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Textile Industrial Wastewater Treatability Studies by Soil Aquifer Treatment in Conjunction with Jackfruit Peel as Adsorbent

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Abstract - *Water is an important fundamental basic need for the living organisms. Water resources around the world getting pollution due rapid growing of population and industrialization. It is not only the depletion of quantity but also the quality is deteriorating due to improper discharge of untreated industrial waste waters and sewage generated from the community. Better wastewater management requires many treatment methods. This research employs SAT System to recycle wastewater for potable and non-potable usage. SAT system was tested on textile industry effluent under different experimental circumstances. The NaturalAdsorbent like Jack fruit peel powder were tested in clayey andsilty soils. In silty soil, which gives good removal efficiency.*

Key Words: SAT, Jack fruit peel, Copper, Zinc, Chromium.

1. INTRODUCTION

Water has its own importance and humanity's most vital resource. Population growth Industrialization and urbanization are creating dense human settlements that pollute the water India generates 6.2 million m3 of untreated Industrial wastewater every day, yet barely 20 % and 60 % of household and Industrial wastewater Industrial effluent pollutes waterways. Men and their actions polluted the aquatic environment, harming the ecology and human's Industrial effluents, urban runoff, agricultural fertilizer, and animal feaces are the water pollutants These activities raise physio-chemical parameters over permissible limits, altering water quality. lather, printing, textile, sugar, and other industries.

This industry's waste water contains more colored contaminants and certain haram compounds that impair human health, the environment Industrial effluent contains heavy metals such as copper, zinc, nickel, chromium, and others, which are harmful to aquatic life and the environment. Textiles industries generates a lot of wastewaters it contains the combination of dyes solvents heavy metals and organic compounds from dyeing,printing, finishing, and washing. Wastewater flow into waterways may pollute soil, water, and aquatic habitats. Many wastewaters treatment process like electrocoagulation reverse osmosis and other techniques are used SAT (Soil Aquifer Treatment) Is the one of the wastewater treatment techniques is used for treating of this textile industrial waste water because this process gives more efficient results in the treating of wastewater and removing of heavy metals in industrial wastewater.

SAT artificially recharges groundwater aquifers. Controlled soil percolation adds water to groundwater. Soil aquifer treatment either artificially augments groundwater to remove freshwater later or prevents saltwater or pollutants from entering. Percolation allows water to enter the aquifer and mix and maybe undergo additional physical and chemical processes.

Adsorbents remove heavy metals, contaminants, and toxic chemicals from environmentally harmful liquid or gas substances. (natural adsorbents) are made of natural materials like natural fibers, volcanic rocks, soils, plant biomass, agricultural and industrial wastes, animal shells, Microalgae, and Fungal biomass, coconut shell, Scrap types, bark, Fruit wastes and other tannin-rich materials. Sawdust and other wood type materials, rice husk, fertilizer, Fly ash, Sugar industry wastes, chitosan, Blast furnace slag, petroleum wastes.

2. MATERIALS AND METHODOLOGY

2.1 Collection of Soil Samples

Soil samples were collected from the two different location that is in and around Bangalore. Silt Soil were collected froman open ground in Nagavara and the Clayey Soil was collected from the lake in Nagavara. These two Soil samples were tested and then introduced in the columns.

2.2 Preparation of Adsorbent

Collection of jack fruit peels at local fruit shops it is washed fromthe tap water first after to remove extra fleshly parts from the peels and to clean the peelsfrom the distilled water after that it can dried under the sun light until it is ready for

making the powder after words grind the peels it becomes the powder.

2.3 Experimental Setup For SAT

The experimental setup involves a PVC column with 1.5 meters in length and a diameter of 6 inches.At the base of the column, a fine mesh with a pore size of 60µm is provided. The bottom of the column is designed in funnel shape to facilitate the collection of treated water. A regulator is to maintain the flow of wastewater in the column. To maintain consistency, a ponding depth of 35 cmis maintained, and any excess water is guided out of the column through an overflow system. The column, includingthe mesh, is thoroughly cleaned after each trial.

2.4 Collection of Wastewater

The wastewater is used for the SAT system is collected from the textile industry is located in Kareem sab layout of Peenya industrial area Bangalore.

3 RESULTS AND DISCUSSIONS

The experiment is carried to determine the efficiency of SAT with and without using adsorbents for this study two types of soil is used they are Clayey soil and Silty soil and Jackfruit peel powder used as adsorbent. The textile industrial wastewater used in the study was obtained from a specific industrial source.

The results obtained by experimentation and efficiency of SAT with and without using adsorbents can be discussed below.

Table 1: Characteristics of Wastewater

Parameters	Wastewater characteristics
pH	6.25
Conductivity, (µs/sec)	3600
T.D.S, mg/L	1702
Chloride, mg/L	Ab
Hexavalent Chromium(Cr^{+6}), mg/L	0.45
Copper, mg/L	0.98
Nickel, mg/L	Ab
Zinc, mg/L	1.2

Table 2: Performance of SAT for only Silty Soil

Parameters	Influent	Filtrate	RE %
pH	6.25	7.65	
Conductivity, (µs/sec)	3600	2100	
T.D.S, mg/L	1702	1300	
Chloride, mg/L	Ab	Ab	
Hexavalent Chromium (Cr^{+6}),mg/L	0.45	0.220	51.1111
Copper, mg/L	0.98	0.4870	50.306122
Nickel, mg/L	Ab	Ab	-
Zinc, mg/L	1.2	0.55	54.16667

As the table 2 shows the removal efficiency by the SAT system by only silty soil. The removal efficiency of chromium is 51.11%, Copper 50.30% and Zinc of 54.167% by above results the performance of SAT by only silty soil gives Zinc is the maximum removal efficiency

Table 3: Performance of SAT for Clayey Soil

Parameters	Influent	Filtrate	RE %
pH	6.25	7.98	
Conductivity, (µs/sec)	3600	2900	
T.D.S, mg/L	1702	1795	
Chloride, mg/L	-	Ab	
Hexavalent Chromium(Cr^{+6}) ,mg/L	0.45	0.41	8.88889
Copper, mg/L	0.98	0.68	30.61224
Nickel, mg/L	Ab	0.00	Ab
Zinc, mg/L	1.2	1.12	6.6667

Table 3 shows the performance of SAT by only clayey soil with out using any adsorbents.in this the removal efficiency of Chromium. Copper and Zinc is 8.88%, 30.61% and 6.67% of removal efficiency.

Table 4: Performance of SAT For Silty Soil with Jackfruit Adsorbent

Parameters	Influent	Filtrate	RE %
pH	6.25	7.78	
Conductivity, (µs/sec)	3600	1780	
T.D.S, mg/L	1702	895	
Chloride, mg/L	-	-	-
Hexavalent Chromium(Cr^{+6}),mg/L	0.45	0.162	64
Copper, mg/L	0.98	0.18	81.6327
Nickel, mg/L	Ab	-	Ab
Zinc, mg/L	1.2	0.44	63.33

Table 4 shows efficiency of SAT by silty soil with jackfruit adsorbent the removal efficiency is Chromium 64%, Copper 81.63% and Zinc is 63.33%. and these results shown in graph below.

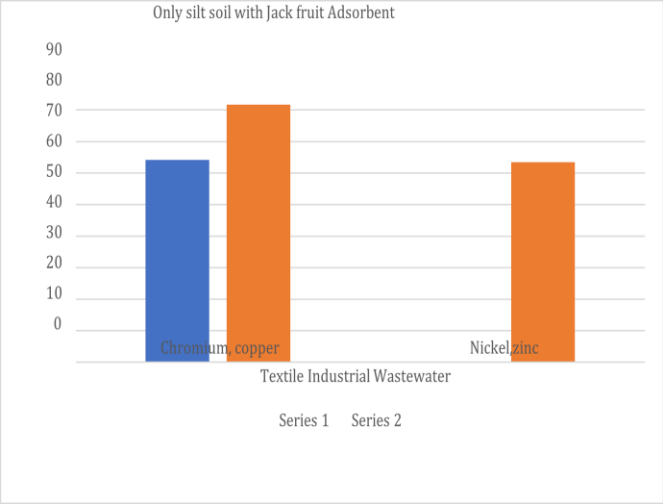

Fig 1: - Performance of SAT silty soil with Jack fruit peel as adsorbent

Table 5: Performance of SAT by Clayey Soil with Jackfruit Adsorbent

Parameters	Influent	Filtrate	RE %
pH	6.25	8.01	
Conductivity, (µs/sec)	3600	3020	
T.D.S, mg/L	1702	1970	
Chloride, mg/L	AB	-	-
Hexavalent Chromium(Cr^{+6}),mg/L	0.45	0.35	22.2222
Copper, mg/L	0.98	0.48	51.0204
Nickel, mg/L	Ab	-	Ab
Zinc, mg/L	1,2	0.89	25.8333

The Efficiency of SAT by the clay soil with jack fruit adsorbent showed the removal of chromium about 22.22% copper 51.02% and zinc of 25.8% by this results is tabulated in table 4.9 and the respected graph is ploted for the values in fig 4.6 by this combination of clay soil and jack adsorbent it removes maximum amount of 51.02% of copper. These results are shown by graph below.

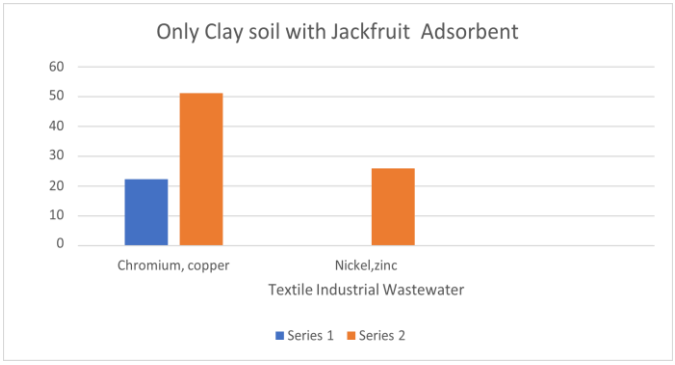

Fig 2: Performance of SAT Clayey soil with Jack fruit peel as adsorbent

3 CONSLUSION

- Clayey soil with adsorbent shows less removal efficiency in removing heavy metals from wastewater.
- Silty soil with jackfruit peel as adsorbent shows maximum removal efficiency in removing heavy metals such as copper 81.64%, Chromium 64% and Zinc of 63.33%.
- Jackfruit peel adsorbent have the capacity to remove the heavy metals present in industrial wastewater by SAT.
- Both silty soil and clayey soil are introduced into SAT System without conjunction with adsorbent. Silty soil gives more efficiency than clayey soil in removal of heavy metals in the wastewater along with-it addition of the adsorbent will increase the efficiency.

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