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Adsorption Study on Waste Water Characteristics by using Natural Bio-Adsorbents

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Abstract: ***Wastewater generation and treatment is an ever-increasing concern in the current century due to increased urbanization and industrialization. Hazardous contamination of water is a major hurdle in the provision of usable and drinkable water to the world. Innovative, economic, renewable and environment friendly technologies are need of the hour for wastewater treatment.***
Numerous wastewater treatment techniques, including physical, chemical, and biological (primary to tertiary treatment) approaches, are used to address the issue of growing environmental hazards. Various treatment techniques being used have the risks of producing secondary pollutants. The most promising technique is the use of different materials as adsorbents that have a higher efficacy in treating wastewater, with a minimal production of secondary pollutants. Adsorption Technology is used for Grey water treatment.
Adsorption is the most efficient and popular method since it is suited for the removal of turbidity at high concentrations and has a low maintenance cost. This review elaborates the major agricultural and non-agricultural materials-based sorbents that have been used with their possible mechanisms of pollutant removal. This review also explains the re-usability and mechanisms of the used adsorbents and/or their disposal in a safe and environmentally friendly way, along with highlighting the major research gaps and potential future research directions. Additionally, the cost benefit ratio of adsorbents is clarified.
Keywords: Adsorption, Wastewater treatment, Natural bio-adsorbent, Characterization, Sustainable solutions.

I. INTRODUCTION

Water is base of human life, but present situation is not good because water pollution increases day by day by different reasons like industrial untreated discharge in water bodies, religious reasons, navigation in case of leakage of oil during transportation, through waste garbage directly into the water resources which affect aquatic life. Many types of pollutants are present in water like Chloride, Turbidity and TDS (Total Dissolved Solids) also the part of water pollution. So, the treatment is required to minimize the water pollution and to reduce the wastage of water.

II. MATERIALS USED AND ITS PROPERTIES

Materials used for the experiment includes Waste water, Castor seed, Peanut shell powder, Java plum seed or Indian blackberry and activated carbon.

A. Waste Water

Wastewater is water generated after the use of freshwater, raw water, drinking water or saline water in a variety of deliberate applications or processes. Another definition of wastewater is "Used water from any combination of domestic, industrial, commercial or agricultural activities, surface runoff / storm water, and any sewer inflow or sewer infiltration". In everyday usage, wastewater is commonly a synonym for sewage, which is wastewater that is produced by a community of people.

B. Castor Seed (Ricinus communis)

Castor seeds in an expeller to extract oil from it in a temperature-controlled with the help of steam. Castor Oil Cake is one of the most versatile natural manures. It is truly organic manure which enhances the fertility of the soil without causing any damage or decay. Castor is a plant that produces seeds. Castor oil is produced from ripe seeds that have had their outer covering removed. Castor oil has been used as a medicine for centuries.

C. Peanut Shell (Arachis hypogaea)

The peanut is the seed, the papery covering is the seed coat, and the hard shell is the seed pod. The peanut shells were characterized by high porosity and showed water absorption around 198% at 72 hours. Its chemical composition is essentially composed of silica, iron oxides, alumina and calcium oxide. Its microstructure showed that the peanut shells were a compilation of microfibers with high porous borders. Peanut shelling is the process by which the outer hull or shell of a peanut is broken, and the kernel or seed is removed and separated. In the recent past environmental concerns have led to an interest in using peanut shells for a variety of purposes: fuel, mulch, carrier for chemicals and fertilizers, bedding for livestock and poultry, pet litter, soil conditioners, etc.

D. Java plum seed powder or Indian blackberry(Syzygium cumini)

As per the construction and demolition (C&D) waste rule 2016, any waste comprising building materials, debris and rubble resulting from construction, remodeling, repair and demolition of any civil structure is classified as c and D waste. C&D waste are in several types. We particularly using brick types c & d waste using size c & d waste will sieve in 4.35mm.

E. Activated carbon

Castor seed, Peanut shell powder and java plum seeds are converted into activated carbon. The seeds are dried in sunlight after that the seeds are heated in Muffle furnace.

Fig.1 Wastewater


Fig.2 Castor seed


Fig.3.Peanut Shell


Fig.4 Java plum seed powder


Fig.5 Castor seed activated carbon


Fig.6 Peanut Shell activated carbon

III. TEST PREPARATION

A. Chloride

1) The collected wastewater sample is taken in quantity of 20 ml and poured in beaker, then 2ml of potassium dichromate/potassium chromate is added.

2) This solution is titrated against the $Agno_3$ solution taken in burette.

3) The End point is turning of yellow colour into brick red colour.

4) The values are observed and noted and used for initial chloride calculation.

B. Turbidity

1) Nephelometric turbidimeter is switched on and waited for few minutes till it warms up.
2) The instrument is calibrated using standard turbidity samples.
3) The sample is shaked thoroughly, and it is kept for sometimes to eliminatethe air
4) The Sample is taken in Nephelometer sample tube, and the sample is put ina sample bubble. chamber and the value on the scale is found and tabulated.

C. TDS Meter

The collected wastewater is poured on a China dish and then the TDS meter is immersed in it. After it is immersed in China dish containing tape water for cleaning the dip of the TDS meter and the dipped portion is let too dry by setting free. The values are observed and tabulated.

IV. TEST RESULTS

Material	Castorseed	JavaPlum seed	Peanutshell
Turbidity(NTU)	1.09	2.41	1.94
TDS(ppm)	489	471	474
Chloride(mg/l)	230.4	141.4	245.95

Table 1

Fig.7 Total suspended solids

Fig.8 Chloride test

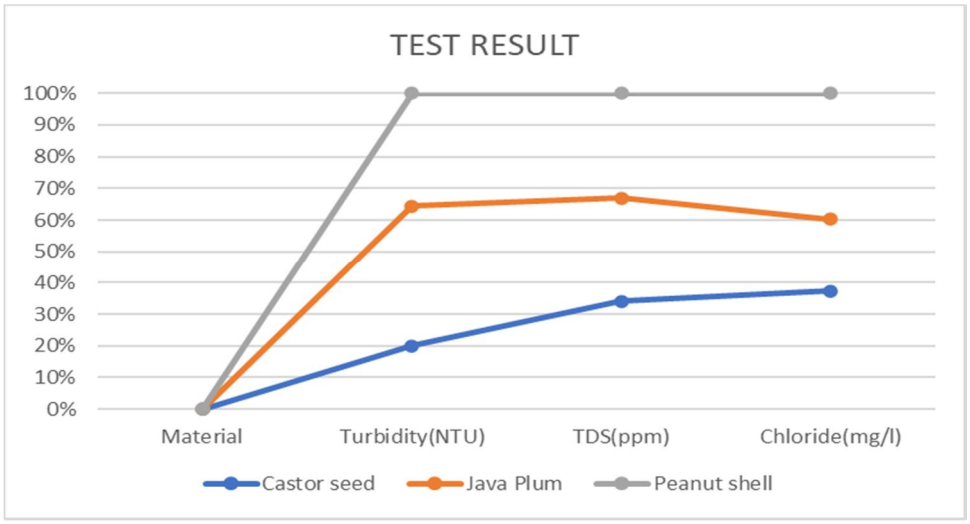

Fig 9 Graph

V. CONCLUSION

1) Adsorbents made from biomass have been used to successfully removeseveral pollutants from wastewater
2) The TDS level is highly reduced while using the java plum seeds when compared to the peanut shell powder and castor seed powder.
3) The turbidity level (NTU) removing tendency is greater while using thecastor seed when comparing to the other two.
4) The Java plum seed powder is best adsorbent to reduce the Chloridecontent in Wastewater.
5) The filtration efficiency is greatly increased while using the java plumseed powder.
6) The filtration efficiency of java plum seed powder is about 20.9 timeshigher when compared to the peanut shell powder.

VI. SUGGESTION

1) We suggested that the solids content removed water can be used forIrrigated purposes, golf parks and etc.,
2) The drinking water standard chloride is 250mg/l.
3) The concentrations above 250mg/l, chloride can impart a salty taste. So, Java plum seed powder is best absorbent for wastewater.
4) We can suggest the secondary sludge was dried to use fertilizers for agricultural land.

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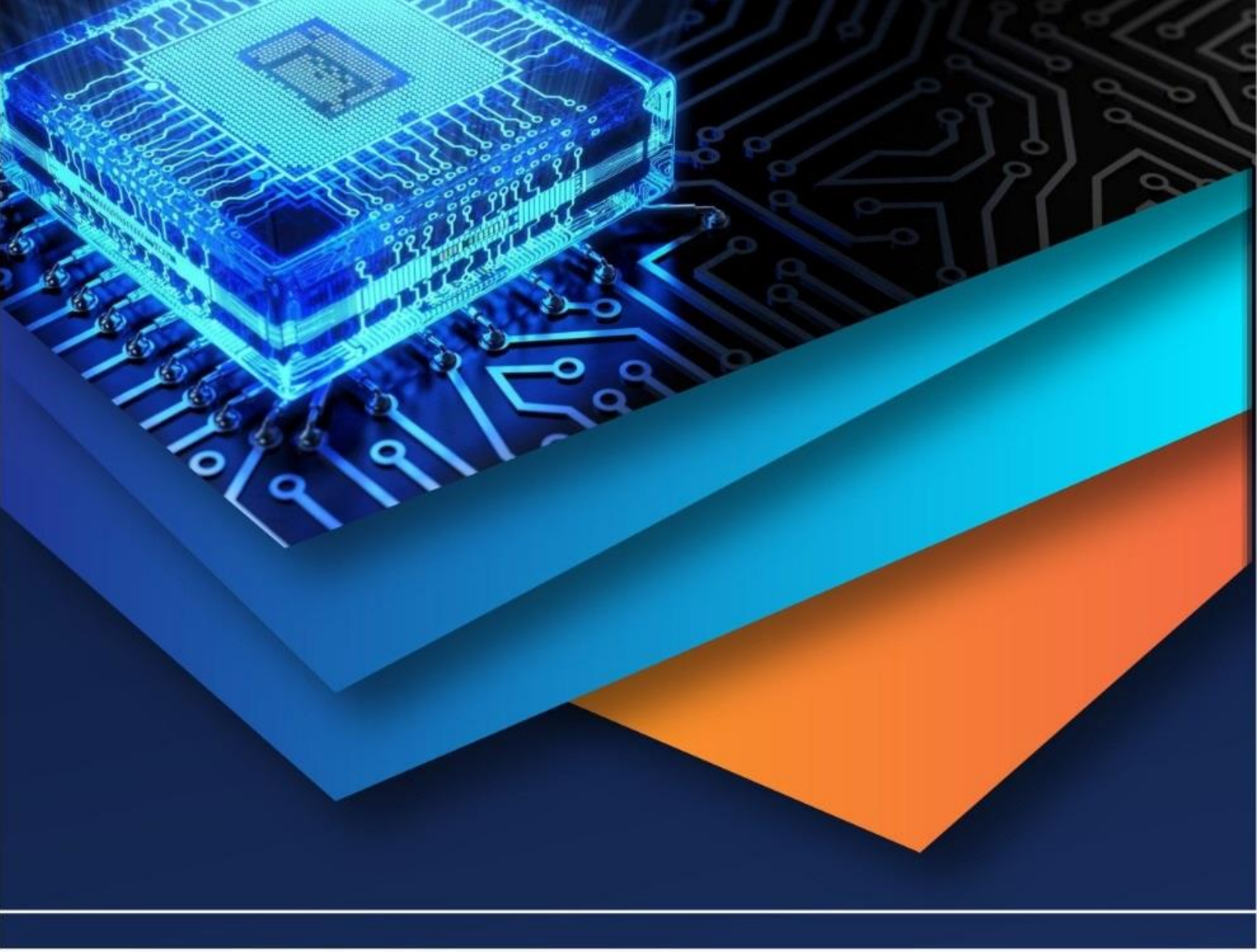

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