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ASSESSMENT AND TREATMENT OF DRINKING WATER BY USING NATURAL HERBS

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Abstract — *The study involves process of removing undesirable physical, chemicals, biologically contaminants from water. The results conclude on providing effective water treatment with low coat and high reliability. Proposed system consists of combination of natural substances (Tulsi , Neem, Moringa, Orange Peel, Sponge Guard, Vetiver, Banana Peel, Luffa Cylindrica). This method showns effectiveness on removing 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 river water samples for removal of fluoride content. Water samples are all analyzed and tested in laboratory.*

Keywords: *Tulsi , Neem, Moringa, Orange Peel, Sponge Guard, biologically contaminants, fluoride.*

I. INTRODUCTION

Drinking water is a vital resource for all human beings, and the access to safe and clean drinking water is a major concern throughout the world (WHO). When surface water is used as raw water the removal of organic and inorganic material from raw water is essential before it can be supplied to human for consumption. This is being carried out by chemical coagulation. In developing countries like India, this system is inappropriate because of the expensive and low and non-availability of chemical coagulants. The chemical coagulation process also change the water from liquid to a semi-solid state and causes adverse impact on human health. As a consequence of the above mentioned drawbacks, there was need to develop alternative, cost effective and environmentally friendly coagulants. Hence the detailed studies have to be carried out by using herbal coagulants like Neem, Moringa Olifera seed, Luffa Cylindrica, Orange peel, tulsi and Vetiver for community water treatment as an alternate for chemical coagulants.The results from this study will satisfy the drinking water standards as Prescribed by World Health Organization (WHO).The water purification system is to be developed in this study is simple and effective.

1.1 Neem

Neem is one of the commonly available plant herbs which can be use for various purposes such as medicinal as well for disinfecting the water. The tannin present in Neem can be extracted and used to disinfect the water and minimized the bacterial content in the water.

1.2 Vetiter

Vettiver is grown for many different purposes. Vettiver has the ability to absorb the phosphates, nitrates, heavy metals, cholera and dysentery which will cause water-borne disease. It is an efficient biological means of primary filtration and can be use as a low-cost primary filter. Vettiver can be use to reduce the Biological, Chemical Oxygen Demand, Hardness present in water.

1.3 Tulsi (Ocimum Sanctum)

Tulsi is considered as one of the holy plant in India, it is one of the most effective natural herb in removing 100% E.Coli bacteria from water. In addition, Tulsi extracts are use in Ayurvedic remedies for a variety of ailments.

1.4 Moringa Oleifera

Moringa Oleifera is the most widely cultivated species of the genus moringa, which is the only genus in the family moringaceae. Crushed moringa seeds clarify and purify water to suit domestic use and lower the bacterial concentration in the water making it safe for drinking. It can be used as a quick and simple method for cleaning dirty river water. It also acts as a anti-bacterial agent removing 90-99% bacteria content in water

1.5 Orange Peel (Citrus Reticulata):

Orange is one of the edible fruit which is locally available in almost every places, and orange peel can be used for treating the water. The main function of orange peel is to remove the heavy metals present in water. Industrial and factory water contents heavy metals at high concentration and it can be removed using orange peel.

1.6 Sponge gourd (luffa cylindrica):

Luffa is a genus tropical and subtropical vines in the cucumber family, which can be use to remove the various parameters in water treatment. It can also be use for the filtration of the waste water.

1.7 Aloe vera (aloe barbadensis miller):

Aloe vera is one of the herbs species which can be use for many purposes such as water purification, medicinal purposes etc. The gel obtain from aloe vera cactus can be used to reduce some parameters like phosphate, copper,iron and so on. It is also use to control odour in water purification.

1.8 Banana peel(musa acuminata):

Banana peel contains nitrogen, sulphur and carboxylic acid, these contents have the ability to bind the toxic metals and remove them from the water at high concentration. It is easily available at low cost.

1.9 Objective of the project

The present study and the performance evaluation of natural herbs for the water purification in different water sources of Coimbatore district by the removal of various contaminants by using various natural coagulants.

II. COLLECTION OF RIVER WATER SAMPLES

The River water samples were collected from different places. The samples from noyyal in Coimbatore, walayar in Palakkad(kerala), Cauvery in sathyamangalam. The capacity of each sample is two litres. The river water consists of various impurities, organic and inorganic wastes. The river water contains various floating matter like plastic bottles, plastic bags, tree branches, leaves, paper, algae etc. It also contains mud, fine sediments, debris, silts, broken glass and many other impurities visible to naked eyes

Table 1 Collection of Samples

Samples (LOCATION)	District	Capacity
Noyyal	Coimbatore, TAMILNADU	2 litres
Cauvery	Sathyamangalam, TAMILNADU	2 litres
Walayar	Palakkad, KERALA	2 litres

2.1 Collection of materials

Indigenous herbs which are required for this project were collected. These herbs were collected with the required quantity for the treatment of the water sample.

1. Neem 2.Moringa oleifera 3.Orange peel 4.Tulsi 5.Sponge guard 6.vetiver

2.2 Analysis on water samples

The main goal of analyzing the water sample is to find out the characteristics of water .The various characteristics are pH, turbidity, BOD, COD, Total Dissolved Solid and so on. These parameters are recorded for the purpose of comparison of the treated water. The entire analysis is done according to the standard procedure.

Table 2 Analysis of Water Samples

PARAMETER	UNITS	SAMPLE 1 (WALAYAR)	SAMPLE 2 (NOYYAL)	SAMPLE 3 (CAUVERY)
Appearance	-	Very slightly turbid	Very slightly turbid	Colourless
Colour	Hazen units	Slightly brownish	Slightly brownish	Colourless
Odour	-	None	Objectionable	None
Turbidity	Ntu	24	36	0
Electrical conductivity		651	1927	522
Total dissolved solids	Mg/l	456	1349	365
pH	Mg/l	7.92	7.46	7.15

Bicarbonate	Mg/l	96	472	84
Carbonate alkalinity	Mg/l	0	0	0
Hydroxyl alkalinity	Mg/l	0	0	0
Phenolphthalein alkalinity	Mg/l	0	0	0
Total alkalinity	Mg/l	96	472	84
Total hardness	Mg/l	192	412	164

Calcium	Mg/l	46	93	42
Magnesium	Mg/l	18	43	14
Sodium	Mg/l	69	190	42
Potassium	Mg/l	8	44	5
Iron	Mg/l	0.1	0.5	0
Manganese	Mg/l	0	0	0
Ammonia	Mg/l	0.45	1.26	0
Nitrite	Mg/l	0	0	0
Nitrate	Mg/l	8	13	9

All these values are collected based upon the tests conducted for each parameter. From this test it shows that the river water is acidic in nature and it must be treated before discharging it for other uses.

2.3 Extraction of material

The various parts of herbal plants like leaves, fruits, roots, peels, seeds etc are extracted, dried and grinded or powdered before applying for the treatment of water sample. Extraction involves the separation of active portion of plant from the inactive or inert components by using selective solvents in standard extraction procedures. The products so obtained from plants are relatively impure liquids or semi liquids or powder.

Fig 1. Moringa Oleifera

Fig 2. Vetiver



Fig 3. Luffa cylindrica


Fig 4. Tulsi



Fig 5. Orange peel



Fig 6. Neem

Fig 7. Aloe vera

Fig 8. Banana peel

2.4 Treatment by Using Herbs

The water sample is collected in various container with a capacity of 1 liter to proceed the treatment using various kinds of natural extracted herbs. The natural herbs such as tulsi, vettiver, moringa oleifera, orange peel, neem, luffa cylindrica are collected and weigh properly to the required quantity in the weighing machine. The following treatment are the done to minimized the parameters btain by analyzing the water sample. The dosage of herbs are taken in an order like 1gm, 2gm, 4gm, 6gm, 8gm, and 10gm to obtain the optimum dosage.

2.5 Treatment for Odour

The odourless water is preferred for various purposes and it defines the quality of the water, to make it happen aloe vera herbs is taken in various quantity. The water sample is collected in various containers and the herbs of different quantity like 1gm, 2gm, 4gm and so on are added on water sample and it has been found out that 2gm/l is the optimum dosage with the effectiveness of 90%.

2.6 Treatment for pH

The same trial and error method is followed to balance the pH of the water sample and the optimum dosage is found out to be 1gm/l . It reduce the pH of water sample from 6.91 to 6.72.

2.7 Treatment for Turbidity

Turbidity is remove from water sample by moringa oliefera under optimal condition and was very high as compared with conventional coagulant such as aluminum salts. Moringa oliefera kernel reduce the turbidity upto 90% with a minimum dosage with a 4gm/l.

2.8 Treatment for Alkalinity

This study has indicated that the orange peel is the most effective on the reduction of alkalinity over other herbals. The orange peel has reduce 80% of the alkalinity with an optimum dosage of 8gm/l.

2.9 Treatment for Oxygen Demand

The balancing of oxygen demand such as BOD and COD are done using herbs like vetiver with an optimum dosage of 4gm/l and it is found to be 70-80% effective.

2.10 Treatment for Total Hardness

The effectiveness of herbs on reduction of hardness is shown by vetiver among other herbs. The vettiver reduce the hardness more than 78% with an optimum dosage of 4gm/l.

2.11 Treatment for Total Dissolved Solids (Tds)

The experimental results showed that the performance of luffa cylindrica was highly significant on reduction of TDS. The effectiveness of herbal on reduction of total dissolved solids is very high. Luffa cylindrica has reduced 60% of TDS with an optimum dosage of 8gm/l.

2.12 Treatment for Fluoride

Neem is use for the treatment of fluoride content in water sample and it showed great effectiveness on reduction of fluoride content. Neem has reduced 94% of fluoride content with an optimum dosage of 2gm/l.

2.13 Treatment for Chloride.

The herbal coagulants used in this paper have less potential on removal of chlorides. Luffa cylindrica is used for the removal of chlorides from the water sample. The effectiveness of luffa cylindrical on removal of chlorides. Luffa cylindrical has reduced nearly 7.6% of chloride with an optimum dosage of 8gm/l.

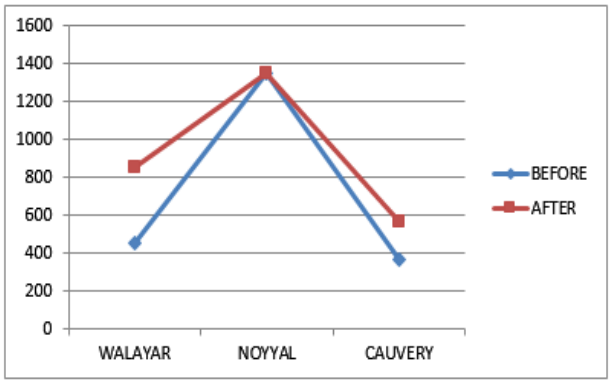

Fig 9. Comparison of total dissolved solids on before and after treatment

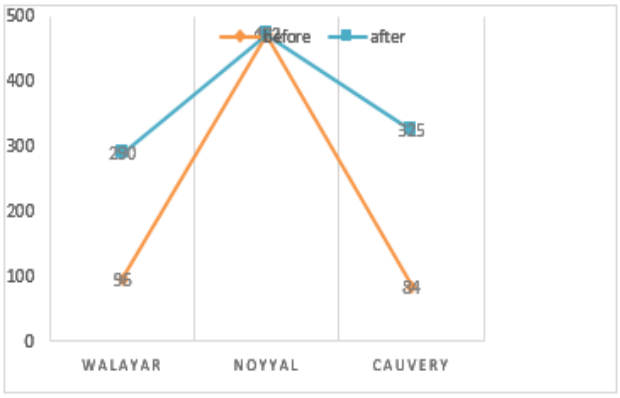

Fig 10. Comparison of total alkalinity on before and after treatment

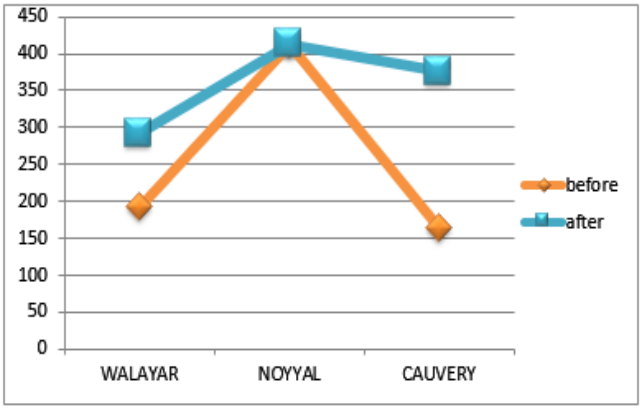

Fig 11. Comparison of total hardness on before and after treatment

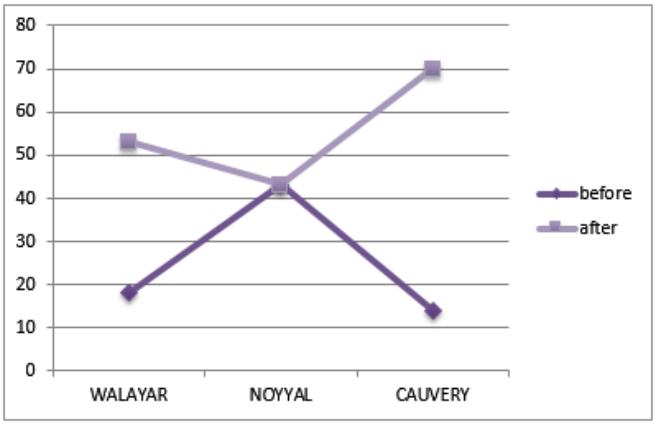

Fig 12. Comparison of magnesium on before and after treatment

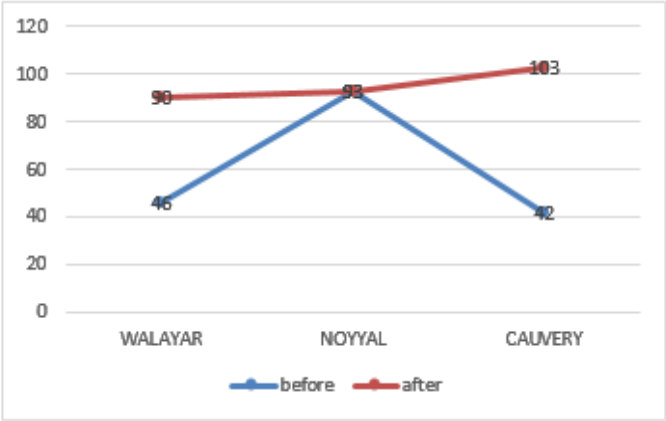

Fig 13. Comparison of calcium on before and after treatment

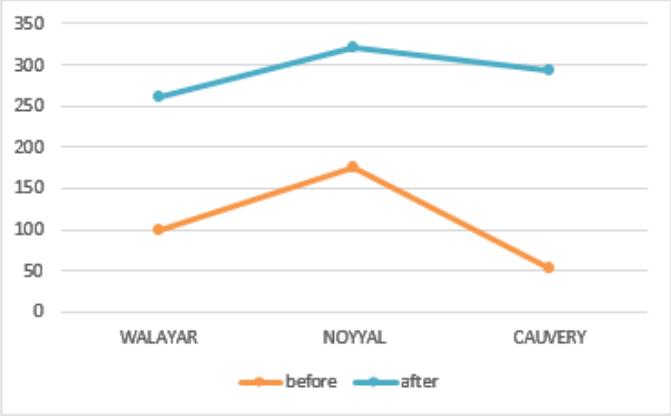

Fig 14. Comparison of chloride on before and after treatment

III. CONCLUSION

In the present study and the performance evaluation of herbals as a coagulant aid has been done to determine their efficiency in different water sources of Namakkal zone. The following are the important findings of this work.

- The Moringa Oleifera Seed has removed 73% of Calcium with an optimum dosage of 4 gm/L.
- The Vettiver was more effective on reduction of hardness more than 78% with an optimum dosage of 4gm/L.
- The Vettiver has removed 90% of Magnesium with an optimum dosage of 4gm/L.
- The Luffa cylindrica has removed 20% of Chloride with an optimum dosage of 8gm/L.

Therefore the above results shows that the natural coagulant have high efficiency in the removal of contaminants in different water sources of Coimbatore District. In future it can also used in treatment plants for

huge amount of water .Natural coagulant have bright future and are concerned by many researches because of their abundant source, low price, environment friendly, multifunction, and biodegradable nature in water purification.

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