DEVELOPMENT OF LOW-COST BIO-FILTER USING HERBAL TECHNIQUE

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***Abstract*- It's egregious fact that clean water is hugely needed for healthy living. A needful force of fresh and clean drinking water is essential for all mortal beings on the earth, yet it has been detected that millions of people worldwide are poverty-stricken by this. defiled water plays a significant part in taking multitudinous lives in these points, for which several sweats are being made for penetrating safe purified drinking water. Fortunately, effective and cheap water sanctification systems are being employed and being tried to be penetrated worldwide for easy access to clean water. In our design, we tried to develop a Low cast Water sanctification fashion "By using the introductory ideas of a bottle sludge and some locally Herbal available sludge material like Tulsi leaves greasepaint, Neem leaves greasepaint, Rice Husk, Sugarcane bagasse, finely graded beach and we try to ameliorate the methodology using the UV Sludge, RO Filter, and Actuated Carbon Filter medium. Our main focus was the junking of iron from face water by adsorption fashion. Among all the herbal accouterments used, the ash produced from rice cocoons was proved to give a stylish result in the junking of the cheapest material cost. We locally collected Sugarcane club bagasse and neem leaves greasepaint mixed with calcium hydroxide(chuna) was prepared which also proved to be effective for the junking of iron. junking of iron astronomically four herbal accouterments were used in the trials is that Tulsi leaves greasepaint, neem leaves greasepaint, rice cocoon, and sugarcane bagasse has been espoused. The following adsorption media had been tested then for the junking of iron from drinking water.**

Keywords: **Herbal, Rice husk, Tulsi, Filtration.**

INTRODUCTION

Inviting essence in water is begun from squandered water of multitudinous gambles. This substantial essence effectively affects conditions and mortal well-being A little nation of this substantial essence deed at low obsession can beget multitudinous genuine affections. Along these lines, the expatriation of substantial essence from water is to be allowed

According to the world health association,1.1 billion people warrant access to a bettered drinking water force, 88 of the 4 billion cases of diarrhea complaints are attributed to unsafe drinking water and 1.8 billion people die from diarrhea conditions each time(WHO, 2007). Statistics show that these conditions redounded in ninety percent of all deaths of children under five times old in developing countries, due to low immunization of children to infections. Reducing death from waterborne conditions is a major thing for public health in developing countries. Despite the fulfillment of the demand for drinking water norms, the external water used in developing countries is being bettered, and cost-effective water filtration ways are being developed generally used to ameliorate taste or to exclude any uninvited matters. Among pastoral habitations in Indian countries,,511 face quality issues with drinking water. As of November 27 this time,3.22 percent of pastoral habitations across all countries and UTs, counting for 3.73 percent of the population, were consuming drinking water with quality issues, according to data tabled by the Ministry of Jal Shakti in Parliament. Iron is the most common adulterant of drinking water, with over,000 pastoral habitations affected, followed by saltness that affects roughly,000 pastoral habitations, arsenic(,000), fluoride(nearly,000), and heavy essence. Rajasthan has the loftiest number of pastoral habitations affected by impurity overall, at,833. utmost of these –,182 – are affected by saltness in drinking water,,182. The compass of this design is to study the living water filtration styles, the announcement uses the knowledge to design a Low- cost water filtration using the herbal fashion. This water filtration system made by the bottle, which will concentrate on cutting down the cost while maintaining sludge effectiveness, by furnishing affordable water pollutants for pastoral and remote areas, will greatly ameliorate people's quality of living, and reduce the threat of any waterborne conditions, thus, saving lives. Critical analysis of colorful herbal ways used for identification of water sanctification.

A most suitable system for junking the poisonous element. Development of low-cost water sanctification outfit using different herbal (Tulsi leaves, Neem leaves, Rice cocoon, sugarcane basement.).

2. MATERIALS AND METHODS

In this study, the assembled water of identified iron concentration was conceded through the inlet pipe. Inside the bottle cylinder, unlike adsorption media of quantified thickness were located with appropriate gravel support. Then post-filtration, the filtered water was composed through the outlet part in a beaker and the ending concentration was restrained in the Atomic Absorption Spectrometer. The rate of filtration was noted and for each adsorption media, three or four samples were tested and regular concentration was measured for analyzing the efficiency of filters. Materials used and Preparation of Adsorption Media: The possibility and efficiency of utilization of herbal as an adsorbent for heavy metal adsorption in polluted water has been worked upon. The following materials were used in the removal of iron from water.

Sand: Fine sand and gravel are natural glacial deposits great in silica content and low in soluble calcium, magnesium, and iron compounds, and are very useful in the removal of sediments. But here it is used for iron removal from drinking water. Sand passing through 600 Micron sieve is used.

Tulsi Leaves Powder: Tulsi, Holy basil, or Osmium Sanctum Linn. leaves in drinking water are used for purification and medication. It is an excellent medicinal plant found all over India and is considered sacred. The leaves, seeds, and roots of this plant have been used in Ayurveda. It chemically contains many nutrients and other biological activities. It can remove fluoride levels in drinking water. It has also been found in fighting fluorosis. Tulsi leaves powder, as in figure 1, was used for the removal of iron from water.

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Neem leaves Powder

The scientific name of neem is Azadirachta indica. Neem leaf powder was purchased from the local market in Gorakhpur. We have to take neem leaf powder for the removal of toxic elements from water. We adopted two methods for this

In the first method, neem powder was used but in the second method, it was mixed with calcium hydroxide(chuna).

Rice Husk

Rice husks are the hard protective covering grains of rice. Around 20% of the paddy weight is a husk. Rice's scientific name is Oryza sativa. The chemical composition of rice husk is similar to that of many common organic fibers and also it contains cellulose 40-50%, lignin 25-30%, ash 15-20%and moisture 8-15%. It is found by Hwang and Chandra in 1997.

After burning, most evaporable components are slowly lost and the silicates are left. The low-value of agricultural rice husk can be made purification of water. This was used as an absorbent along with sand as a base material.

Aluminum hydroxide-coated Rice husk:
When the rice husk was burnt then it generates rice husk ash. Cellulose and lignin are removed by burning and leaving behind silica ash. Rice husk ash was produced by controllable temperature and environment of the burning process in a muffle furnace at a temperature of 500 degrees Celsius for 3 hours. Firstly, the rice husk ash was soaked with 0.01 N HCL. Dry rice husk ash of 100 gm,0.6M of aluminum salt solution, and 3Msodium hydroxide was added and it also adds stirred for 1 hour, and then the filtered rice husk was kept in the oven for 3 hours at 373K.

Sugarcane Bagasse:
After juice extraction, the bagasse is the sugarcane fiber waste left. Bagasse contains cellulose, hemicellulose, pentosans, lignin, sugars, wax, and minerals also. Firstly, it was washed through the tap water and again washed with distilled water to remove dirt and metallic impurities and after which it was dried in the oven at about 105 degree Celsius for 3 hours and 24 hours dried in the sunlight. It was used as an absorbent along with sand as a base material.

METHOD
In the model, the Iron concentration of the prefabricated water was passed through the inlet pipe above. Inside the bottle of the cylinder, different absorption media of specified thickness were placed with proper gravel support. After filtration, the filtered water was collected through the outlet part in a beaker and the final concentration was measured in the atomic absorption spectrometer. The rate of filtration was noted and for each absorption media, three or four samples were tested and the average concentration was considered for analyzing filter effectiveness.

Procedure
Plant material- Leaves of Tulsi and neem were collected from the market after that sugarcane bagasse was collected from the vendors who sell the sugarcane juice. Rice husk is collected from the local area and burnt it does not get turned completely to ash, only burnt from the surface.

Other materials- sand is collected from the nearby area.
Sponge and nylon clothes are bought from the market. All the materials were separated and washed with tap water followed by distilled water, sieved, and dried before use.

In the container, all the materials to be kept should be cleaned and dried properly.
All the materials were purified and dried and layered one by one.
Starting from the bottom Nylon cloth -sponge -sand -RHA-sand -sugarcane bagasse-Neem leaf -Tulsi leaf -Sponge.
After placing the material in the layered form, pour the clean water several times till clean water comes.

Collection of water Sample
River water is collected from the Rapti River, Gorakhpur.
Pond water is collected from the Ramgarh Tal, Gorakhpur.
After that, we check its quality i.e., whether it is suitable for drinking or not.

Sponge
(To stop the passage of big particles and maintain the layers)

Tulsi Leaf
(To decontaminate the water)

NEEM LEAF
(Removal of toxic elements)

Sugarcane Bagasse
(Color removal properties)

SAND
(To stop minor particles)

RICE HUSK ASH
(Trap up to 95% of turbidity and bacteria present in water)

RESULTS AND DISCUSSION

Tulsi leaves powder

The results are obtained in the removal of iron by using Tulsi powder as mentioned. The rate of filtration and the effectiveness in removing iron are tabled below. The initial iron concentration was 1.052ppm and better removal of iron (in %) in sample 1 but the rate of filtration, in this case, was lesser.

Sample No.	The thickness the of Sand Layer	Amount of Tulsi Leaf Powder (gram)	Initial Iron content(ppm)	Final Iron content (ppm)	Rate of Filtration (ml/Mn)
1.	Top layer= 2cm Bottom layer= 3 cm	50 grams	1.053	0.973	183
2.	Top layer and Bottom layer= 2 cm	40 grams	1.053	0.975	235
3.	Top layer Bottom layer= 3 cm	40 grams	1.053	0.976	192

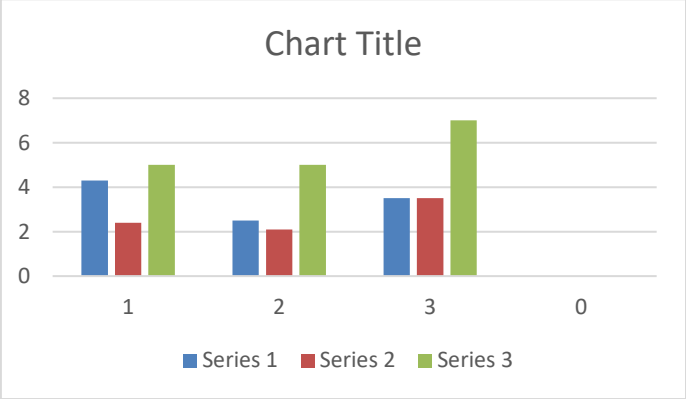
Neem leaves Powder

The results are obtained in the removal of iron by using neem leaf powder as mentioned in below table The initial iron concentration was 1.317ppm and better removal iron (%) was obtained in sample 3 but the rate of filtration, in this case, was lesser. Neem leaf powder gives a better result according to Tulsi leaf Powder.

Sample No.	The thickness of the Sand Layer	Amount of Tulsi Leaf Powder	Initial Iron content(ppm)	Final Iron content (ppm)	Rate of Filtration(ml/Mn)

		(gram)			
1	Top layer =2 cm Bottom layer= 3 cm	50 grams	1.318	0.710	200
2	Top layer Bottom layer= 3 cm	40grams	1318	0.890	227
3	Top layer Bottom layer= 3 cm	40 grams	1.318	0.698	208

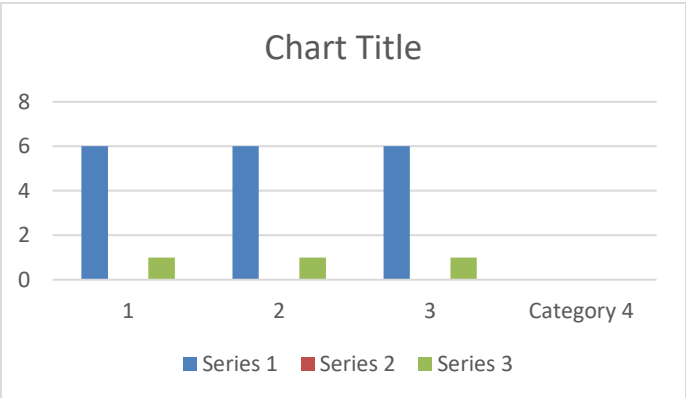
Comparison Of Results:



Rice Husk:

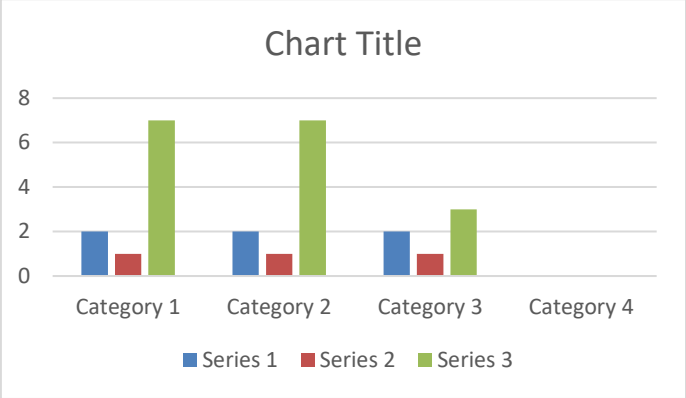
The results are obtained in the removal of iron by using rice husk. The rate of filtration and the effectiveness of removing iron are presented in the table. The initial iron concentration was 22.378 ppm and removal from 1.611 ppm by averaging the concentration of three samples.

Sample no.	Size of RH (micron)	Initial Iron content(ppm)	Final Iron Content (PPM)	Rate of filtration(ml/min)
1	600	2.378	1.593	160
2	600	2.378	1.569	160
3	600	2.378	1.671	160

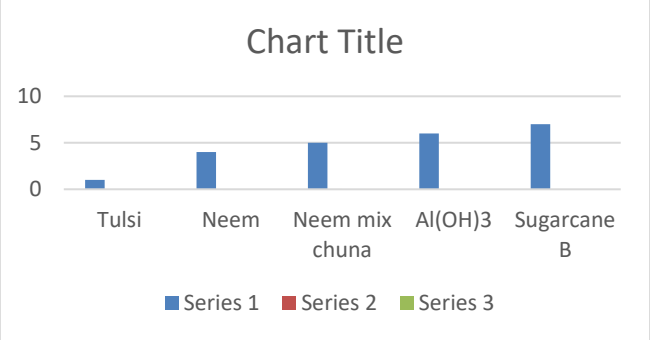


Al (OH)3 coated Rice husk ash:
The results are obtained in the process of removing iron by using AI(OH)3 coated Rice husk ash as mentioned in the below table. The rate of filtration and effectiveness in removing iron is tabled here. It gave satisfactory results in the removal of iron compared to unmodified rice husk. The initial iron concentration was 2.738ppm and removal was from 0.562ppm by averaging the concentration of three samples.

Sample no	Amount of SB (gram)	Initial Iron Content (PPM)	Final Iron Content (PPM)	Rate of filtration (ml/min)
1	100	2.378	1.396	220
2	100	2.378	1.396	220
3	100	2.378	1.396	220



Comparison of results:



Figures in the x-axis indicated:

In Tulsi leaves powder, better results were obtained in sample 1
which removed the interconnection was 7.052%.
In Neem leaves powder, the better result was obtained in the sample3 which removed the iron concentration was 47.00%
In Neem leaf powder mixed with chuna, the better result obtained in the sample1 which remove the iron concentration was 56%.
In unmodified rice husk removal, the iron concentration was 32%.
Modified (Al (OH)3) coated) Rice husk was 76%.
Sugarcane bagasse remove the iron concentration was 40% by averaging the concentration of three samples.

Cost of the filter
Here we have provided a chart for the cost of all the absorbent media we have used for experimentation excluding the labor cost, maintenance cost, and energy cost. Here the material cost of each absorption media per kg used for experimentation is given in the table and the total cost per the amount of material used is also mentioned

Material	The amount used for the experiment(kg)	Rate per kg in rupees	Total cost in rupees
Sand	0.9	15	13.5
Tulsi leaf powder	0.2	300	60

Neem leaf powder	0.3	150	45
Rice husk	0.6	20	12
Aluminum sulfate	0.05	20	12
Sugarcane bagasse	0.2	20	4
Bottle	-	-	-

Conclusions

Absorption is the simplest and cheapest technique for iron removal, it has several advantages, like longer filtration runs, shorter ripening time, and better filtrate quality. But the only limitation is back wash water requirement is essential for the filter media to run effectively.

Sand being the cheapest absorbing surface is very effective in the removal of dissolved iron from drinking water and the rate of filtration is very high.

Tulsi leaves powder is not improved to be a good absorbent removal of iron.

Chuna mixed with Neem leaf powder proved to be a good result in the removal of iron.

Aluminum hydroxide-coated RHA proved to be a good absorbent in the removal of iron. In the case of Iron, there is no proof of the formation of any complex. So, the removal may be credited to roughening of the RHA surface due to modification by Al (OH)3.

Sugarcane bagasse, the removal is not so significant. This may be due to larger particles larger will be on the specific surface and better will be removal.

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