsorbent. Where in Colour and TDS removal was maximum in clayey sand when compared to silty soil and soils in conjunction with adsorbents.

KEYWORDS: Soil Aquifer Treatment, Textile mill Wastewater, Soils and Adsorbents

I. INTRODUCTION

The significance of suitable sanitation and the accessibility of enough amounts of water for human utilization, modern and farming use can't be over worried as they assume a dynamic part in maintaining a well living and in the improvement of countries. Greatest human exercises, including water utilize, deliver wastewater which must be dealt with to prescribed or satisfactory guidelines before reuse or discharging into the earth to stay away from contamination of the accepting amphibian bodies. As populaces keep on increasing with its related inconveniences of waste era and contamination of surface water and groundwater, weight on accessible water assets is expanding. This united with periodic droughts around the world and uneven distribution of water resources has conveyed about the need for advanced sources of water supply and local preservation. Wastewater effluents which are treated highly from wastewater treatment plants are now more and more being considered as a reliable source of water supply.

Soil Aquifer Treatment (SAT) is set up to be best, low-cost, bearable and reclaimable technology, which has the ability to produce higher quality of water from the treated wastewater effluent for potable and non-potable uses. During the Soil Aquifer treatment the saturated and unsaturated layer of the soil and groundwater aquifer pretend as the medium in which biological and physicochemical reactions take place. Due to this reaction there is substantially reduction in levels of organic and inorganic compounds.

II. MATERIALS AND METHODS**Soil Collection**

To maintain field environments several soil samples were collected from two different places Sitamma college campus Davangere (silty sand) and from Field beside Rail Nagar, Hubli (clayey Sand).The soils were collected

from the depth of 10 to 50cm due to the fact that most decontamination takes place at the topmost layer of the soil and also most faecal bacteria destroys at the top layer of the soil.

Collection of Wastewater

The textile mill wastewater utilized for experimentation was collected from Gadag Co-operative Textile Mill Ltd., Hulkoti. Grab sampling was carried out to collect the textile mill wastewater and the collected textile mill wastewater was stored in plastic can and preserved in refrigerator to maintain the initial characteristic of textile mill wastewater.

Preparation of Adsorbent

Almond leaf (*Terminalia catappa* L) and Peepal leaf (*Ficus religiosa*) leaves were collected from trees in plenty obtainable at the Rail Nagar, Hubli, India. The collected leaves were rinse away with water few times till no dirt particles enclosed in wash water followed by drying in sunlight for 3 to 4 days until its fully dried. The dried leaves were crushed in gunny bag firstly and powered using domestic mixer grinder and different size fractions of powered leaves were collected.

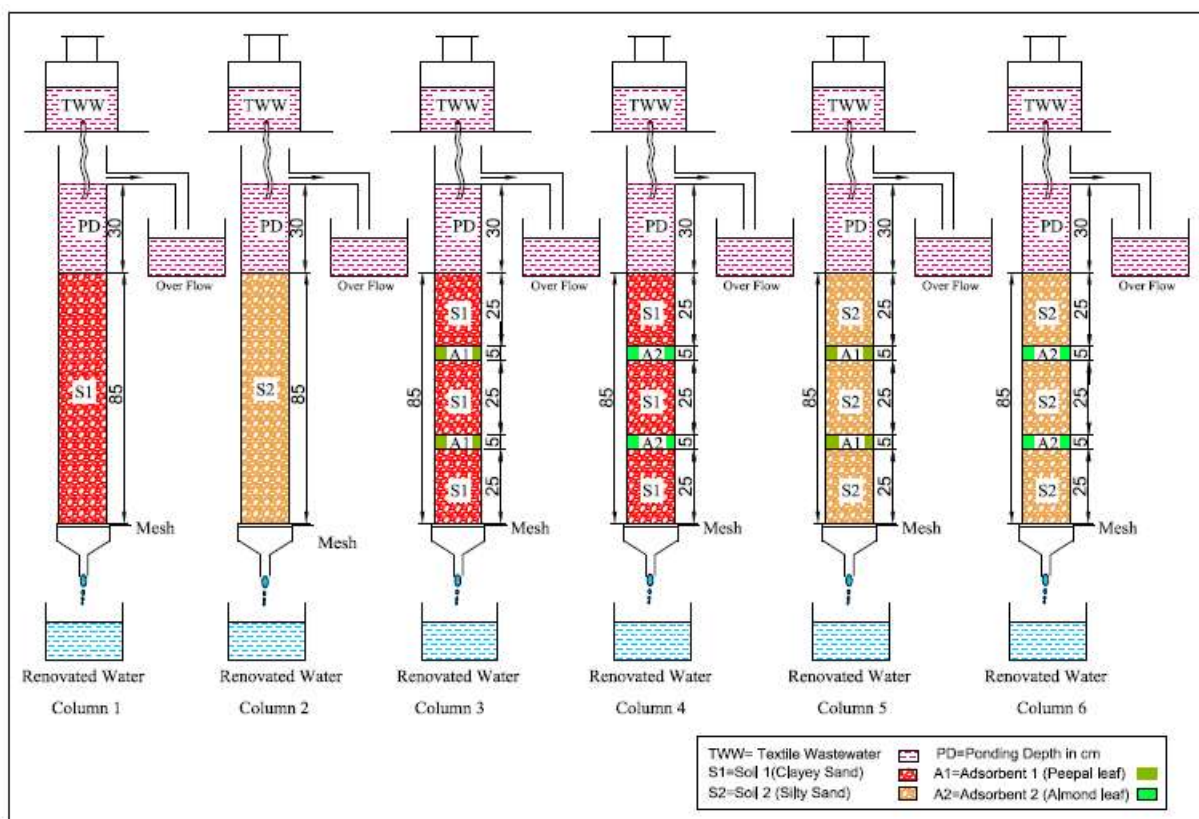


Figure 1: Schematic line Diagram of Experimental Setup, SAT System

Six columns made up of PVC pipe were fabricated for the experimentation. Each column of 115cm length and 16cm inner diameter with the outlet at the bottom and overflow pipe at the side of top. In order to avoid the escape of soil the bottom of each column was persevered with 60 micron mesh inside. The columns are filled by retaining the field density of the soil. Feeding tank containing wastewater sample is placed at the top, wastewater fed from the top and after getting treated renovated water is collected from the outlet provided at the bottom of columns. Column 1 (C1) is filled with clayey Sand soil at a depth of 85cm, column 2 (C2) is filled with silty sand soil at a depth of 85cm, column 3 (C3) is filled with two layer of peepal leaf adsorbents placed in between three alternate layer of clayey Sand soil of soil layer depth 25cm and adsorbent depth 5cm, column 4 (C4) is filled with two layer of almond leaf adsorbents placed in between three alternate layer clayey Sand soil of soil layer depth 25cm and adsorbent depth 5cm, column 5 (C5) is filled with two layer of peepal leaf adsorbents placed in between three alternate layer of silty sand soil of soil layer depth 25cm and adsorbent depth 5cm and column 6 (C6) is filled with two layer of almond leaf adsorbents placed in between three alternate layer silty sand soil of soil layer depth 25cm and adsorbent depth 5cm respectively shown in figure 1.

III. RESULTS AND DISCUSSION

The analysis and experimentations were carried out as explained in material and methodology enabling to evaluate the performance of column studies by using two types of soils with and without adsorbent under different experimental conditions for treatment of textile mill wastewater.

Table 1: Performance of SAT System with and without Adsorbent in Treating Textile Mill Wastewater

Sl.No	Parameters	Characteristics						
		Influent	Effluent from different columns					
			C1	C2	C3	C4	C5	C6
4	Colour, PtCo	806	96	330	430	485	620	681
5	TDS, mg/l	4430	1262	2261	1826	2127	2012	2841
7	Chlorides, mg/l	1785	600	910	450	480	490	510
10	BOD, mg/l	1800	715	800	380	420	510	550
11	COD, mg/l	4005	1500	1700	940	1020	1260	1220

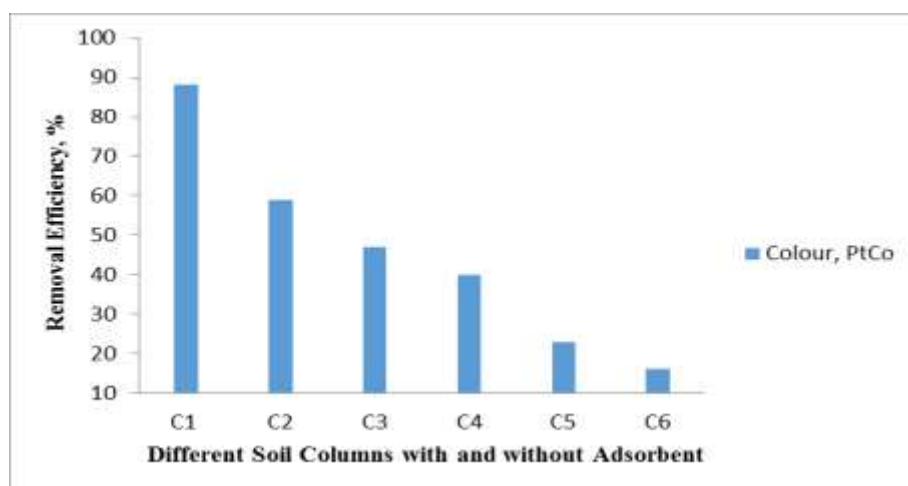


Figure 2: Effect of Soil Column with and without Adsorbent on Colour

From the figure 2 and table 1 shows that maximum removal of colour took place in C1 (Clayey sand soil) and minimum removal in C6 (Silty sand with Almond leaf as adsorbent).

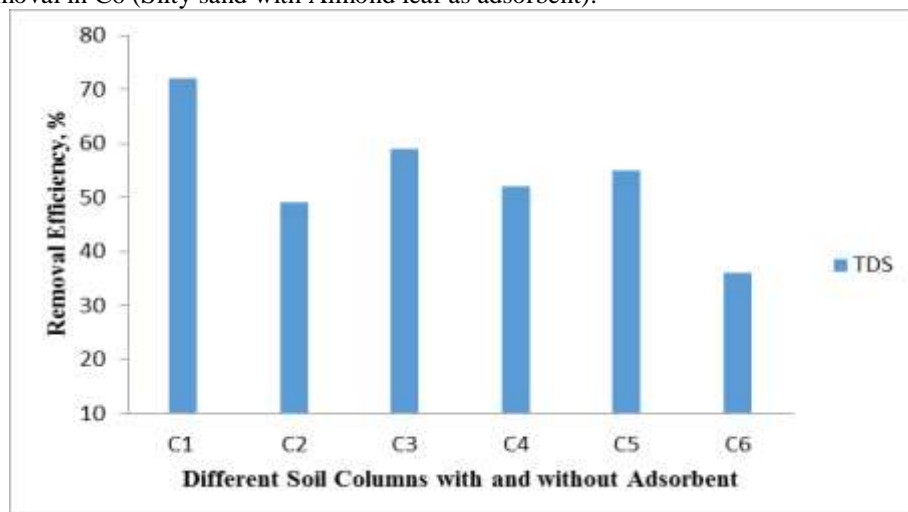


Figure 3: Effect of Soil Column with and without Adsorbent on TDS

From the figure 3 and table 1 shows that maximum removal of TDS took place in C1 (Clayey sand soil) and minimum removal in C6 (Silty sand with Almond leaf as adsorbent).

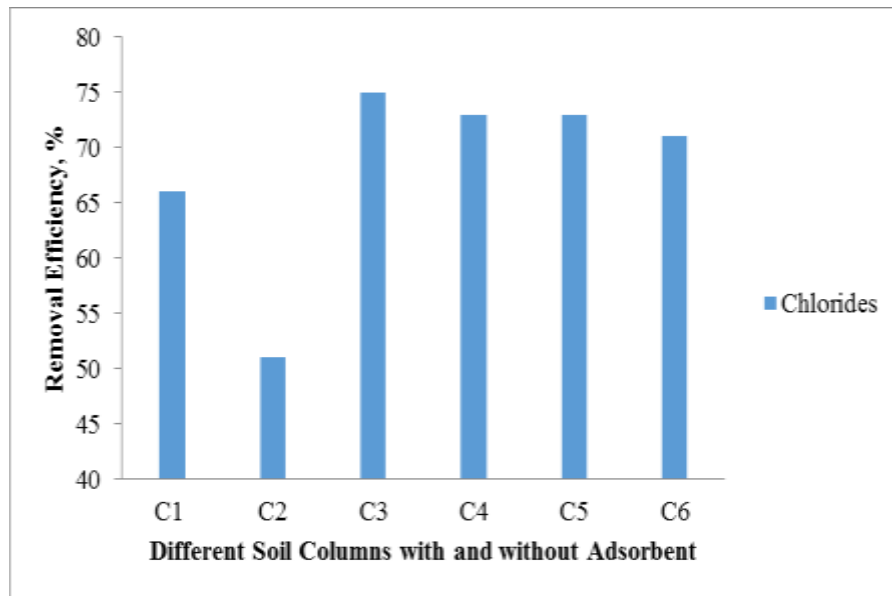


Figure 4: Effect of Soil Column with and without Adsorbent on Chlorides

From the figure 4 and table 1 shows that maximum removal of Chloride took place in C3 (Clayey sand soil with peepal leaf as adsorbent) and minimum removal in C2 (Silty sand soil).

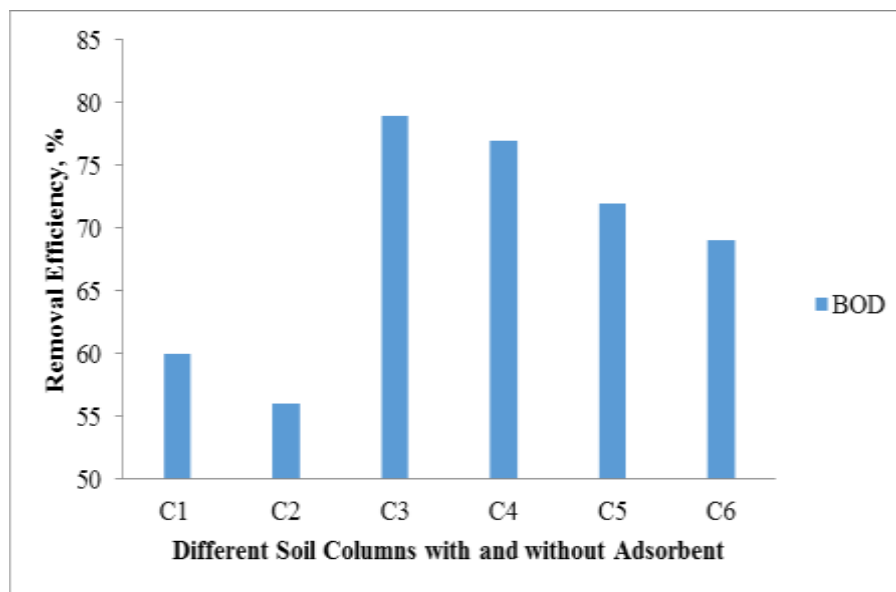


Figure 5: Effect of Soil Column with and without Adsorbent on BOD

From the figure 4 and table 1 shows that maximum removal of BOD took place in C3 (Clayey sand soil with peepal leaf as adsorbent) and minimum removal in C2 (Silty sand soil).

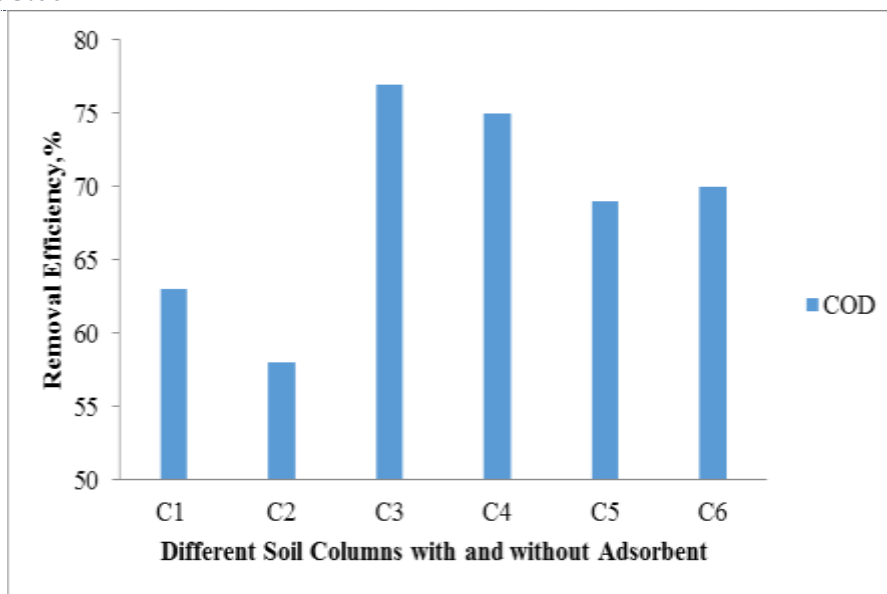


Figure 6: Effect of Soil Column with and without Adsorbent on COD

From the figure 4 and table 1 shows that maximum removal of COD took place in C3 (Clayey sand soil with peepal leaf as adsorbent) and minimum removal in C2 (Silty sand soil).

IV. CONCLUSION

1. SAT system with clayey Sand soil was more efficient in removing colour, TDS, compared with silty sand soil and in soil conjunction with adsorbent.
2. Chloride, BOD and COD optimum removal was observed in clayey sand soil with peepal leaf as adsorbent
3. This system can be employed for treating textile mill wastewater and retrieved water can be used for indirect uses.

V. REFERENCES

- [1] **Akber A, E. Al-Awadi and Rashid** (2003) "Assessment of the use of Soil Aquifer Treatment (SAT) Technology in Improving the Quality of Tertiary Treated Wastewater in Kuwait", *Emirates Journal for Engineering Research*, vol. 8(2), pp:25-31.
- [2] **Deepa K and M. Krishnaveni** (2012) "Water Quality Performance of Soil Aquifer Treatment (SAT) using Municipal Treated Wastewater of Chennai City, India" *Journal of Environmental Hydrology*, vol. 20(2) pp:1-8.
- [3] **Essandoh H.M.K , Tizaoui C, Mohamed M.H.A, Amy. G and Brdjanovic** (2011) " Soil Aquifer Treatment of Artificial Wasterwater under Saturated Conditions", *Journal of Water Research*, vol. 45 pp:4211-4226.
- [4] **Irina-Isabella Savin and Romen Buthnaru** (2008) "Wastewater Characteristics in Textile Finishing Mills", *Journal of Environmental Engineering and Management*, vol. 7(6), pp:859-864.
- [5] **Kerem GUNGOR and Kahraman UNLU** (2015) " Nitrate Removal Efficiencies of Soil Aquifer Treatment Columns", *Turkish Journal of Engineering Environmental Science*, vol. 29, pp:159-170.
- [6] **Lav Varma and Jyoti Sharma** (2011) "Analysis of Physical and Chemical Parameters of Textile Wastewater", *Journal of International Academy of Physical Sciences*, vol. 15(2), pp:269-276.
- [7] **Mahmoud A. Elsheikh and Waleed K. Alhemaidi,**(2014) "Wastewater Resue Through Soil Aquifer Treatment", *Journal of Engineering and Technology Research*, vol. 2(1), pp:25-35.
- [8] **Mesut A K and Orhan Gunduz** (2013) "Comparison of Organic Matter Removal from Synthetic and Real Wastewater in a Laboratory-Scale Soil Aquifer Treatment", *Journal of water air soil pollution*, vol. 224:1467 pp:1-16
- [9] **Nagarajappa D.P, Manjunatha K and Manjunath N.T.** (2010),"Effects of Soil Types on Performance of Soil Aquifer Treatment (SAT) System" *Journal of Indian Geotechnical Conference*, pp.425-428.



- [10] **Prakorn Ramakul, Yachanapa Yanachawakul, Natchanun Leepipatpiboon and Niti Sunsandee** (2012) "Biosorption of Palladium (II) and Platinum (IV) from Aqueous Solution Using Tannin from Indian Almond (*Terminalia Catappa* L.) Leaf Biomass: Kinetic and Equilibrium Studies", *Chemical Engineering Journal*, pp:102-111.
- [11] **Shubha Dwivedi, Prasenjit Mondal and Chandrajit Balomajumder** (2014) "Bioadsorption of Fluoride by *Ficus religiosa* (Peepal Leaf Powder) : Optimization of Process Parameters and Equilibrium Study", *Research Journal of Chemical Sciences*, vol. 4(7), pp:52-60.
- [12] **Sivasangari. S, Suseendhar. S, Suresh Kumar K, Vijayaprasath. N and Thirumurugan. M** (2016) "Characteristic Study of Electroplating and Dye Industrial Effluents", *International Journal of Innovative Research in Science, Engineering and Technology*, vol. 5(12), pp:20810-20816.
- [13] **Vigneshpriya D and Shanthi E** (2015) "Physicochemical Characterization of Textile Wastewater", *International Journal of Innovative Research and Development*, vol. 4(10), pp:48-51.

CITE AN ARTICLE

Chavan , S., Nagarajappa, D. P., & Chavan, S. (2017). TEXTILE MILL WASTEWATER TREATABILITY STUDIES BY SOIL AQUIFER TREATMENT SYSTEM IN CONJUNCTION WITH NATURAL ADSORBENTS . INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH TECHNOLOGY, 6(9), 140-153. Retrieved September 5, 2017