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WASTE WATER TREATMENT OF INDUSTRIAL EFFLUENTS USING BANANA STEM EXTRACT

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Abstract - *Because of modernization and population growth in urban culture, industries have risen greater heights. However, this has led to major source of pollution of all types, including air, water, and noise. Many companies use freshwater to transport trash from the plant, then dump the garbage into rivers, lakes, and seas, polluting the water and endangering aquatic life and also cause problems to all those who depend on these rivers and lakes for their daily needs. Industries often need 200-500 litres of water to generate 1kg of goods. This is one of the primary causes of global water scarcity. The water generated by these industries are not even appropriate for agriculture, necessitating wastewater treatment. Because of their adsorbing qualities, many forms of agricultural wastes are presently being investigated for wastewater treatment. Banana stem extract was used as a natural adsorbent in this experiment (Musaceae Zingiberales). In this paper, the different properties of water were studied by mixing banana stem extract with waste water collected from industry. This document discusses the many methods for converting trash into irrigation standards.*

***Key Words*: Adsorption, Coagulation, Total Suspended Solids, Total hardness, Turbidity, Banana pith.**

1.INTRODUCTION

India's population has surpassed 100 million people. An individual's basic necessities include food, clothing, and shelter. India has a diverse range of sectors that are rapidly expanding. According to data, every Indian district has at least ten textile industries. The textile industry uses a lot of water. It approximately needs 250L of water to make 1Kg of textile. The wastewater let out from these industries doesn't have the necessary characteristics to be used for irrigation.

1.1 Why should the wastewater be treated

The Wastewater from industry has a huge amount of Hardness, Total Suspended solids, and other unsuitable chemical characteristics. This makes the water not suitable for irrigation, and harms the natural flora and fauna of these water bodies. The waste created because of the dye used in the textile industries causes high Biological Oxygen Demand and high chemical oxygen demand. This is one of main reason to treat the wastewater that is being let out from these industries. However, the treatment of wastewater is extremely expensive. This problem can be tackled by using natural-adsorbents, also called low-cost adsorbents. It was observed that adsorption was a very feasible alternative for treating the wastewater dumped by these textile industries.

The characteristics of the wastewater coming out from these industries are so poor that they can't be used for anything not even for irrigation. This waste water released from the industries have large amounts of hardness, total suspended solids, turbidity and various other chemical characteristics. This makes the water unfit for other uses. The waste created by using dye from the industry causes not just high Biological Oxygen Demand(BOD) but also high Chemical Oxygen Demand(COD).

1.2 Objectives

The main objectives are:

1. The enhance properties of wastewater collected from the diary industries.
2. To analyze the different characteristics of water by addition of banana stem extract to wastewater collected from industries present nearby.
3. To reduce the suspended solids, hardness, turbidity, pH and dye from the waste water collected from industry by using banana stem extract.

4. To recycle the waste water letout from the industries and make it suitable for other uses such as irrigation.

2. METHODOLOGY AND APPARATUS

To collect water samples from various industries and to collect matured banana stem extract from the local market. Mix the banana stem extract powder that is sun dried/banana stem extract solution that is strained with the waste water sample collected. They are tested using the Coagulation jar test, hardness using titration method, turbidity using Turbidity meter, pH using pH meter and removing dye from wastewater.To analyse the results obtained from the above tests conducted.

2.1. Methodology

Banana plants that had reached maturity were gathered. After separating throns and leaves from the stem. A mixer was used to combine 100g of small fine pieces of pith with 10mL of distilled water. The juice was collected after the mixed pith was strained. To keep the freshness of the banana stem juice, it was stored in freezer at 7°C(44.6F). Mix banana stem extract powder that is sundried/banana stem extract solution that is strained with the waste water sample collected...They are tested using the Coagulation jar test, hardness using titration method, turbidity using Turbidity meter/ Nephlometer, pH using pH meter and removing dye from waste water...To analyse the results obtained from the above tests conducted.

Fig 1: Banana pith

2.2 APPARATUS

Apparatus needed for this project are:

Coagulation jar:

Purpose: To check the total suspended solid particles
IS Code 3025: Part 16: 1984

Permissible limit: 350mg/l - 1200mg/l

Hardness setup:

Purpose: To test the hardness of water

IS Code: IS 3025 : Part 5:1964

Permissible limit: >180mg/L [very hard]

60-120mg/L [moderately hard]

Below 60mg/L [soft]

Nephelometer:

Purpose: To test the turbidity of water

IS code: IS 3025 (part 10)

Permissible limit: 1.0-5.0 NTU

pH meter:
Purpose: To check the pH of water

IS code: IS 3025 (Part11)

Permissible limit:6.0-8.0

Fig 2: Coagulation jar

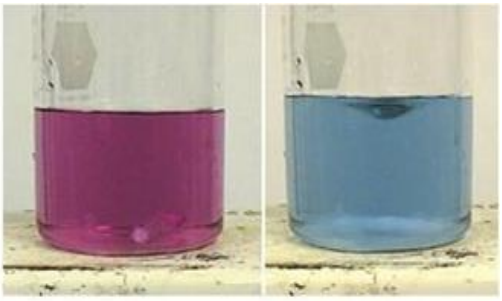

Fig 3: Hardness titration solution

Fig 4: Nephelometer

Fig 5 : pH meter

2.3 Indian Standards

As per the environmental standards as laid by the ministry of environment and forestry, 1989 inorder to make the wastewater suitable for irrigation purposes.

Si no	Parameter	Permissible limit
1	pH	5.5 - 9
2	COD (Chemical oxygen demand)	250mg/L
3	TSS (Total suspended solids)	350mg/L - 1200mg/L
4	Biochemical oxygen demand	100mg/l
5	Turbidity	1.0 - 5.0 NTU
6	Hardness	350mg/L - 1200mg/L

Table 1: Indian Standards

2.4 Results and Outcomes

The table below shows different characteristics of waste water that has been analyzed:

Parameters	Values			
	1	2	3	4
Suspended Solids (mg/l)	8700	7900	9850	8436
Hardness (mg/l)	520	640	635	540
Turbidity (NTU)	1182	1453	1536	1658

Table 2 : Waste water characteristic values

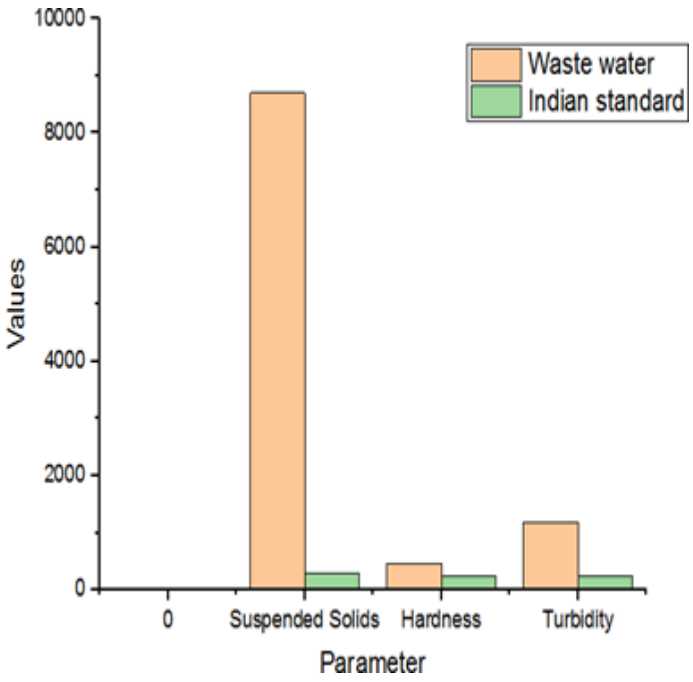

Fig 6: Indian Standards comparison

From the above chart, it is clear that Hardness, suspended solids and turbidity are high in the stream that is located near to industries. The values without adding any adsorbent on the test samples is shown here.

COAGULATION JAR TEST

Results of Coagulation jar test are as shown in figure below, it's recorded that prepared banana stem extract of 140 mL is best for floc production.

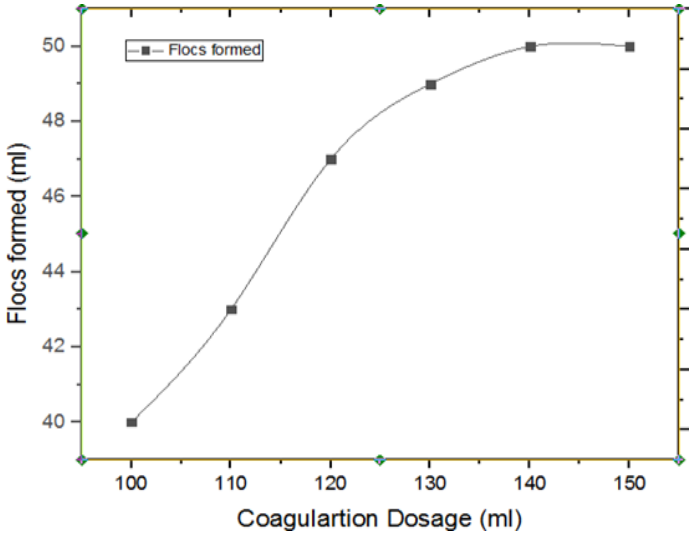

Fig 7: Jar test results

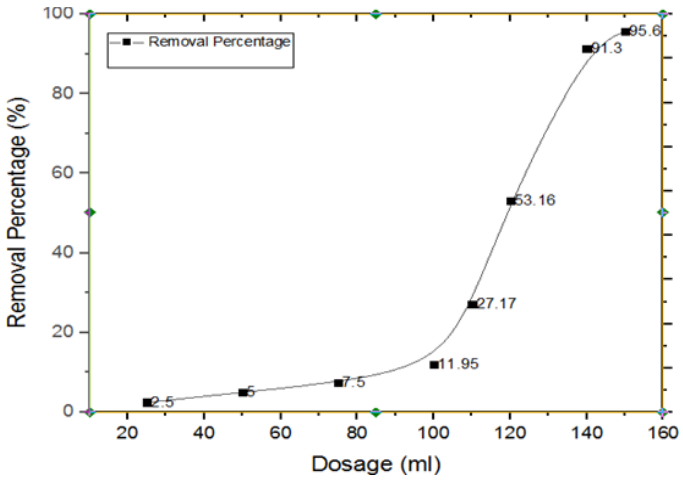

Fig 8: Removal percentage of solids

- From the test results , it can be seen that there is a steep reduction of SS when dosage of more than ¼ of the banana stem volume is used.
- This is mainly because banana stem has the property to adsorb the smaller particles on its surface and allows to settle rapidly. The particle size of the SS are found to be very low after the addition of extract of banana stem.
- Waste water collected in sample point 1: The suspended particles are removed by the extract of banana stem. The suspended solids value exceeds 300 mg/l, which is significantly higher than irrigation standards.
- It could not remove suspended materials below the level that can be used for irrigation.
- sample points two and three: The values of the waste water collected from a great distance away, are below the Suspended solids value stated by the irrigation regulations.
- from Figure, addition of 150 mL of extract of banana stem to 500 mL of waste- water eliminates 95% suspended particulates due to the banana stem extract's adsorption capacity.

HARDNESS TEST

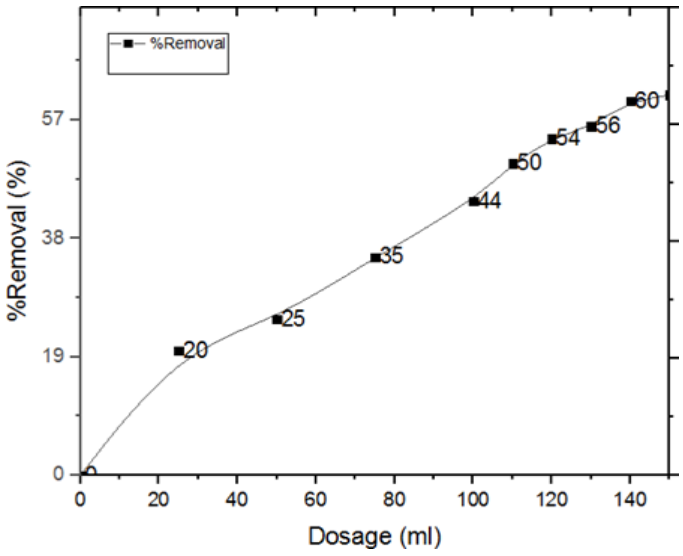

Fig 9: Percentage removal of hardness

- From the graph, it is seen that there is significant decrease in hardness by usage of more dosage of extract of banana stem.
- The extract of banana stem forms the different kind of compound which does not cause hardness.
- The carbonate and bicarbonates are converted in to other chemical compounds.
- After tests Within a day, there is a huge reduction in the hardness.
- but, the hardness doesn't fall under the range that can be used for irrigation.
- Therefore more treatment is needed for the samples collected at sample collection point 1.
- The hardness readings obtained after a dosage of 100ml result in a significant reduction in hardness value, which is far below the irrigation-related restrictions.
- It was found that the hardness value reduces when 1/4th amount of banana stem extract is added to the waste water.
- This is because the conversion of the chemical components that generate hardness in waste water into simpler chemical compounds that are not detectable using titration methods.

TURBIDITY TEST

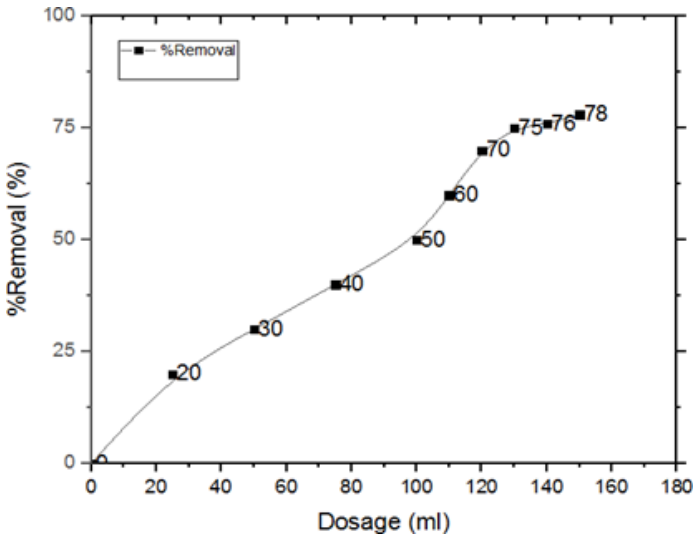

Fig 10: Percentage removal of turbidity

- Figure shows the turbidity reduced from the 4 points.
- The reason for this reduction in turbidity is that the extract of banana stem adsorbs smaller particles which are the major cause for the turbidity and allows the particle to settle down.
- The value of turbidity reduces. for irrigation purposes the turbidity is not a important factor so more emphasis is not given for the same.
- Turbidity is mainly due to the settling of particles which changes colour. The below figure shows color change for the waste water effluents.

3. CONCLUSIONS

- When textile industries wastes are let out into streams, the characteristics of the changes and this was similar to the characteristic of waste-water.
- Because of adsorption capability of extract of banana stem, when 1/4th of the volume of the extract was added to waste water, the number of suspended solids fell by 96 percent.
- When extract of banana stem is applied at a certain amount of 1/4th of the volume of waste water, the hardness value of waste water is reduced by 66%.
- When 1/4th volume of extract of banana stem was mixed to waste water, the turbidity of the samples fell by 78%.

- According to the results of the experiments, the industrial waste water discharged by the textile sector contains extremely high levels of hardness, suspended particles, and turbidity.

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