EXPERIMENTAL TREATMENT OF DYE EFFULENT WITH WASTE TEAK LEAVES AND BANANA TRUNK

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ABSTRACT

With the rapid development of industrialization and globalization in recent years, an increasing amount of textile dye wastewater has been discharged into the environment. Today technology of wastewater treatment has difficulty meeting all the practical requirements of harmless wastewater discharge and therefore, the exploration and development of new technologies to treat various types of wastewater are urgently needed. In this case, prepare the activated adsorbent from teak leaves and banana trunk to remove the color from effluent, the column adsorption technique is adopted and evaluate the efficiency of the activated teak leaves and banana trunk in the removal of synthetic dye through batch experiments. Finally, the challenges and prospects of wastewater treatment are summarized. This study provides useful theoretical guidance for scientists in the fields of environmental science, environmental engineering, and environmental health.

Keyword:- *Decolorization, Dyes, wastewater, Scavengers*

INTRODUCTION

Nowadays due to population and urbanization demand for resources is increasing. To fulfill the demand(s) industrial growth takes place which leads to increased wastewater generation. The dying process discharge around fifteen to twenty percent of colors with effluents. Colors contain natural toxins. which potential is carcinogenic. Classification of dyes can be done based on their application and chemical structure.[1,2].The treatment of textile wastewater is considered a challenging process, representing a major threat for water receiving bodies due to the chemical composition and the high concentration of dye in the wastewater. complex effluents are generated by industries such as textile, cosmetics, pharmaceutical, paper, and food, among others[3,4]. the treatment of dye wastewater from textile and dyestuff industries is not easy. Dyes have a synthetic origin and complex aromatic molecular structures. These structures make them more stable and more difficult to biodegrade. Aside from the degradation of dyes or dye waste, the decolorization of wastewater is also important. Because the color in dye wastewater is highly visible, it has to be treated. The major treatment methods for dyes and dye wastes are biochemical and physicochemical methods. Basics dyes, which are water-soluble in an aqueous solution, yield colored cations[4,5]. The available physical-chemical and biological technology for dye removal are very expensive and cause secondary pollution as they lead to sludge formation. The textile dyes are reactive toward the chemical functions present on the fiber surface. Model dye solutions were prepared by dissolving dyes in distilled water[6,7]. In recent years, the application of plant peroxidases for dye decolorization has received significant attention as a cost-effective approach. Various studies have revelated that enzyme-based treatment approaches offer several advantages over conventional methods. In the present study, the decoloration of methyl blue, methyl orange, and monoazo dye, was studied using crude peroxidases extracted from low-cost agricultural wastes of two different plant sources: teak leaves and banana trunks. The effects of reaction parameters such as reaction time, pH, temperature, enzyme dosage, and initial dye concentration were investigated and optimized[8].

Scientists have conducted numerous studies that address the theory and application of AOPs and have made significant progress. Some basic reaction principles of AOPs have been gradually disclosed, and new catalysts have been synthesized to overcome the shortcomings of traditional catalysts in AOPs applications. The basic principles are introduced and summarized in detail in many reviews [9,10], how- ever, there are few systematic reviews that address the treatment and latest advancements in AOPs in industrial dye wastewater and phar- maceutical residue wastewater. This may limit the rapid development of AOPs and their large-scale application in the treatment of industrial wastewater, and as such, this mini-review focuses on the application of AOPs and their combination with catalysts in industrial textile dye wastewater and pharmaceutical residue wastewater. New technologies and their applications of AOPs in these fields are also discussed, and in particular, the improvement of the AOPs degradation effect and its degradation mechanism with different catalysts are systemically analyzed. The challenges and prospects are summarized based on the existing development of AOPs for the treatment of dye wastewater and pharmaceutical wastewater. This work provides useful guidance and a robust foundation for further studies and applications in the treatment of refractory industrial wastewater[11,12].

I. TREATMENT OF INDUSTRIAL TEXTILE DYE WASTEWATER

Textile dye wastewater is an important component of industrial wastewater. It is estimated that approximately 70,000 tons of dye are used in the textile industry each year, and approximately 40 % will eventually become pollutants and endanger environmental health [13]. Wastewater from the textile dye industry accounts for 17 %–20 % of total industrial wastewater [14]. Chemical textile dyestuffs have com- plex compositions, easy synthesis, stable chemical structures, and difficult decomposition characteristics [15]. Most textile dyestuffs have biological toxicity, carcinogenicity, and teratogenicity. Among industrial wastewater, textile dyestuff wastewater is one of the most difficult to decompose [16], and has high chroma, high biochemical oxygen demand, and a high content of dissolved solids [17]. Most dyes are highly resistant to biodegradation because of the need to maintain color and structural integrity in the application, and in particular, azo dyes are easily converted into dangerous aromatic amines under hypoxic conditions [18,19]. The treatment methods for textile wastewater include physical treatment, oxidation, and biological treatment [20]. Currently, most textile dye wastewater treatments use a secondary treatment process, which is mainly composed of a biochemical process (anaerobic system) [21] and a physicochemical process (coagulation sedimentation or air flotation) [22,23]. However, new dyes and tech- nologies have significantly changed the composition and properties of wastewater and increased textile wastewater treatment difficulties. The degradation efficiency of traditional wastewater treatment decreases markedly [24], and there is a pressing need to explore high-efficiency wastewater treatment technologies. AOPs are widely used in waste- water treatment because of their advantages. In this section, four representative AOPs are selected, and their textile wastewater research progress is discussed[24]. Fenton oxidation was the first AOP discovered and is considered to be a powerful oxidation process that destroys refractory organics. Many reviews have introduced the basic principle of Fenton oxidation [24,25]. In the Fenton oxidation process, the pH value of the reaction system is a problem, but in real industrial textile wastewater[25]. It should be noted that the dye solutions used in these studies were all prepared solutions of the dyes. A large gap between the prepared solution and the real dye wastewater, which is one of the key factors affecting the treatment process, remains. To verify the effect of the Fenton oxidation process on the treatment of real dye wastewater, some research has examined real dye wastewater treatment in the laboratory[26,27]. Both photo-Fenton oxidation and electro-Fenton oxidation have achieved good effects in real wastewater treatment, and they are one of the treatment methods with application prospects in textile wastewater treatment. In real printing and dyeing industrial wastewater, there are many kinds of ions, such as chloride ions, sulfide ions, and UV quenching substances, or free radical scavengers that can affect the oxidative degradation process[28].

II. MATERIALS USED

Adsorbents

• Teak leaves (Tectonagrandis) • Banana trunk (Musa) **Chemicals**

• Methylene blue dye • HNO (nitric acid) 3 • H3PO4 (orthophosphoric acid)

Apparatus

• Hot air oven • Muffle furnace • Magnetic stirrer

• Photometric Colorimeter

III. PROCEDURE

- Teak leaves were collected near the house and washed repeatedly until the dirt was eliminated and was left for sundry.
- The banana trunk collected in the was farm and it was cut to smaller pieces and was left to sundry.
- Then after completely achieving dry state.
- They were placed at muffle furnace for 410℃ and 770℃ for teak and banana trunk respectively. Time for teak was 40 min and banana trunk was 90 min.
- Low cost carbon was prepared from the TEAK LEAVES and BANANATRUNK .
- Then the powdered carbon is sieved using 150 micron sieve, to the required particle size .
- The adsorbent in powdered form was washed with distilled water to remove dust particles.

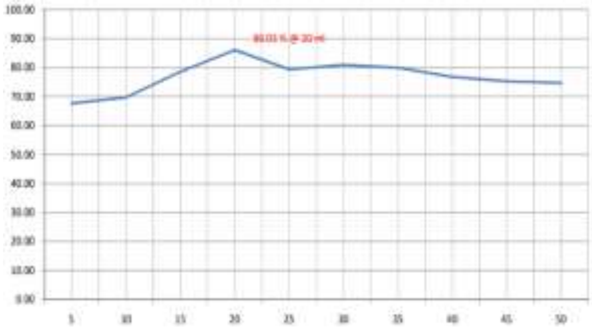
- After washing with distilled water, they were placed at hot air oven for 40 mins at at 110℃ .
- And these Powered carbons are stored in air tight pack for future use.

IV. EXPERIMENTAL RESULT OF COLUMN STUDY

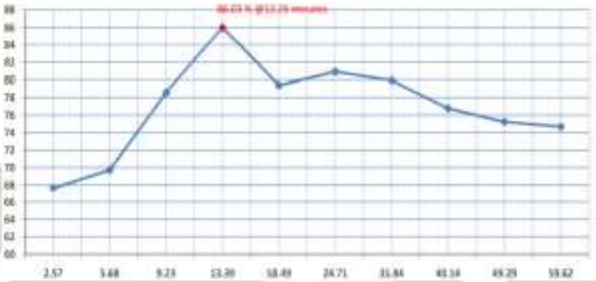
Outflow (ml)	Absorbance (Optical) Density)	Colour removal Efficiency (%)	Time rate (minutes)
5	0.504	67.63	2.57
10	0.466	69.71	5.68
15	0.219	78.56	9.23
20	0.101	86.83	13.39
25	1.063	79.39	18.49
30	1.095	80.91	24.71
35	1.071	79.94	31.84
40	1.168	76.76	40.14
45	1.392	75.24	49.29
50	1.433	74.69	59.62

The activated carbons of Teak leaves and banana trunk are in the ratio (a) 1:1

Outflow (in ml) vs. Colour removal efficiency (in %)



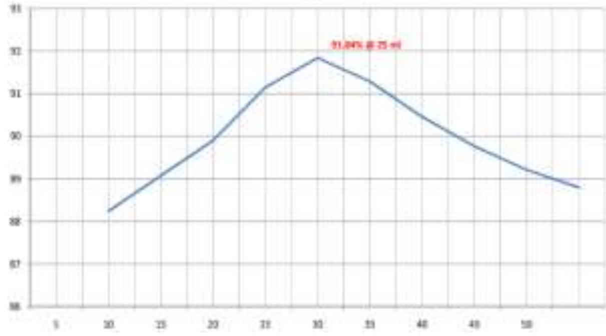
Time rate (in minutes) vs. Colour removal efficiency (in %)



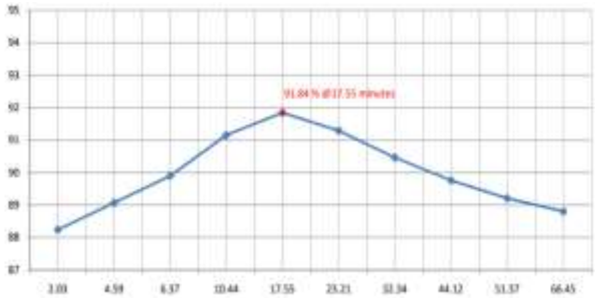
The activated carbons of Teak leaves and banana trunk are in the ratio (b) 1:1.5

Outflow (ml)	Absorbance (Optical) Density)	Colour removal Efficiency (%)	Time rate (minutes)
5	0.085	88.24	2.03
10	0.079	89.07	4.59
15	0.073	89.90	6.37
20	0.064	91.15	10.44
25	0.059	91.84	17.55
30	0.063	91.29	23.21
35	0.069	90.46	32.34
40	0.074	89.76	44.12
45	0.078	89.21	51.37
50	0.081	88.80	66.45

Outflow (in ml) vs. Colour removal efficiency (in %)



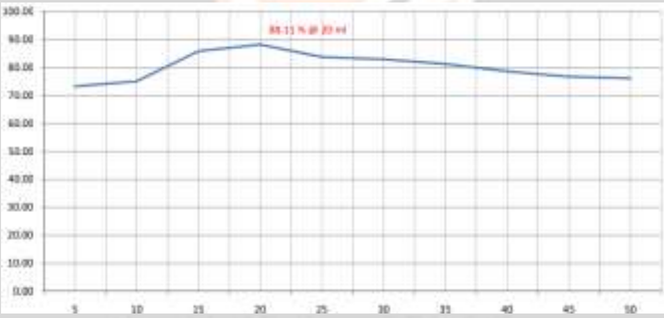
Time rate (in minutes) vs. Colour removal efficiency (in %)



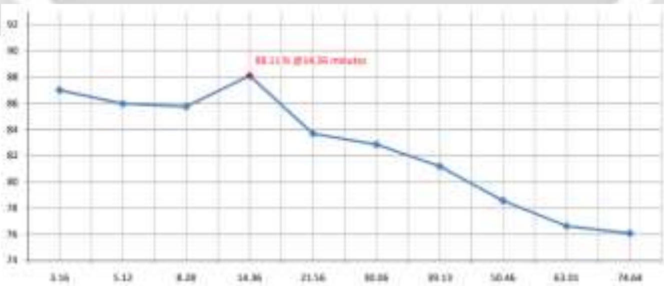
The activated carbons of Teak leaves and banana trunk are in the ratio (c) 1.5:1

Outflow (ml)	Absorbance (Optical) Density)	Colour removal Efficiency (%)	Time rate (minutes)
5	0.094	87.00	3.16
10	0.181	74.97	5.12
15	0.103	85.75	8.28
20	**0.086**	**88.11**	**14.36**
25	0.118	83.68	21.56
30	0.124	82.85	30.06
35	0.136	81.19	39.13
40	0.155	78.56	50.46
45	0.169	76.63	63.01
50	0.173	76.07	74.64

Outflow (in ml) vs. Colour removal efficiency (in %)



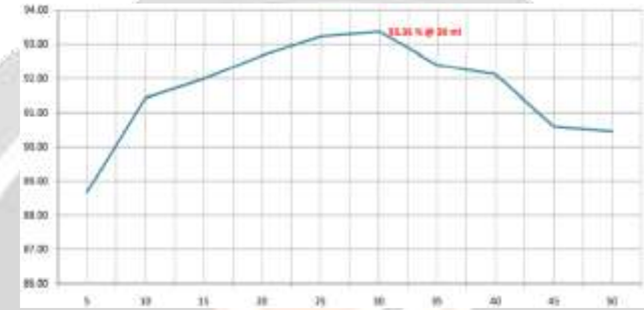
Time rate (minutes) vs. Colour removal efficiency (in %)



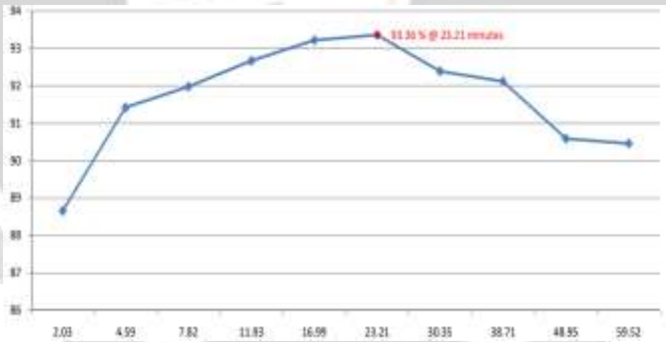
The activated carbons of Teak leaves and banana trunk are in the ratio (d) 1:2

Outflow (ml)	Absorbance (Optical Density)	Colour removal Efficiency (%)	Time rate (minutes)
5	0.082	88.66	2.03
10	0.062	91.42	4.59
15	0.058	91.98	7.82
20	0.053	92.67	11.93
25	0.049	93.22	16.99
30	0.048	93.36	23.21
35	0.055	92.39	30.35
40	0.057	92.12	38.71
45	0.068	90.59	48.95
50	0.069	90.46	59.52

Outflow (in ml) vs. Colour removal efficiency (in %)



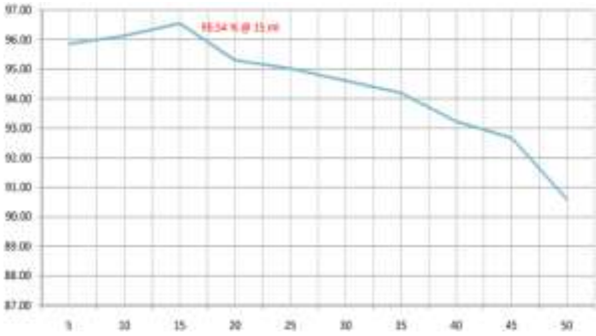
Time rate (in minutes) vs. Colour removal efficiency (in %)



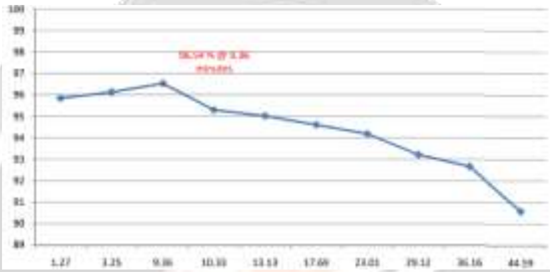
The activated carbons of Teak leaves and banana trunk
are in the ratio (e) 2:1

Outflow (ml)	Absorbance (Optical) Density)	Colour removal Efficiency (%)	Time rate (minutes)
5	0.03	95.85	1.27
10	0.028	96.13	3.25
15	0.025	96.54	9.36
20	0.034	95.30	10.33
25	0.036	95.02	13.13
30	0.039	94.61	17.69
35	0.042	94.19	23.01
40	0.049	93.22	29.12
45	0.053	92.67	36.16
50	0.068	90.59	44.59

Outflow (in ml) vs. Colour removal efficiency (in %)



Time rate (minutes) vs. Colour removal efficiency (%)



SUMMARY RESULTS OF COLUMN STUDY

S.NO	Ratio of adsorbent	Optical density	Colour removal Efficiency (%)	Time rate in (minutes)
1	1:1	0.101	86.03	13.39
2	1:1.5	0.059	91.84	17.55
3	1.5:1	0.086	88.11	14.36
4	1:2	0.048	93.36	23.21
5	2:1	0.025	96.54	9.36

COMPARISION OF TREATED AND UNTREATED WATER

S.NO	QUALITY TEST	UNTREATED WATER	TREATED WATER
1	pH	8.6	10.4
2	Temperature	30ºC	30ºC
3	Turbidity	265 NTU	003 NTU
4	Optical density	0.723	0.025
5	TDS	2865 ppm	615ppm
6	Hardness	458ppm	125ppm

V. CONCLUSION

Hence it is concluded that the activated carbon produced from teak leaves and banana trunk can be effectively used for the dye removal from industrial effluent . The efficiency of banana trunk (Musa)is comparatively higher than that of teak leaves(Tectonagrandis). So that the ratio of teak leaves and banana trunk (2:1) shows higher colour removal efficiency. Thus the treated water is used for secondary uses such as construction,laundering,flu.

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