

Removal of Iron Content from Ground Water by Herbal Techniques

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Abstract – Over the last three decades, the concern about the environment protection has increased tremendously. Presently, several attempts were carried out for the conversion of byproducts of natural materials, especially agricultural wastes into a biosorbent material. Rice husk is one of the low-value agricultural by-products which have been used as absorbent material especially to absorb heavy metals. Previous studies have found that rice husk were capable to absorb heavy metals such as lead, cadmium, selenium, copper, zinc and mercury in the wastewater. Under this experimental job it has been decided to remove the iron content from the ground water by the help of Rice Husk, Neem leaf, and by Tulsi leaf powder.

Index Terms – Rice Husk, , Neem leaf, and Tulsi leaf powder, Iron Sample, Bottle Filter, Absorption and Filtration.

1. INTRODUCTION

Beyond this limit taste/appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria. the need of purified water is absolutely essential for healthy life and it has great impacts on people's everyday life, especially in the rural and remote areas where access to safe drinking water is very crucial. rice husk are the hard protecting covering of grains of rice. around 20% of the paddy weight is husk. Scientific name for rice is *Oryza sativa*. the chemical composition of rice husk is Similar To That Of Many Common Organic Fibres And It Contains Of Cellulose 40-50%, Lignin 25- 30%, ash 15-20% and moisture 8-15%. Ultimately the aim of development of any low cost water filtration model should be to operate with minimum energy, minimum maintenance, cost effective, environment friendly, implementable with ease and can be developed from local artisans. This will subsequently inspire the people to put hygiene in to habit and of course will help in the social and economic growth of the country.

2. MATERIALS AND FILTER DIMENSIONS

Filtration Model Development:

Here we have manufactured a simple cylindrical filtration bottle as shown in Figure 3.1(a) with the Following dimension:

- Length=18 cm.

- Internal diameter = 8 cm.

From the base, outlet pipe is extended to collect water with a tap as shown in fig 3.1(a) to regulate filtered water. Top of the cylinder filter bottle was covered with a cap of 0.5mm thickness as shown in fig(1). A hole of 4mm diameter was made to connect with the inlet pipe.

Plane Sand:

Fine sand and gravel are naturally occurring glacial deposits high in silica content and low insoluble calcium, magnesium and iron compounds are very useful in sedimentation removal. But here the media is used for iron removal from drinking water. Here for the experimentation plane sand passing through 600 Micron IS sieve were used.

Tulsi Leaves Powder

The scientific name of Tulsi is *Ocimum Tenuiflorum*, Holy basil or *Ocimum Sanctum* Linn. Leaves are dropped in drinking water for purification and for medication. In all Hindu temples, water mixed with Tulsi leaves are offered to devotees every day since the herbal plant is an excellent medicinal plant found all over India and is considered sacred. The leaves, seeds and root of this plant have been used in ayurvedic medicine. Chemical composition is highly complex, containing many nutrients and other biological active compounds.

Neem Leaves Powder:

The scientific name of neem is *Azadirachta indica*. Neem leaf powder was purchased from the local markets of Lucknow. Neem leaves powder was taken for removal of toxic element from water.

Rice husk:

RHA is a great environment threat causing damage to the land and the surrounding area in which it is dumped. Lots of ways are being thought of for disposing them by making commercial use of this RHA

2.1. Procedure for preparation of Standard Solution:

- Standard solution of the toxic element will be prepared by mixing toxic element with the water.
- Filter model will prepared consisting sponge, sand and different herbals.
- Then standard solution will pass through the filter model and final solution obtained is the purified solution.
- Finally the content of toxic element remaining will be calculated.
- Toxic element used was iron.
- First made the iron 200 ppm standard solution.
- 1.404gm Ferrous AmoniumSulphate → in 1000ml volumetric flask → (20ml conc. H_2SO_4 + 50ml Diluted Water) → 500ml diluted water → some drop of $KMNO_4$ → shows light pink colour → (diluted water) 1000ml.
- Now 1000ml = 200ppm

Now,

$$N_1V_1 = N_2V_2$$

$$200 \times V = 10 \times 500$$

$$V = 25\text{ml} \rightarrow 500\text{ml} = 10\text{PPM}$$

↓

(25ml From upper sol. + 500ml DW gives 10ppm)

3. EXPERIMENTAL PROGRAM

Experimental study plan

Collection of iron water sample from the lab of U P JAL NIGAM.

Test it from the spectrophotometer to find out the intial iron concentration of water sample. Then filter it from prepared bottle filter. Again took the reading of filtered water sample by using spectrophotometer. For removing of iron broadly four herbal materials in the experiments i.e. Tulsi leaves powder, neem leaves powder, rice husk and plain sand has been adopted. Preparing of the adsorption media for removal of iron from drinking water.



Fig :1 bottle filter



Fig : 2 Tulsi leaf Powder Bottle Filter



Fig 3 Neem leaf Powder Bottle Filter



Fig : 4 Rice Husk Bottle Filter

4. RESULTS

Table : Results of filtration in tulsi leaf powder

SAM PLE	Initia l Iron conte nt (ppm)	Final Iron content (ppm)	Efficien cy in percent age(%)	Rate of filtration(ml/min)
1	21.47	0.42	98.04	65
2	12	0.38	96.83	85

3	12	0.31	97.41	80
4	5	0.14	97.02	75
5	15	0.30	98	65

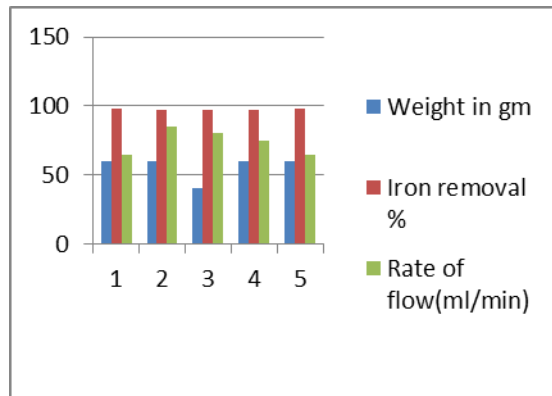
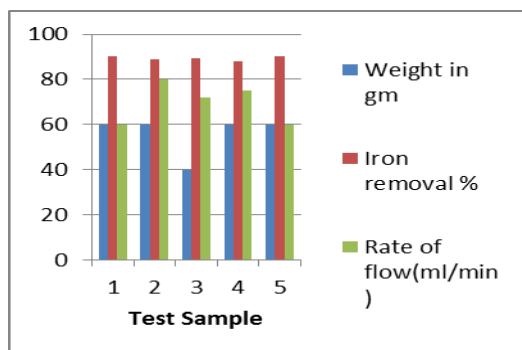


Fig : 4.1 Graph of Tulsi Leaf Powder On Different Test Sample

Table : Results of filtration in Neem leaves powder

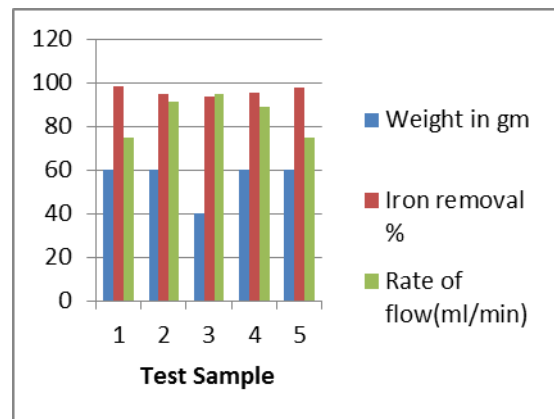
Test Sample	Initial Iron content (ppm)	Final Iron content (ppm)	Efficiency in percent age(%)	Rate of filtration (ml/min)
1	21.47	2.06	90.40	60
2	12	1.35	88.75	80
3	12	1.3	89.16	72
4	5	0.6	88	75
5	15	1.47	90.33	60



Graph of Neem Leaf Powder on Different Test Samples

Table : Results of filtration in rice husk

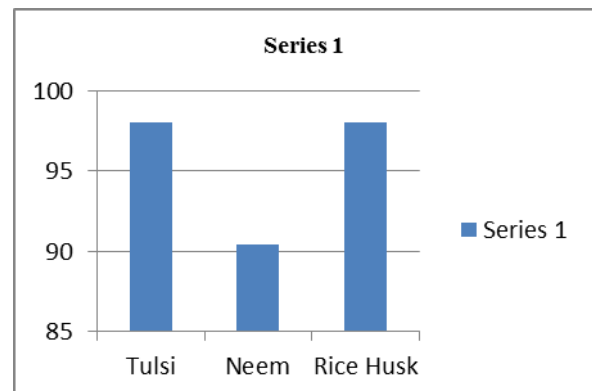
Test Sample	Initial Iron content (ppm)	Final Iron content (ppm)	Efficiency in percent age(%)	Rate of filtration (ml/min)
1	36.5	0.71	98.05	75
2	21.47	1.12	94.78	91
3	21.47	1.42	93.38	95
4	21.47	1.02	95.24	89
5	19.1	0.44	97.696	75



Graph Of Rice Husk On Different Test Sample

- In Tulsi leaves powder, better result obtained in sample1 which removed the iron concentration was 98.04%.
- In Neem leaves powder, better result obtained in sample1 which removed the iron concentration was 90.40%.
- In Rice Husk, better result obtained in sample1 which remove the iron concentration was 98.05%.

Comparison of result



5. DISCUSSIONS

Adsorption being the simplest and cheapest technique for iron removal, it has several advantages, like longer filtration runs, shorter ripening time, 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 adsorbing surface is very effective in removal of dissolved iron from drinking water and the rate of filtration is also very high. The only demerit is subsequent development of bacterial layer due to rigorous use. Again back washing is needed time to time.

6. CONCLUSION

Tulsi leaves powder is also prove to be a good adsorbent in removal of iron. But rate of filtration is normal.

Neem leaf powder proved to be less better result in removal of iron compare to Tulsi leaves powder. But the rate of filtration is less as compare to normal sand filter.

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