

# DAIRY WASTEWATER TREATABILITY STUDY BY SOIL COLUMN TREATMENT SYSTEM WITH ADSORBENT

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**Abstract** – Soil Column Study or Soil Aquifer Treatment (SAT) is an systematic technology for industrial as well as domestic wastewater, if it is combined with different available wastewater treatment methods. In this method waste effluent to be treated is fed to infiltrate through layers of soil in conjunction with low cost adsorbent like moringa oleifera seeds. In this study removal efficiency of soil column system with and without adsorbent is conducted for parameters like pH, Colour, Turbidity, Chemical Oxygen Demand .

**Key Words:** Soil Aquifer Treatment, Adsorbent, Clayey Silts, wastewater, pH, COD, Turbidity, Colour.

## 1.INTRODUCTION

Industrialisation is spine for improvement of country. The pollutants due to industrial zone is a severe difficulty in in the course of the world .Among all industrial activities, the food zone have one of the maximum consumptions of water and are certainly considered one among the largest manufacturers of effluent. Usual primary and secondary treatment methods normally aims at disposal of treated effluents into rivers, lakes, coastal bodies or else inland water bodies, without much attention towards preservation and restoration [1]. Hence it is sensible that alternative technology for waste effluent disposal that results in preservation of natural water source in their immaculate state and restoration of wastewater for reuse are conceived. Creative procedures in wastewater treatment for reuse have been found out. One amongst the innovative technique of restoration of waste effluent with rapid infiltration system known as soil column system or SAT. Wastewater generated after column method is adoptable for unrestricted irrigation and also it proves to be cost effective than conventional treatment methods[2].

### 1.1 Objectives of study

- Identifying Geotechnical Parameters of Soil for Conducting Soil Column Treatment Method.
- Evaluation of filtering efficiency of soil with and without adsorbent.
- To check the feasibility of dairy wastewater treatment with selected adsorbent.
- To evaluate the treatment potential of wastewater using natural adsorbent and soil column methods .

## 2.0 MATERIALS AND METHODOLOGY

To estimate the outcome of SAT system in treating dairy effluent, we incorporated column studies under different conditions. Clayey silts Soil is used and geotechnical parameters of soil are tabulated in Table No 1. The columns are filled by maintaining the field density of the soil. Dairy effluent for experimentation was collected from Davanagere Dairy , Doddabathi, Davanager District, Karnataka State. Characteristics of Dairy effluent are entered in Table N

**Table -1: Geotechnical Properties of Clayey Silts Soil Used for Experimentation**

Sl NO	Parameters	Average Values
1	In Situ Dry Density (g/cm <sup>3</sup> )	1.66
2	Specific gravity	2.54
3	Differential Free Swell %	25.0
4	Liquid Limit %	34.0
5	Plastic Limit %	27.84
6	Plasticity Index	6.14
7	Compaction Test(light) : γ <sub>d</sub> max g/cc OMC %	1.81 10.0
8	Permeability (cm/s)	0.72 X 10 <sup>3</sup>
9	Sieve Analysis : % of Gravel % of Sand % of Silt & Clay Uniformity Co-efficient (cu) Co-efficient of Curvature (Cc)	1.2 37.8 61 5.3 0.540
10	Soil Classification	Clayey Silts (ML)

**Table 2: Characteristics of Dairy Wastewater Used**

Sl No	Parameter	Dairy Wastewater
1	pH	4.51
2	Colour (PtCo)	71500
3	Turbidity (NTU)	16100
4	Chemical Oxygen Demand (mg/l)	5852

PtCo=Platinum Cobalt Scale, NTU = Nephelometre Turbidity Unit , mg/l= Milligram Per Liter

### 3. Experimental Setup

Columns were made of PVC pipes, each 1.1 m long, with an inner diameter of 15 cm with an wayout at the bottom and an spillage at the crown. Each column is secured with a 60 micron netting inside. A container for supplying a sample of wastewater is placed on top, wastewater is supplied from above, after cleaning, new water is accumulated at the outlet. provided at the end of the columns. The flow is maintained in such a way as to maintain a constant ponding depth of 30 cm above soil level.

#### 3.1 Preparation of Adsorbent

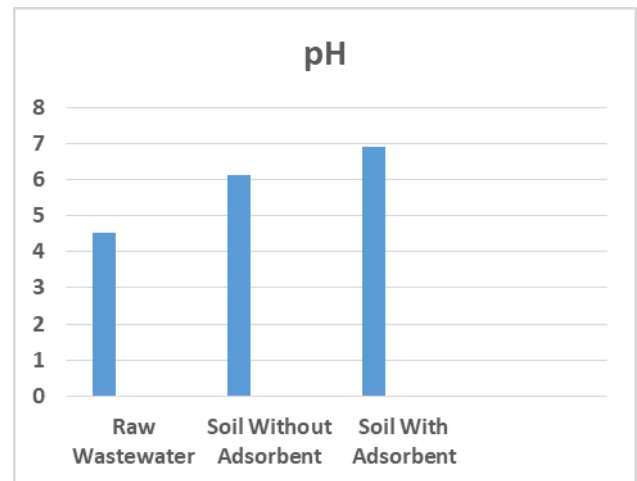
Moringa oleifera seeds are also known as Drumstick seeds are collected from farm land near Harapanahalli and pod shells are removed manually and are washed with tap water and then distilled water to remove particulate matter from their surface, after that they were dried and kernels were grounded in a domestic blender and sieved through 600 micrometer sieve to get uniform geometrical size for use



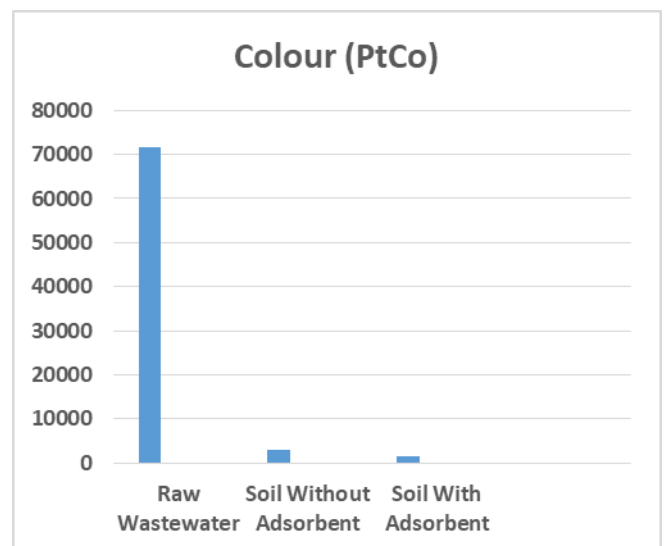
**Fig-1:** Moringa oleifera Seeds and Powdered Moringa Oleifera Seeds

**Table 3:** SAT System Performance with and without Adsorbent

Sl No	Parameters	Soil	Soil with Adsorbent
1	pH	6.14	6.9
2	Colour (PtCo)	2935	1624
3	Turbidity (NTU)	223	344
4	COD (mg/l)	851	629



**Chart -1:** pH removal in SAT without and with Adsorbent



**Chart -2:** Colour removal in SAT without and with Adsorbent

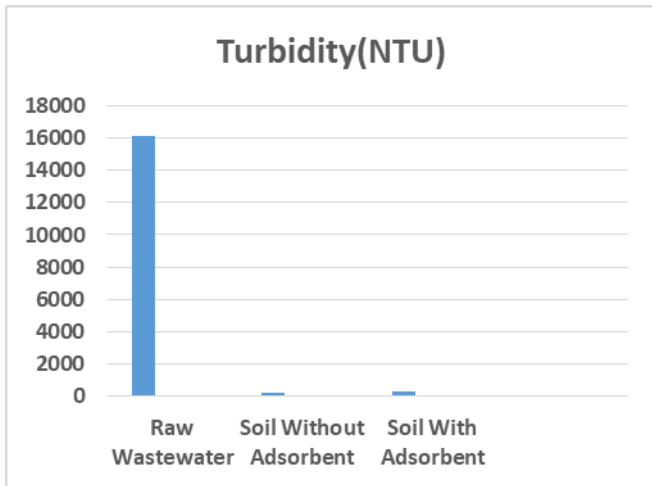


Chart -3: Turbidity removal in SAT without and with Adsorbent

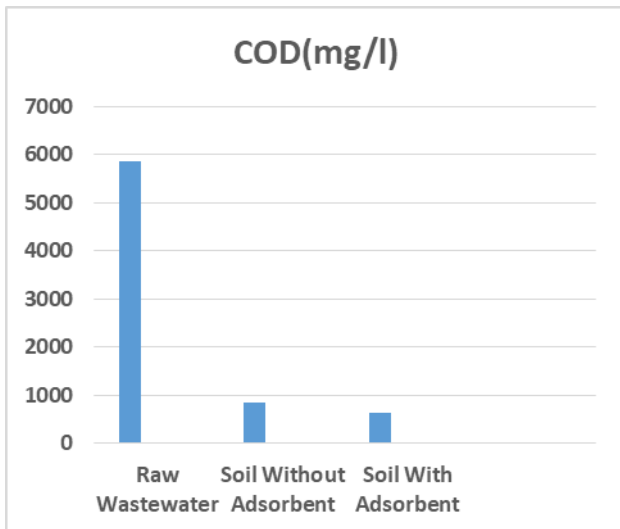


Chart -4: COD removal in SAT without and with Adsorbent

#### 4. CONCLUSIONS

Bench scale column studies were done to find out the removal efficiency of SAT System with and without adsorbent. Based on analysis results Column system with adsorbent is more efficient in treating Dairy Wastewater. sa

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