International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 06 | June - 2025 SJIF Rating: 8.586 ISSN: 2582-3930

Utilization of Banana Trunk for Treating Textile Industry Waste Water

Krushna Tayade[1], Sanika Ubhe[2], Sukruti Patil[3] Dr.V.S.Chavhan[4]

[1]*Student of Civil Engineering Department at AISSMS College of Engineering, Pune.*
[2]*Student of Civil Engineering Department at AISSMS College of Engineering, Pune.*
[3]*Student of Civil Engineering Department at AISSMS College of Engineering, Pune.*
[4]*Professor of Civil Engineering Department at AISSMS College of Engineering, Pune.*

Abstract - The textile industry, a major contributor to employment and economic growth in developing nations, is also a significant source of environmental pollution. Textile wastewater, generated during various processing stages, contains a complex mixture of organic and inorganic pollutants that can severely degrade water quality. This paper provides a comprehensive overview of the characteristics and composition of textile wastewater. It explores the national standards governing textile effluent discharge and reviews a range of treatment technologies, including primary, secondary, tertiary, and advanced methods. By understanding the nature of textile wastewater and the efficacy of different treatment techniques, the industry can adopt sustainable practices and minimize its environmental impact.

***Key Words*:** Textile industry, waste water, environment pollution, treatment process, banana trunk.

1.INTRODUCTION

The textile industry plays a pivotal role in the global economy, contributing significantly to employment and trade. However, its rapid growth and extensive processing operations come at a considerable environmental cost, particularly concerning wastewater discharge. Textile wastewater has been treated using a variety of techniques, including physical, chemical, and biological techniques, or appropriate combinations of these techniques, before being released into the environment. Of these, the adsorption process has been shown to be better than other methods due to its easy operation, high removal efficiency, and simplicity of design. Activated carbon has been used extensively in adsorption processes lately because of its porous structure, large surface area, and high adsorption capacity. Despite activated carbon's benefits as an adsorbent medium, its high price led researchers to look for a less expensive substitute. Researchers have become more interested in investigating the potential of using agricultural waste as adsorbent media to address the issue of textile wastewater**.**

1.1 AIM

The main aim of this project is to analyse efficiency of banana trunk for trating wastewater released from textile industry which impacts on environment. Banana trunk is used for treating waste water for achieving effective and sustainable wasterwater treatment. The use of banana trunk is an eco- friendly and cost effective approach.

1.2 OBJECTIVE

- To prepare the activated adsorbent from banana trunk
- To study and evaluate the efficiency of the activated banana trunk in removal of pollutants of wastewater
- To analyze and identify the suitable adsorption isotherm for wastewater treatment.
- The enhance properties of wastewater collected from the textile industries.

1.4 NEED FOR STUDY

Given the growing environmental impact of wastewater from the textile sector, research into using banana trunks for wastewater treatment is essential. Secondary contamination results from the energy-intensive and chemically dependent nature of conventional remediation techniques. Banana trunks, a common agricultural waste, provide an economical and environmentally friendly option. This study

intends to help develop environmentally friendly and effective wastewater treatment technologies, reducing the environmental impact of the textile industries, by examining their adsorption properties for different pollutants, optimising the treatment process, and investigating regeneration techniques.

1.5 LIMITATIONS

- Needs pre treatment for consistent performance.
- Saturation over time- regeneration or replacement.
- May not fully recover all classes of pollutants alone, often used as part of a multi-stage treatment.

2 METHODOLOGY

Banana trunks are used to make inexpensive activated carbon (absorbers).
The banana trunk is cleaned and dried to create a powdered adsorbent.
Following sieving and filtering, the powdered adsorbent is activated with orthophosphoric acid (which works better).
Hold the solution in a muffle furnace for 40 to 90 minutes after 40 minutes in a hot air oven.
Then banana trunk powder is mixed with 100ml distilled water.
After that, the wastewater is mixed with this adsorbent.
The adsorbent absorbs the colour and settles the solids.
The sample is then centrifuged for 10 minutes to determine the optical density of the treated stock solution.
A photometric colorimeter is used to analyse the effluent's final concentration.

TABLE -1: CHARACTERISTICS OF UNTREATED WASTE WATER

PARAMETER	RANGE
pH	6-10
Temperature	35-45
Total Solids(mg/l)	8000-12000
BOD(mg/l)	80-6000
COD (mg/l)	150-12000
Total Suspended Solids (mg/l)	**15-8000**
Total Dissolved Solids (mg/l)	**2900-3100**
Chlorine(mg/l)	**1000-6000**
Free Chlorine(mg/l)	**<10**
Sodium(mg/l)	**70%**
Trace metals(mg/l)	**<10**
Fe	**<10**
Zn	**<10**
Cu	**<10**
As	**<10**
Ni	**<10**
B	**<10**
F	**<10**
Mn	**<10**
V	**<10**
Hg	**<10**
Po_4	**<10**
Co	**10-30**
Oil and Greese(mg/l)	**10-30**
TNK(mg/l)	**<15**
Free Ammonia(mg/l)	**<10**
Sulphate(mg/l)	**600-1000**
Silica(mg/l)	**<15**
Total Kjeldahl Nitrogen(mg/l)	**70-80**
Colour (Pt-Co)	**50-2500**

2.1 RESULTS

Analysis	Raw Textile Effluent	After Tretment			Max Reduc-tion (%)
		50ml	100 ml	150 ml	
TSS	7950 (mg/l)	7500	7350	980	88
Hardness	540 (mg/l)	470	332	266	51
Turbidity	1080 (NTU)	756	540	259	74

Due to adsorption capacity of banana trunk extract, it is seen that there is 88% reduction in suspended solids, 51% reduction in hardness, 74% reduction in turbidity.

3. CONCLUSIONS

- When textile industries release the effluent into river stream, the physical, chemical and biological properties of water are altered, often acquiring characteristics of waste water. Therefore, it is really necessary to treat this water before discharge to reduce environmental impact.
- The use of banana trunks for wastewater treatment represents a promising and sustainable approach. It offers a cost-effective, eco-friendly, and efficient method for improving water quality by neutralizing harmful pollutants, particularly in agricultural and industrial wastewater.
- It is seen that there is significant decrease in hardness by usage of more dosage of extract of banana stem.

REFERENCES

1. Hayelom Dargo, Nigus Gabbiye, and Adhena Ayalew: Removel of Methylene Blue Dye from Textile Wastewater using Act ivated Carbon Prepared from Rice Husk., International Journal of Innovation and Scientific Research., Vol. 9., No. 2.,(2014), pp. 317-325.
2. Kamaljit Singh and Sucharita Arora: Removal of Synthetic Textile dyes from Wastewaters: A Crit ical Review on Present Treatment Technologies. National Agricultural Library, Information Systems Division, Maryland USA., pp.1-4 (Critical Reviews in Environmental Science and Technology. Vol.41., (2011),pp.807-878
3. Kamaruddin MA Yusoff MS Aziz HA and Alrozi R 2013 Preparation of rice husk carbon-clinoptilolite composite adsorbent for color removal from real textile wastewater: Effects of operating conditions. *Business Engineering and Industrial Applications Colloquium*
4. Amri N Alrozi R Osman MS Nasuha N and Aman NS 2012 Removal of methylene blue dye from aqueous solution using pink guava (Psidium guajava) waste-based activated carbon *Humanities, Science and Engineering Research (SHUSER)*,p.33-38
5. Zakia Sultana, Ershad Ali M, sala Uddin M, Mominul Haque M. 2013. Implementation of Effluent treatment plants for wastewater treatment. Journal of Environmental protection 4, 301-308
6. Brindha et. al. (2012). Physico-chemical properties of fibers from banana varieties afterscouring. Indian Journal of Fundamental and Applied Life Sciences. 2 (1) pp.217 -221
7. .Tripathy T, De BR. 2006. Flocculation: A New Way to Treat the Waste Water. Journal of Physical Science 10, 93-127.
8. .Tholoana M. 2007. Water Management at a Textile Industry: A Case Study in Lesotho. University of Pretoria.