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Study of Removal of Impurities from Water by Activated Charcoal Prepared from Coconut Shell and Hen Feathers Both Embedded in Bio-Plastic Straw Made from Hen Rachis

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ABSTRACT

In every 90 sec, a child dies from water-borne diseases. Due to vast urbanization and industrialization water bodies are contaminated with huge toxic chemicals, solid wastes, heavy metal ions etc. that vanishes the aquatic life and cut the water quality day by day for drinking purpose. Purification of water is the need of the present day. Though there are several methods to purify water, still lacks cost effectiveness. Thus, here we conducted a study on purification of water, which is aim to remove biological, colloidal, and as well as suspended impurities, water-soluble dye at cost effective and eco-friendly way by using waste products. Our study deals with the construction of a prototype, which works on the principle of adsorption. Our main mission and vision are to offer this system to each common person who is unable to install RO's or high-cost technology for water purification. The prototype of a bio plastic straw consists of hen rachis, hen barbs, activated charcoal, etc. for purification of water. The bio-plastic straw is made up of hen rachis. Thus, the complete study is focus from waste to wealth management.

Keywords: - Adsorption, Bio plastic, Hen Feathers, malachite green oxalate.

I. INTRODUCTION

Every 90 seconds, a child dies from water borne disease. This mostly occurs in rural areas. The impurities in water, which leads to these diseases, are dissolved impurities such as salts like calcium, magnesium, carbonates and bicarbonates, which leads to diseases like gall, kidney stone and goiter, And many more impurities like colloidal impurities, micro-organism and suspended impurities. So, In order to get rid of these diseases there is necessity to purify water at high purification accuracy, By cost effective and eco-friendly way the textile industry is accountable for using and producing 1.3 million tons of dyes and pigments, most of which are made synthetically. The textile industry is one of the largest sectors globally and produces an astonishing 60 billion kilograms of fabric annually, using up to 9 trillion gallons of water.10-25percentage of textile dyes are lost during the dyeing process, and 2-20% is discharged as aqueous effluents in different environmental Components. In particular, the discharge of dye-containing effluents into the water

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environment is undesirable because of their colour, released directly and breakdown products are toxic, carcinogenic or mutagenic to life forms mainly because of carcinogens such as Benzedrine, naphthalene and other aromatic compounds.

VISION

To provide safe and adequate drinking water for rural areas

GOALS

To provide every rural person with adequate safe water for drinking, cooking and other domestic by Hen Barbs, Hen Rachis, and coconut shell.

OBJECTIVES

- Follow conjoint approach of sanitation and water supply, which would progressively lead to Swachh Bharat.
- Provide support and environment for Panchayat Raj Institutions and NGO to manage their own drinking water sources and systems in their villages with regard to lakes, ponds, river, well water and underground water.
- Enable all rural people to have access to and use safe & adequate drinking water.
- Ensure portability, reliability, sustainability, convenience, equality and consumers preference and conveniently accessible and in all situations.
- Needs on a sustainable basis. This basic need should meet water quality standards and be readily

MATERIALS AND CHEMICALS REQUIRED

Sodium chlorite, 2 N sodium hydroxide, 2 N HCL, 0.05N sodium sulphide, 30% v/v Hydrogen peroxide, He and Ne cylinders, malachite green oxalate dye, acetone, hen feathers and coconut shell.

EXPERIMENTAL PROCEDURE

The experimental work is divides into following stages: -

A. Preparation and activation of coconut shell carbon
B. Activation of hen feathers
C. Preparation of bio plastic from Hen Rachis.
D. Removal of impurities from water using activated charcoal & hen feathers.
E. UV-Visible Spectroscopic study for the analysis of the water sample.

A.) Preparation and activation of coconut shell carbon

* Discarded coconut shells were collected from nearest temple
* For increasing the porosity of coconut shell surface, the pieces of coconut shell (20gm) were soaked into the solution of zinc chloride.

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* The soaked material was subjected to muffle furnace in the presence of inert atmosphere of He and Ne, at 17 atm
* The burnt material from the muffle furnace was crushed into small beads
* The beads were given the washings with 1:1 HCL solution, and were resined with distilled water.
* For removing access of water the carbon beads were subjected to a Buchner funnel.
* The moisture was removed by keeping the material in the oven at 110^{o} C.
*

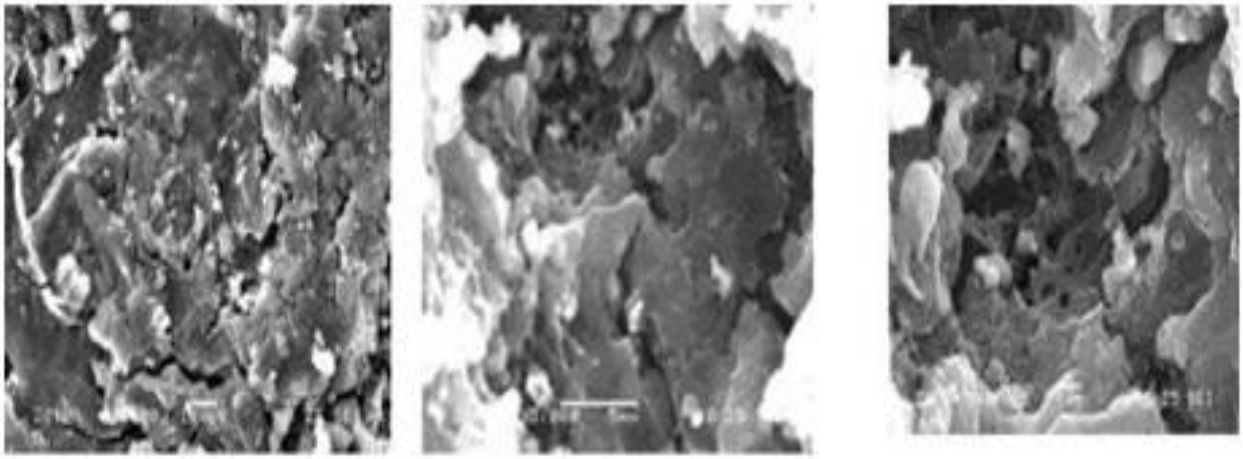

Fig 1 : SEM Images of coconut shell carbon

B.) Activation of Hen Feathers:-

* Collected the Hen Feathers from nearest slaughter shop.
* Washed it with a tap water and detergent.
* For removing blood stains, washed it with a sodium chlorite solution or ethyl alcohol.
* Then for remove sticky impurities, Soaked the Hen Feathers in 30%v/v solution of hydrogen peroxide for
* 24 hours.
* Then again washed it with distilled water.
* For removing excess water, treated hen feathers were subjected to a Buchner funnel process.
* Finally kept the Hen Feathers in oven at 100^{o}C for removing the moisture. Then separate the Hen barbs and hen rachis separately from treated hen feathers.

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C.) Preparation of Bio plastic from Hen feathers:-

Fig. 2: Preparation of Bio plastic from Hen feathers

Treated Hen rachis was taken in bulky amount. Fig 4.

* Approx. 5 gm. of Hen Rachis powder was added in 100 ml of 0.05N sodium sulphide and 2 N NaOH solution
* This mixture was kept for stirring on magnetic stirrer at 32^{o}C for 2 Hours.. The solution was then filtered and centrifuge at 18000 rpm for 5 min. (step 2).
* The supernatant liquid was collected by using filter paper and 2N HCL was added to the solution. (step 3).
* The precipitate mixture was poured in a petri dish and then left for drying at 50^{o}C for an Hour to make plastic, (step

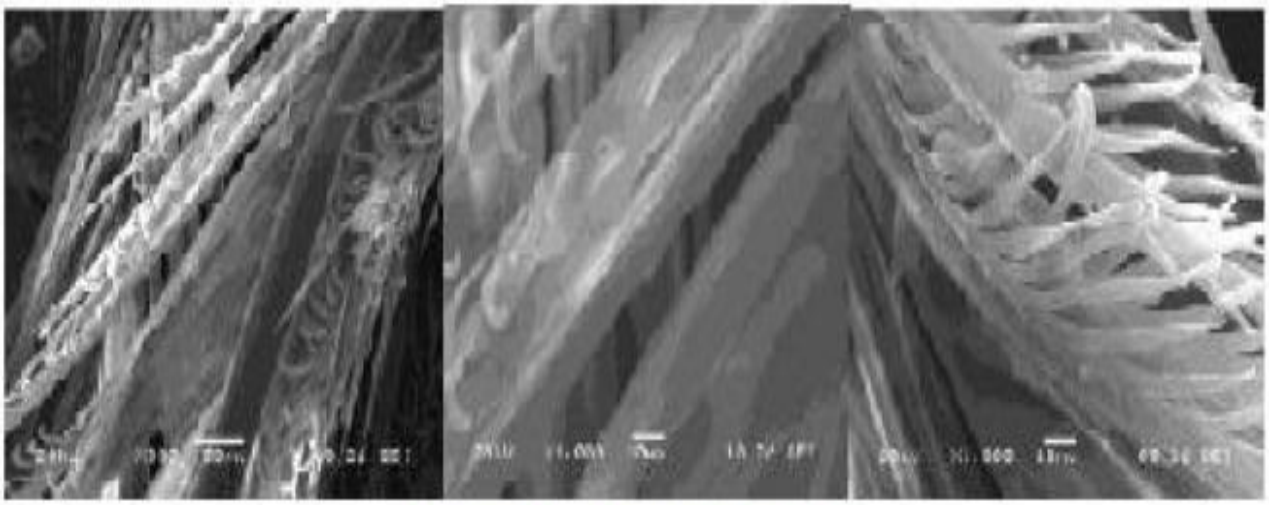

Fig: 3: SEM of Hen fethers

* The concentrations of the malachite green were varied from 1 x 10^{-5} to 5 x 10^{-5} M.
* Contact time of solution with activated charcoal was also varied from 5 seconds to 60 seconds.
* The removal of dye was calculated by measuring the absorbance with the help of UV-visible spectrophotometer, of the sample solutions before and after contact with the activated charcoal.

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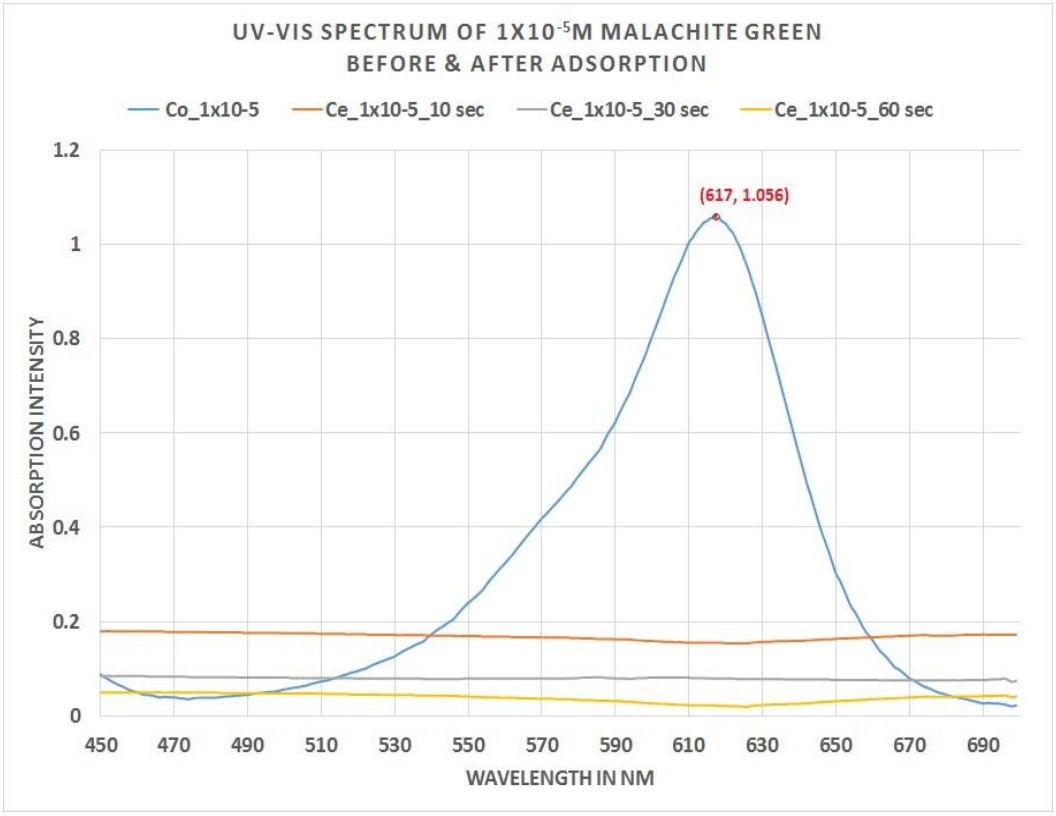
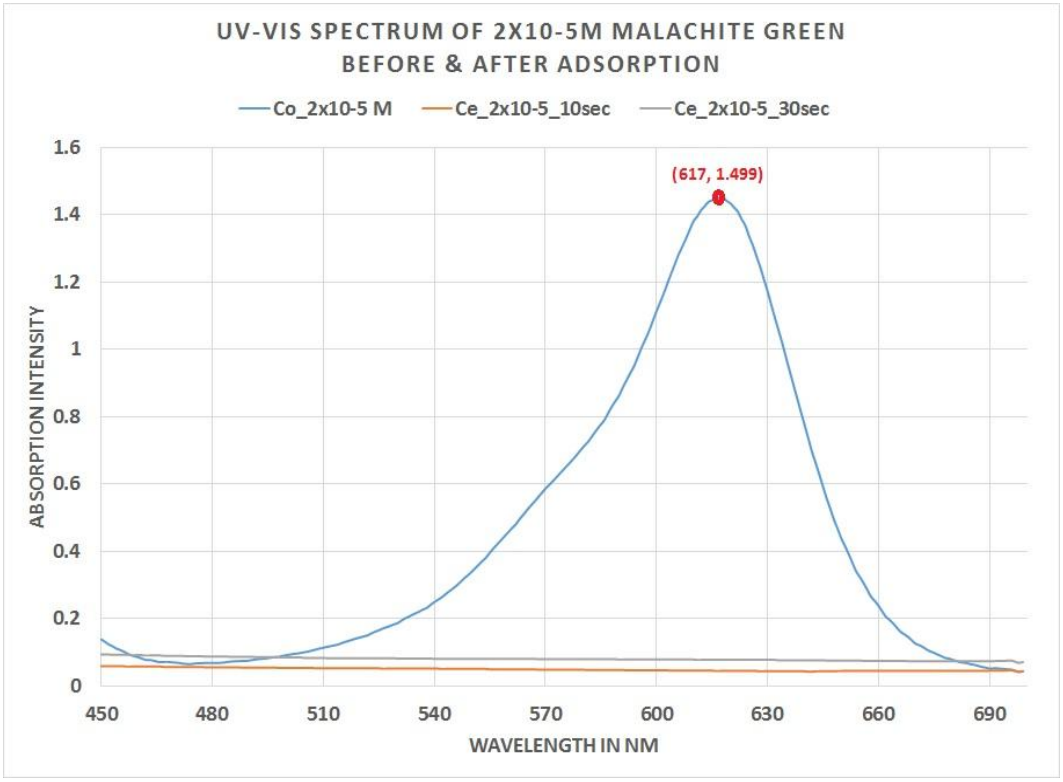
Graphs: -The UV-Vis Spectrum shows the effective removal of malachite green oxalate at different contact timing of the Activated Charcoal with water sample.





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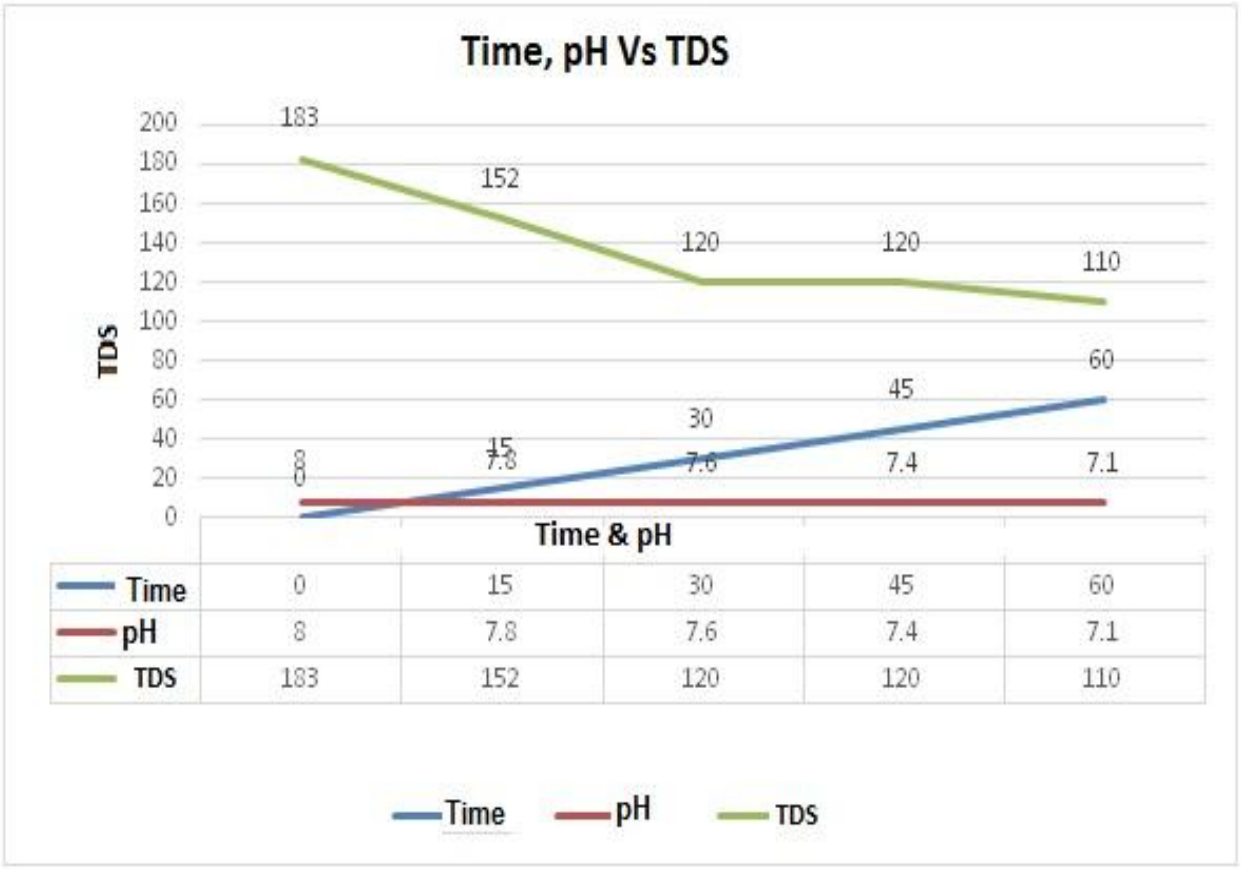

RESULTS: -

Parameters	Nature of sampling	Before Sampling	After Sampling
pH	Only activated charcoal	8.2	7.2
TDS	Hen feathers & activated charcoal combined	183 ppm	110 ppm
Hardness		289 mg/lit	62 mg/lit
BOD		4	2
Absorbance (Co: $1x10^{-5}$M)	Only activated charcoal	1.056	< 0.1
Absorbance (Co: $2x10^{-5}$M)	Only activated charcoal	1.499	< 0.1

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Advantages of Bio plastic straw:-

- Totally eco-friendly.
- High tensile strength.
- Can be used for purification of water.
- Economical and easy availability of the raw material.
- Polybags, toys, fibres, etc. can be made from this plastic.

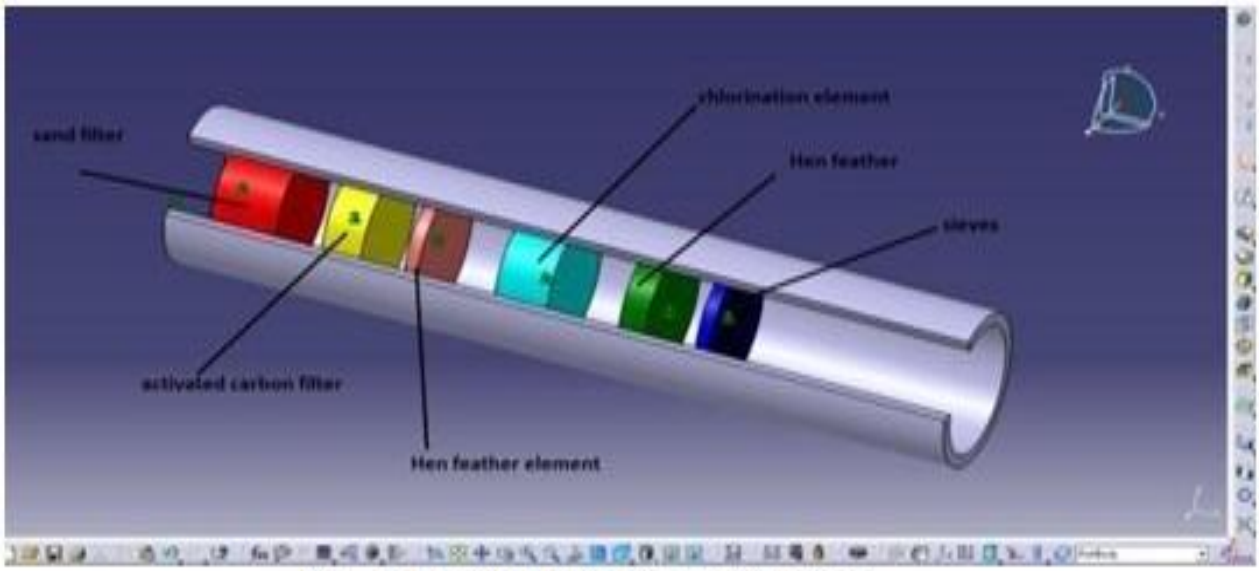

Fig. 6: Prototype for Bioplastic straw

CONCLUSION

Water from Indrayani River, Alandi, Pune, Maharashtra (flowing at backside of our college), was taken as one of the sample for the current study. It was analyzed for various parameters like TDS, pH, Hardness and BOD, before and after the treatment. The treatment showed considerable decrease in the pH, TDS, Hardness, and BOD at much desired level.

Hence, we can conclude that we are ready to provide this prototype at doorsteps to the common people at the rate of approx. 5-6 Rs, eco-friendly way, and this can be used up to 6-7 days. This system can filter 500-ltr water in one time use, yet now it's a kind of disposable model.

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