International Journal of Advance and Applied Research
www.ijaar.co.in
ISSN – 2347-7075 Impact Factor – 8.141
Peer Reviewed Bi-Monthly
Vol. 6 No. 18 March - April - 2025

Teak And Banyan Leaves Ash Treated Wastewater

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DOI - 10.5281/zenodo.15260250

Abstract:
This work is based on the treatment of wastewater with the help of plant materials like teak (Tectona grandis) and banyan (Ficus benghalensis) plant leaves ash are innovative and eco-friendly approaches towards sustainable wastewater management. This paper focuses on using plant materials as adsorbents to remove wastewater pollutants. The plant materials are subjected to high temperatures in a controlled environment to obtain ash, which is used for the minimization of pollutants such as heavy metals, organic compounds, and nutrients from wastewater. The study could have significant implications for the development of low-cost and eco-friendly wastewater treatment technologies. The use of plant materials ash for wastewater treatment could provide a sustainable and natural alternative to conventional wastewater treatment methods. The results showed that plant leaf ashes were effective in reducing the levels of pollutants.

Keywords: Wastewater, Treatment, Teak Leaves, Banyan Leaves and Ash.

Introduction:

Water is a vital component of life on earth, and the accessibility of pure and fresh water is a prerequisite for healthy human life. However, the growing population, industrialization, and urbanization have put significant stress on the natural water resources. Wastewater generation has become a major environmental concern worldwide, and its treatment is essential to prevent the contamination of natural water resources. Wastewater is generated from various sources such as domestic, industrial, and agricultural activities. Domestic wastewater contains human waste, detergents, and other organic and inorganic compounds. Industrial wastewater contains heavy metals, toxic chemicals, and organic compounds. Agricultural wastewater contains nutrients, pesticides, and other organic and inorganic compounds. These pollutants can have adverse effects on human health and the environment if left untreated.

Wastewater treatment is the process of removing contaminants from wastewater to make it safe for discharge or reuse. Conventional methods of wastewater treatment include physical, chemical, and biological processes. However, these methods require expensive infrastructure, skilled personnel, and high energy consumption. In recent years, researchers have explored alternative methods of wastewater treatment using natural materials such as plant leaves and ashes. Plant leaves ashes are a byproduct of the burning of plant leaves. They are rich in potassium, calcium, magnesium, and other minerals that can help neutralize the pH of acidic wastewater. Additionally, the alkaline nature of the ashes can also help precipitate dissolved solids, making them easier to remove. This paper aims to provide an overview of the use of

plant leaf ashes in wastewater treatment.

The herb being a rich source of antioxidants possesses the property of free radical scavenging thereby causing the lysis or death of pathogenic agents and cells. The potential of community forests that have not been utilized at this time, such as teak leaves that can be processed into liquid smoke which is an alternative material for biopesticides and stimulants and fertilizers in increasing the productivity of agricultural land, soil fertility, and opening new jobs. (Gusmailina, *et, al.*, 2020).

The plant leaves biosorbents broadly used for iron and phosphorous removal were reviewed, mainly focusing on their cellular structure, biosorption performance, their pre-treatment, modification, regeneration/reuse, modeling of biosorption (isotherm and kinetic models), the development of novel biosorbents, their evaluation, potential application and future (Subhashish *et al.*, 2022 and Gupta *et al.*, 2015). The essence of teak (inner black part) is inflammation (relieving swelling) and pain relief, poisoning, and burning. Teak leaves can be boiled in water and drank or can be consumed in powdered form to ward off several health problems. A large number of teak plant leaf biosorbents have been investigated for their metal binding capacities under various optimum conditions. The temperature variation had major effects on the sorption process.

An increase in the temperature is known to increase the rate of diffusion of adsorbate molecules across the surface boundary layer and in the internal pores of adsorbent particles as a result of the reduced viscosity of the solution. Banyan has low-fat content; it has also low amounts of Mg and Ca. The leaves have little amounts of stored crude protein, fibers, calcium oxalate, CaO, and phosphorous, the flavanols are also identified in leaves, as well as quercetin3-galactoside and rutin. Banyan yields latex which contains sugar caoytchoue (2.4%), resin, albumin, cerin, and malic acid (Adebiyo, *et, al.*, 2015). The physical characteristics' effectiveness and quality were improved with parameters i.e., turbidity is about 50%, viscosity is about 15 %, total dissolved solids are about75 %, pH is about 26 % and electrical conductivity improves is about 150% and the efficiency of chemical characteristics was improving i.e., alkalinity is about 21 %, acidity 25 %, hardness 35 %, dissolved oxygen 575 %, BOD 35 % and COD 24 % respectively (Gudadhe, 2022).

The main aim of this study is to minimize the pollutants load from wastewater with the help of Teak and Banyan plant leaves ash and that water is used for agricultural and domestic purposes.

Methodology:

The experimental setup was installed in the well-equipped laboratory for the removal of pollutants that are present in wastewater with the help of Teak and Banyan plant leaf ash. The preparation of ash from leaves and treatment of wastewater by the following process:

***Collection of Plant Leaves*:** Collect teak (*Tectona grandis*) and banyan (*Ficus benghalensis*) plant leaves of certain plants have been found to be particularly effective in treating wastewater due to their high concentration of natural compounds with antimicrobial properties.

Drying and Burning: Wash the collected leaves with distilled water to remove any dirt or dust particles. Spread them out on a clean, dry surface and allow them to air dry completely. Once the leaves are dry, they can be burned in a furnace or any other heating device to ash form plant leafs.

***Treatment of Waste Water*:** The filtered wastewater should be poured into a beaker and the ash solution added in a ratio of 1:10 (ash solution: wastewater). The mixture should be stirred thoroughly for around 10-15 minutes. This allows the natural

compounds in the ash to dissolve in the water and remove impurities.

***Additional Treatment*:** If necessary, the treated water can be passed through a sand filter or a carbon filter to further remove any impurities or contaminants.

Results and Discussion:

Table 1: Before and after wastewater treatment physicochemical analytical results:

Sr. No.	Parameters	Unit	Before Treatment	After Treatment	
				Use of Banyan Leaves Ash	Use of Teak Leaves Ash
1	pH	--	8.9	7.8	7.8
2	Electrical Conductivity (EC)	µS/cm	28.9	34.5	39.5
3	Turbidity	NTU	48.5	23.5	27.8
4	Total Dissolved Solids (TDS)	mg/l	308.1	160.2	175.2
5	Hardness	mg/l	128.5	99.5	110.6
6	Biochemical Oxygen Demand (BOD)	mg/l	42.6	25.4	31.5
7	Chemical Oxygen Demand (COD)	mg/l	45.8	27.2	29.3
8	Organic Matter	%	4.6	3.1	3.0
9	Nitrogen (N)	%	28	21.0	22.3
10	Phosphorus (P)	mg/l	7.2	5.2	6.5
11	Potassium (K)	mg/l	9.1	6.1	6.6

The physicochemical parameters like pH, EC, TDS, turbidity, hardness, BOD, COD organic matter, nitrogen, phosphorus, and potassium results are shown in Table 1. The observed values of physicochemical parameters after treatment of wastewater with the help of Teak and Banyan plant leaves ash were satisfactory, these are as follows:

pH: The potential of hydrogen ion concentration of wastewater before treatment is alkaline in nature but after treatment, it will be converted to near neutral by use of both plant leaves ash. 13% alkalinity was minimized by treating teak leaves ash.

EC: The electrical conductivity of wastewater after ash treatment of both plant leaves was satisfactory. 45% increased the quality of wastewater by treating Banyan leaves ash.

Turbidity: The results were satisfactory after treatment in both plant's leaves ash. 55% impurities were minimized by using Teak plant leaf ash in treatment.

TDS: Total dissolved solids were minimized after treatment by using both plant leaves ash and 45 % of impurities like dissolved solids were decreased by treating wastewater using Banyan leaves ash.

Hardness: The hardness was minimized after the treatment of wastewater by using both plant leaves and ash. 23% hardness was decreased by treating wastewater using Banyan leaves ash.

BOD and COD: The biochemical oxygen demand and chemical oxygen demand minimized pollution load after treatment of wastewater by using both plants leaves ash and results show satisfaction. 32% and 40% decrease BOD and COD load by treating wastewater using Banyan leaves ash respectively.

Organic Matter: The result of organic matter load was decreased at a certain level found in both plant's leaves ash. 17% organic matter load was decreased by Teak leaves ash treatment of wastewater.

N, P, and K: nitrogen, phosphorus, and potassium act as nutrients in the environment for algae and plant growth. The results show that a 19 % nitrogen load was decreased in Banyan plant leaves ash, and 16% and 30% phosphorus and potassium load was decreased in Teak plant leaves ash respectively.

The results of wastewater before and after treatment by using the ash of leaves of Teak and Banyan trees are found satisfactory and 35 % pollution load was minimized on average by all physicochemical parameters and nearly about same results were found by Syed Farman Ali Shah *et al* (2015) and some parameters results were nearly same found by Gou *et al*., (2015).

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