Low Cost Water Purifier By Using Natural Herbs

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Abstract- *Water purification is a process of removing undesirable physical, chemicals, biologically contaminants from water. Water purification system proposed in this paper focus on providing a pure drinking water at low cost with high reliability to the rural families in remote area. There are various methods available for purification of water but they are not economically feasible for poor people. Proposed system consists of combination of natural substances (tulsi & neem). It is an effective method to remove flouride from water. This method can be made portable, cost effective, user complaint and energy efficient which will be self sufficient to meet the drinking water needs. Experimentation was carried out for testing of different water samples for removal of fluoride content. Water samples selected was Well water and Bore well water, all water analyzed and tested in laboratory.*

Keywords- Neem leaves, tulsi leaves, clay, Ca (OH) 2, filter, antimicrobial activity.

I. INTRODUCTION

One of the major challenges faced by mankind today is to provide safe drinking water to a vast population around the world. In India, 85% of rural water supply depends on groundwater. Groundwater quality may be impaired by many natural constituents such as fluoride, arsenic, iron, nitrate and salinity of which fluoride stands first as a pollutant of geo-genic origin. Chronic exposure drinking water containing high fluoride can result in dental, skeletal and non-skeletal fluorosis. Health Ill-effects caused by excess daily intake of fluoride with drinking water is the major contributor & has affected people in 20 states of India. currently there are some defluoridation technologies based on chemical separation, absorption on solid filter media, chemical precipitation and coagulation; Physical separation processes for defluoridation include electro-dialysis, reverse osmosis and Nano-filtration. However, in poor rural areas, many technologies have failed in the field due to high costs, non-availability of skilled operators, unpalatable taste of treated water and impractical operational requirements. A simple and affordable technology that is acceptable to users is a need of the hour. Also, these techniques are costlier and required large amount of electricity for their working.

This paper focuses mainly on removal of Fluoride from the water as presence of these chemicals are posing serious threats to the Rural and tribal populations who cannot afford the available costlier techniques. So, it is the need of the hour to introduce the cost effective and efficient method for the removal of the Fluoride from water.

Material:

Tulsi:
Leaves of tulsi plant yield an essential oil containing eugenol, carvacrol, methyl eugenol and caryophyllene. The oil possesses antibacterial and insecticidal properties. The juice of leaves possesses diaphoretic, antiperiodic, stimulating and expectorant properties. The dried powder of this material will be used as an ingredient in the formation of disc.

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

Water:
Water free from suspended solids need to be used. Although, purity of the water used for mixing will not have much effect.

Fig: Material form of Neem and Tulsi

Clay: There are three essential properties that make clay different from dirt. These are plasticity, porosity,and the ability to vitrify.

a) Plasticity: Plasticity has to be our first consideration.
b) Porosity: Porosity is the second necessary property that clay must have.

c) Vitrification: Vitrification is the third important property of clay. Vitrification is the process of becoming glasslike. although clay products never become absolutely vitrified or glasslike, it is necessary that the clay become hard (or almost vitrified) at a reasonable temperature.

Activated carbon:

Activated carbon is basically used for two water treatment purposes and each work in totally different ways.

1. Chlorine Removal: Activated carbon may be used to remove chlorine with little degradation or damage to the carbon. De-chlorination occurs rapidly and flow rates are typically high.

2. Removal of Organic Matter: As water passes through an activated carbon filter, organic particles and chemicals are trapped inside through a process known "adsorption". The adsorption process depends upon 5 key factors: 1) physical properties of the activated carbon (surface area and pore size distribution); 2) the chemical makeup of the carbon source (amount of hydrogen and oxygen); 3) the chemical makeup and concentration of the contaminant; 4) water pH and temperature; and 5) the length of time the water is exposed to the activated carbon filter (called empty bed contact time or EBCT).

II.METHODOLOGY

The methodology involved in this research consists of the following various steps.

I. Construction of filter model-

Mainly the skeletal of the filter will consists of the Hollow cylinder of ABS plastic for containing Raw water as well as Treated water.

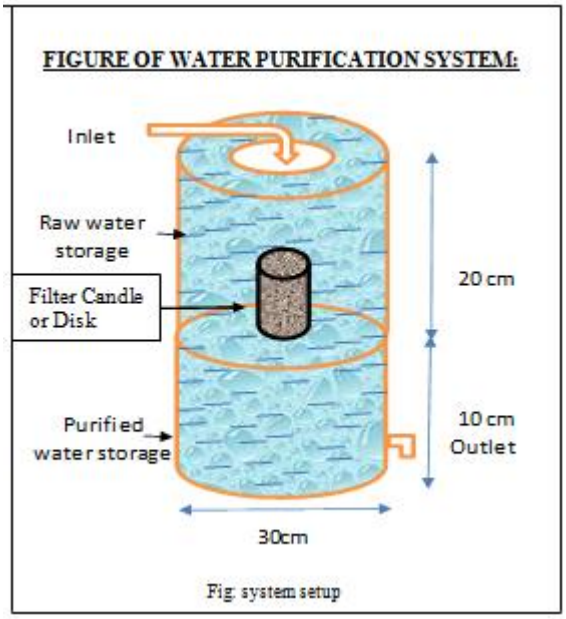
Focus of this paper will be on the preparation of the filter media which will consist of a filter disk made up of various compositions with different percentages of herbal materials as below.

Table I: Composition of Filter Disk

Sr. No	Trials	Composition
1.	Trial. 1	100% tulsi powder
2.	Trial. 2	70% tulsi powder + 30% red clay
3.	Trial. 3	50% tulsi powder + 50% river sand
4.	Trial. 4	30% tulsi powder + 20% activated carbon + 50% red clay
5.	Trial. 5	30% tulsi powder + 70% clay

Fig.disc & candle of tulsi & neem powder

FIGURE OF WATER PURIFICATION SYSTEM:



II. Analysis of raw water.

Pre-treatment Analysis-

All the collected samples of water collected were analysed to evaluate the initial characteristics before they are subjected to the filtration through above prepared filter media. Water Samples were tested for the following characteristics

1. pH.
2. Fluoride Content.
3. Hardness.
4. Arsenic Content.

Results obtained from the raw water analysis are as follows;

Experimental work:

Before Filtration: -

Sr. No	Type of water	Fluoride (mg/lit.)	pH	Total hardness(mg/lit.)	Arsenic (mg/lit)
1.	Borewell	1.6	6.85	305.75	<0.01
2.	Well water	1.8	6.85	325.65	<0.01
3.	Well water	1.8	6.85	298.90	<0.01
4.	Borewell	1.7	6.85	294.92	<0.01

III. Analysis of treated water-

Post-Treatment Analysis-

The above collected samples of water were treated using low cost water purifier using herbal materials.

The same parameters which were analysed before the filtration of raw water were analysed for filtered water after the filtration.

Filtered water Samples were tested for the following characteristics

1. pH.
2. Fluoride Content.
3. Hardness.
4. Arsenic Content.

Design and Specification of Filter Unit	
Parameter	**Details**
Storage Tank	
Material Used	ABS Plastic
Shape	Hollow Cylinder
Diameter	30 cm
Height	
a) Raw Water Storage	20 cm
b) Filtered water Storage	30 cm
Capacity of the tank	20
a) Raw Water Storage	14 Ltr
b) Filtered water Storage	7 Ltr
Filter Disk	
Material Used	Neem And tulsi with Activated Carbon
Diameter	7 cm
Height	10 cm
Rate of filtration	4.5-5 Ltr per Hour

The results obtained for fluoride content after filtration was as follows.

Sr. No	Type of water	Fluoride
1.	Borewell	0.73
2.	Well water	0.94
3.	Well water	0.95
4.	Borewell	0.87

IV. Determining the efficiency-

Depending upon the test carried out on the water samples before and after the filtration attempts are made to calculate the efficiency of the system.

Efficiency obtained for the system is as follows.

Sr. No	Type of water	Original Fluoride (mg/lit.)	Fluoride after Filtration (mg/lit.)	% Efficiency
1.	Borewell	1.6	0.73	54.37%
2.	Well water	1.8	0.94	48.33%
3.	Well water	1.8	0.95	47.22%
4.	Borewell	1.7	0.87	48.82%

III. RESULTS & CONCLUSION:

The above results indicate that the average % removal of fluoride from water is observed to be around 51.35% & 47.77% using tulsi & neem powder. Even though the overall % removal is seemed to be quite on lower side but

this much efficiency is enough for making the water fit for drinking purpose.

So, the proposed Low-cost water filter can be used for the filtration of water containing fluoride. However further research work can be extended to improve the efficiency of the system.

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