Treatmentability Study by Soil Aquifer Treatment Using Ashoka Tree Leaves Powder Adsorbent

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Abstract- *The present study explores the effectiveness of treating Dairy wastewater using Soil Aquifer Treatment in conjunction with Ashoka tree leaves powder adsorbent. In this column study efferts have been taken to find the removal efficiency of SAT under varied positioning of adsorbent at 20%, 40%, 60% and 80% height from bottom of column. The parameters like colour, turbidity, total dissolved solids, total suspended solids, chemical oxygen demand and biological oxygen demand are considered. Loamy Sandy soil in conjunction with Ashoka tree leaves adsorbent positioned at 40% showed maximum removal efficiency and among other parameter turbidity removal efficiency of 99.22% is maximum.*

Keywords- Adsorbents, Ashoka Tree Leaves Powder, Dairy Wastewater and Soil Aquifer Treatment.

I. INTRODUCTION

Fresh water is scarcely available in future days due to many reasons like increase in population, increase in per capita water consumption and due to increase in drought conditions in different parts of world. Therefore there is need for discovery of an alternate source of water that satisfies growing demand of water [2].

SAT system is one of the emerging natural treatment technology available for wastewater treatment which can produce effluent of acceptable quality. SAT system is comparatively cheaper than other existing conventional treatment technologies [5].

Dairy industry is considered to be one of the largest source of generation of food processing wastewater which is mainly organic in nature[4].

II. RELATED WORK

Achla Kaushal et al. [1] from his studies showed that agro based adsorbent like Ashoka Tree Leaves powder has a capacity to treat wastewater. He achieved success in removing zinc ions from aqueous solutions to great extent.

Sarada D. K. et al. [3] from the studies carried showed the Soil aquifer treatment technology is the wastewater reclaiming technology to acceptable limit. In this study wastewater is treated by SAT under conditions like types of soil and different depth of soil. 1m depth of silty soil exhibited better removal efficiency than clayey soil.

III. METHODOLOGY

A. Preparation of Soil

Loamy Sandy soil was characterized through geotechnical properties. The field dry density was found to be 1.68 g/cm3 and same conditions were maintained by mixing water and by compaction. Single depth of 0.8m and different heights of adsorbent layers were considered. An 8cm layer of adsorbent at 20%, 40%, 60% and 80% was introduced in four columns.

B. Preparation of Adsorbent

From public parks Ashoka tree leaves are collected and allowed to dry for few days and dry leaves were cleaned and powdered using grinder and thoroughly washed using distill water and dried in oven for 8 hours and sieved through 300 micron sieve and finally stored in air tight container[4].

C. Collection Source of Wastewater

Wastewater is collected through dairy. The untreated wastewater from common collection basin from effluent treatment plant (ETP) is collected through grab sampling.

D. Experimentation

Column studies are carried out using PVC pipes of 15cm diameter and 1.1m length. Single soil depth of 0.8m is maintained. 4 adsorbent heights 20%, 40%, 60% and 80% from bottom of column is considered. Dairy wastewater to be tested for removal efficiency is passed through overhead tank and ponding depth of 0.3m is maintained over soil mass. Overflow pipe is also fitted to maintain ponding depth. The treated wastewater is collected from bottom of the column and analysed for parameter like colour, turbidity, total dissolved solids, total suspended solids, chemical oxygen demand and biological oxygen demand.

IV. EXPERIMENTAL RESULTS

A. Performance of Loamy Sandy Soil with Ashoka tree leaves Adsorbent

Results of experimental studies are tabulated in table 1 to 4. The parameters like colour, turbidity, TDS, TSS, COD and BOD are analyzed and removal efficiencies with respect adsorbent positioning at 20%, 40% 60% and 80% are represented graphically.

Table 1: Shows the performance of Loamy Sandy soil of depth 0.8m and Adsorbent Positioned at 20% height from bottom

Sl. No	Parameters	Influent	Effluent	Removal Efficiency %
1.	Colour (PtCo)	73500	845	98.9
2	Turbidity (NTU)	17200	344	98.0
3	TDS (mg/l)	2731	1141	58.2
4	TSS (mg/l)	5802	464	92.0
5	COD (mg/l)	5953	655	89.0
6	BOD (mg/l)	4840	919	81.0

Table 2:Shows the performance of Loamy Sandy soil of depth 0.8m and Adsorbent Positioned at 40% height from bottom

Sl. No	Parameters	Influent	Effluent	Removal Efficiency %
1.	Colour (PtCo)	73500	1624	97.8
2	Turbidity (NTU)	17200	170	99.0
3	TDS (mg/l)	2731	1476	45.9
4	TSS (mg/l)	5802	696	88.0
5	COD (mg/l)	5953	417	93.0
6	BOD (mg/l)	4840	629	87.0

Table 3: Shows the performance of Loamy Sandy soil of depth 0.8m and Adsorbent Positioned at 60% height from bottom

Sl. No	Parameters	Influent	Effluent	Removal Efficiency %
1.	Colour (PtCo)	73500	970	98.7
2	Turbidity (NTU)	17200	204	98.8
3	TDS (mg/l)	2731	1741	36.3
4	TSS (mg/l)	5802	290	95.0
5	COD (mg/l)	5953	536	91.0
6	BOD (mg/l)	4840	1016	79.0

Table 4: Shows the performance of Loamy Sandy soil of depth 0.8m and Adsorbent Positioned at 80% height from bottom

Sl. No	Parameters	Influent	Effluent	Removal Efficiency %
1.	Colour (PtCo)	73500	801	98.9
2	Turbidity (NTU)	17200	134	99.2
3	TDS (mg/l)	2731	1610	41.0
4	TSS (mg/l)	5802	348	94.0
5	COD (mg/l)	5953	715	87.9
6	BOD (mg/l)	4840	774	84.0

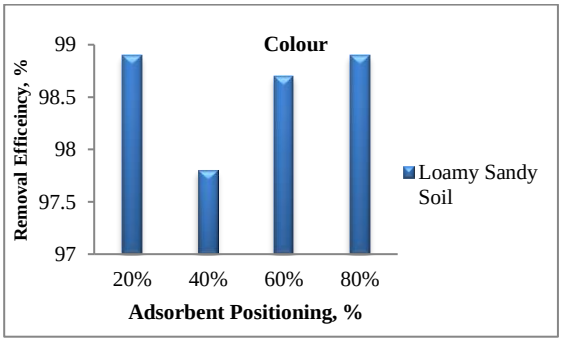

Fig 1.0 Removal Efficiency of Colour at Different Positioning of Adsorbent

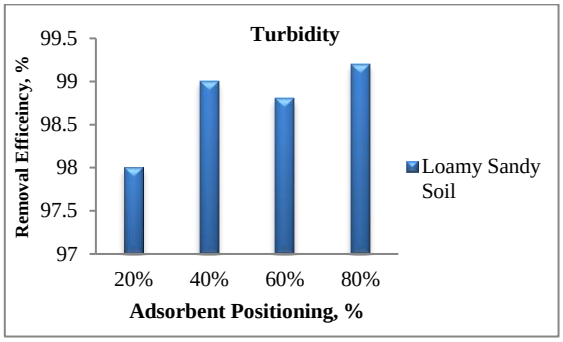

Fig 2.0 Removal Efficiency of Turbidity at Different Positioning of Adsorbent

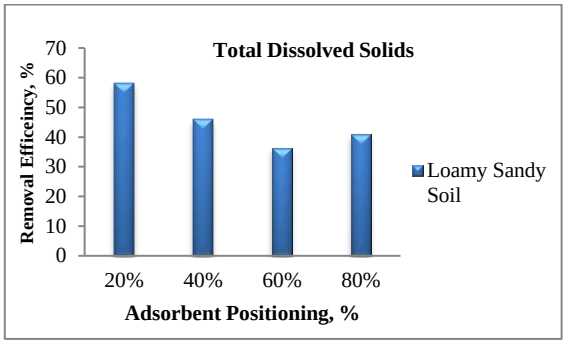

Fig 3.0 Removal Efficiency of TDS at Different Positioning of Adsorbent

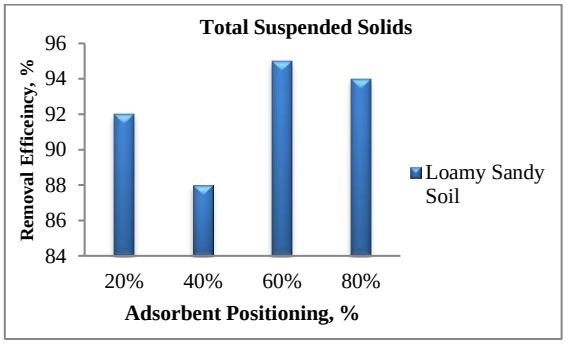

Fig 4.0 Removal Efficiency of TSS at Different Positioning of Adsorbent

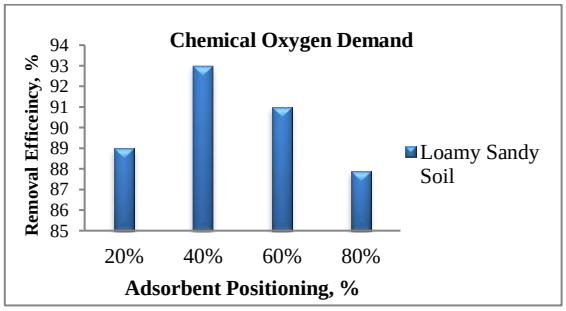

Fig 5.0 Removal Efficiency of COD at Different Positioning of Adsorbent

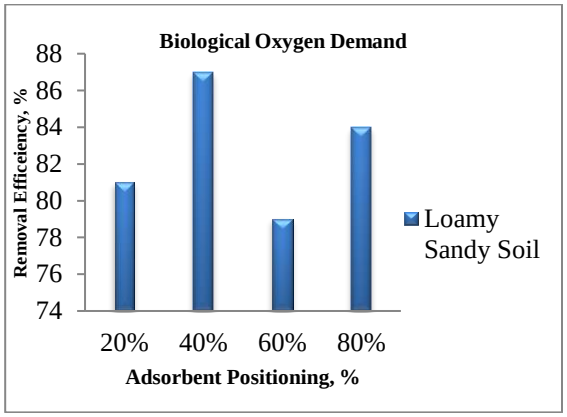

Fig 6.0 Removal Efficiency of BOD at Different Positioning of Adsorbent

V. CONCLUSIONS

The experimental studies showed that Loamy Sandy soil in conjunction with Ashoka Tree Leaves powder as adsorbent showed over all greater removal efficiency for all parameters. The removal efficiency obtained in each parameters are as follows colour (98.0%), turbidity (99.2%), total dissolved solids (58.2%), total suspended solids (95.0%), Chemical oxygen demand (92.9%) and Biological oxygen demand (87.0%).

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REFERENCES

[1]] Achla Kaushal and S. K. Singh, “Removal of Zn (II) from Aqueous Solution Using Agro-based Adsorbents”, Imperial Journal of Interdisciplinary Research, 2(6), 2016, pp. 1215-1218.

[2] Amal Raj S. and Srinivasa Raghavan R, “Removal of Chromium from Synthetic Effluent by Adsorption on Activated Carbon”, Independent Journal of Environmental Proto., 2(1), 2002, pp. 69-72.

[3] D. K. Sharada, D. P. Nagarajappa, K. K. Shiva and N. T. Manjunatha, “Bench Scale Treatability Studies of Wastewater by Soil Aquifer Treatment”, International Journal of Innovative Research in Science, Engineering and Technology, 4(6), pp. 4274-4279.

[4] Onet Cristian, " Characteristics of The Untreated Wastewater Produced by Food Industry", Analele Universitatii din Oradea, Fascicula Protection Mediului, vol. 15, 2010, pp. 709-714.

[5] P. Nema, C. S. P. Ojha, A. Kumar and P. Khanna, "Technoeconomic Evaluation of Soil Aquifer Treatment Using Primary Effluent at Ahamedabad, India", International Journal of Water Research, 65(9), pp. 2179-2190.