

## WASTEWATER TREATMENT USING PLANT LEAVES ASH

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### ABSTRACT:

The study based on wastewater treatment using different plant materials like neem (*Azadirachta indica*) and mango (*Mangifera indica*) plant leaves ash are innovative and eco-friendly approaches towards sustainable wastewater management. This work focuses on using the plant materials as adsorbents for removing pollutants from wastewater. The plant materials are subjected to high temperature in a controlled environment to obtain ash, which are used for the removal of pollutants such as heavy metals, organic compounds, and nutrients from wastewater. The study aims to investigate the efficiency of each plant material as an adsorbent, and the potential of the mixture of plant materials for wastewater treatment. 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 leaves ashes were effective in reducing the levels of pollutants.

**Keywords:** Wastewater, Treatment, Mango Leaves, Neem Leaves and Ash.

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### INTRODUCTION:

Water is an essential resource for all living beings, and the availability of clean water is a prerequisite for healthy human life. However, the increasing 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 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 leaves ashes in wastewater treatment.

The herb being a rich source of antioxidants it possesses the property of free radical scavenging thereby causing the lysis or death of pathogenic agents and cells. Neem exhibits a peculiar activity on Oncogenes, Tumor suppressor gene, it has a role in angiogenesis, Apoptosis etc., (Olabinri, and Adebisi, 2009).

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, modelling 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 mango leaves are full of vitamins, enzymes, antioxidants and various other minerals. The active compound 'Mangifera' present in these leaves has immense benefits (Rymbai *et al.*, 2013). Mango leaves can be boiled in water and drank or can be consumed in powdered form to ward off a number of health problems. A large number of mango leaves biosorbents has been investigated for their metal binding capacities under various optimum conditions. The variation in temperature 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 reduced viscosity of the solution. The mango leaves biosorbents residues were measured with respect to major textural region, textural mapping and surface useful groups the material was applied as a biosorbent in batch procedures to eliminate the poisonous from water solution in these conditions of various amounts, pH, rotation time and temperature (Ali *et al.*, 2020). The physical characteristics effectiveness and quality was improving with parameter i.e., turbidity is about 50%, viscosity is about 15 %, total dissolved solids are about 75 %, 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 to minimize the pollutants load from wastewater with the help of mango and neem plant leaves ash and that water is used to agricultural and domestic purpose.

## **METHODOLOGY:**

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

*Collection of Plant Leaves:* Collect neem (*Azadirachta indica*) and mango (*Mangifera indica*) plant leaves of certain plants have been found to be particularly effective in treating waste water 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.

*Treatment of Waste Water:* The filtered waste water should be poured into a beaker and the ash solution added in a ratio of 1:10 (ash solution: waste water). 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 physico-chemical analytical results:

Sr. No.	Parameters	Unit	Before Treatment	After Treatment	
				Use of Neem Leaves Ash	Use of Mango Leaves Ash
1	pH	--	8.9	7.9	7.8
2	Electrical Conductivity (EC)	μS/cm	28.9	35.4	42.1
3	Turbidity	NTU	48.5	25.0	27.8
4	Total Dissolved Solids (TDS)	mg/l	308.1	158.5	172.2
5	Hardness	mg/l	128.5	102	118.6
6	Biochemical Oxygen Demand (BOD)	mg/l	42.6	29.4	31.5
7	Chemical Oxygen Demand (COD)	mg/l	45.8	28.1	30.9
8	Organic Matter	%	4.6	3.9	3.7
9	Nitrogen (N)	%	28	22.5	24
10	Phosphorus (P)	mg/l	7.2	6.4	6.0
11	Potassium (K)	mg/l	9.1	7.5	6.1

The physico-chemical 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 physico-chemical parameters after treatment of wastewater with the help of mango and neem plant leaves ash was satisfactory, these are as follows:

**pH:** potential of hydrogen ion concentration of wastewater before treatment is alkaline nature but after treatment it will be converted in near about neutral by used of both plant leaves ash. 12% alkalinity were minimized by treating mango leaves ash.

**EC:** The electrical conductivity of wastewater after ash treatment of both plant leaves were satisfactory. 46% were increased the quality of wastewater by treating neem leaves ash.

**Turbidity:** The results were satisfactory after treatment in both plants leaves ash. 57% impurities minimized by using mango plant leaves ash in treatment.

**TDS:** Total dissolved solids were minimized after treatment by using both plant leaves ash and 49 % impurities like dissolved solids were decrease by treating wastewater using neem leaves ash.

**Hardness:** The hardness ware minimized after treatment of wastewater by using both plant leaves ash. 21% hardness were decrease by treating wastewater using neem leaves ash.

**BOD and COD:** The biochemical oxygen demand and chemical oxygen demand ware minimized pollution load after treatment of wastewater by using both plant leaves ash and

results shows satisfactory. 31% and 39% decrease BOD and COD load by treating wastewater using neem leaves ash respectively.

**Organic Matter:** The result of organic matter load was decrease at certain level found in both plants leaves ash. 15% organic matter load was decrease by mango leaves ash treatment of wastewater.

**N, P and K:** nitrogen, phosphorus and potassium act as nutrients in environment for algae and plant growth. The results shows that 20 % nitrogen load was decrease in neem plant leaves ash, 17% and 33% phosphorus and potassium load was decrease in mango plant leaves ash respectively.

The results of wastewater before and after treatment by using ash of leaves of mango and neem trees are found satisfactory and 31 % pollution load were minimized in an average by all physico-chemical parameters and near 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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