

Defluoridation of Water Using Tamarind Gel

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Abstract: - Environmental contamination due to various chemicals and its subsequent harmful health effects in obvious forms in all living creatures including human and animal merits serious attention worldwide. Fluoride is an essential microelement for human health. Fluorine, mostly found in the form of fluorides is a highly reactive halogen element that binds with almost all cations to form stable fluoride complexes. Fluoride related health hazards are a serious environmental problem across the globe. Several methods have been used to remove fluoride from water. Fluoride can be removed by an adsorption technique called defluoridation. Defluoridation refers to method of water treatment that reduces the concentration of fluoride in the water. This technique is used for the removal of excess fluoride from the aqueous solution using tamarind fruit cover.

I. INTRODUCTION

Water is the most abundant and is an essential component of our life supporting system. Due to rapid industrialization and urbanization, today most of the countries are facing drinking water problems. In India, drinking water is contaminated at many places by various pollutants such as fluorides, nitrates, iron contents. Excessive intakes results in pathological changes in teeth bones, such as dental fluorosis followed by skeletal fluorosis. According to World Health Organization permissible limit for fluoride in water 1mg/l. Several methods have been used to remove fluoride from water. This technique is used for the removal of excess fluoride from the aqueous solution. The successful and cost effective removal of fluoride from ground water by adsorption techniques, demands the optimal operation of the adsorption unit. The work is to examine and determine the potential application of tamarind fruit cover to remove the fluoride ion in water.

II. OBJECTIVE

- To analyze the high fluoride content in ground water.
- To remove the fluoride content in ground water by cost effective method using tamarind fruit cover.

III. METHODOLOGY

- Study Area
- Sample Collection
- Preserving the Sample
- Fluoride Test
- Tamarind Gel Preparation
- Treatment Process
- Treated Sample Collection

- Sample Analysis
- Results

Study Area

In Tamil Nadu, the highly fluoride affected area is Dharmapuri district and next to that Ramanathapuram district. Our study area is Ramanathapuram, which is an administrative district of Tamil Nadu state with coordinates 9°23'N 78°45'E. Uchipuli is a major source of water supply in Ramanathapuram district. Ramanathapuram district is divided into four zones for collecting the samples.

Sample Collection

Water sample was collected from bore well in different zones of Ramanathapuram.

Sample Preservation

The water sample should be preserved at 4°C from the time of collection to the laboratory testing.

Fluoride Test

Fluoride in the water sample was tested by using water testing kit (For the estimation of fluoride). The water testing kit consists of fluoride reagent, measuring jar, test tube, fluoride color chart.

Fluoride Test Procedure

- 5ml of water sample was taken in the test tube.
- Fluoride reagent was shaken well and then 5 drops were added to the water sample.
- The content was well mixed.
- The color that forms was compared with the Fluoride color chart and the Fluoride value was recorded.

Fluoride Contents in Water

1. Sample taken in the East zone : 2 mg/l
2. Sample taken in the West zone : 5 mg/l
3. Sample taken in the North zone : 3 mg/l
4. Sample taken in the South zone : 2 mg/l

Tamarind Fruit Cover

Tamarind fruit cover was obtained from the ripe tamarind fruit. They are easily broken and brown in colour. It is easily available. It is degradable and does not affect the soil fertility.

Tamarind Gel Preparation

Tamarind fruit cover was washed with distilled water. And dried in an oven at 100°C for half an hour. The dried fruit cover was powdered. The dried fruit cover was powdered and soaked in 1M HCL for 24 hours and kept on water bath at 70°C for half an hour. Cooled and neutralised with 50 ml of 1 N of NaOH. It was dried in an oven at 80°C for 6 hours and cooled at room temperature in dessicator.

Treatment Process

500mg of adsorbent and 100ml of water were taken in 125 ml stopper bottle. Bottle was shaken in temperature controller water bath (25±1°C) at 200 rpm for 2 hours to reach equilibrium of the solid-solution mixture. After attaining equilibrium, the biosorbent was separated by filtration.

Treated Sample Collection

After filtration, the treated sample was collected and taken in a test tube for analyzing the sample.

Sample Analysis

5 ml of treated sample was taken in a test tube. Fluoride reagent was shaken well and then 5 drops were added to the treated water sample. The content was well mixed. The color that forms was compared with the Fluoride color chart and the Fluoride value was recorded.

IV. RESULTS AND DISCUSSIONS

The baseline fluoride concentrations of the four zones were in the range of 3-5 mg/l. The fluoride concentration after treating with tamarind gel in the water sample decreased from 5mg/l to 1mg/l. Fluoride content is reduced but Tamarindus Indica cannot be directly used because acidity of the water increased. The present study was an experimental trial to assess the efficacy of tamarind gel in reducing fluoride concentration in drinking water. The result of the study showed that tamarind gel can effectively remove fluoride from water.

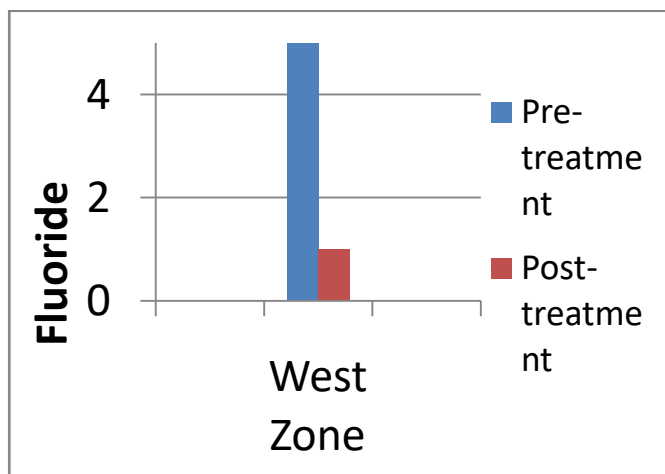


Figure 1: Pre – treatment and post – treatment fluoride values

V. CONCLUSION

The study results showed that the tamarind fruit cover powder can effectively remove fluoride from drinking water. The tamarind fruit cover is also easily available naturally and is a waste product of many fruit pulp industries so it is quite cheap also. This can be the most efficient and cheap material to use as a defluoridating agent. The technique developed and used in the present study is quite simple and cheap.

VI. SCOPE OF THE STUDY

The further study shows that the production rate, degradation rate and efficient use of tamarind fruit cover, effect of adsorbent dosage, effect of particle size on sorption of fluoride, effect of temperature on defluoridation.

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