

GOVERNMENT DEGREE COLLEGE BELLAMPALLY, DIST.
MANCHERIAL,
TELANGANA STATE.

DEPARTMENT OF CHEMISTRY.



JIGNASA STUDENT STUDY PROJECT

2021-2022

TITLE OF THE PROJECT

COMPARATIVE STUDY ON REMOVAL OF FLUORIDE FROM GROUND WATER

BY
COST EFFECTIVE ADSORBENTS

Submitted BY THE STUDENTS

- | | | |
|---------------------|-----------|--------------|
| 1. B. Shirisha | BZC I YR | B. Shirisha |
| 2. J. Anudeepthi | BZC I YR | Anudeepthi |
| 3. SK. Shabana Azmi | BZC II YR | Shy |
| 5. M. Sai Sahaj | BZC II YR | M. Sai Sahaj |
| 6. E. Srijay Rao | BZC II YR | E. Srijay |

Under the supervision of


PAKA SWAMY Lecturer in Chemistry



PRINCIPAL
PRINCIPAL
Govt. Degree College
Bellampalli-504 251
Dist: Mancherial (T.S.)

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1. INTRODUCTION:

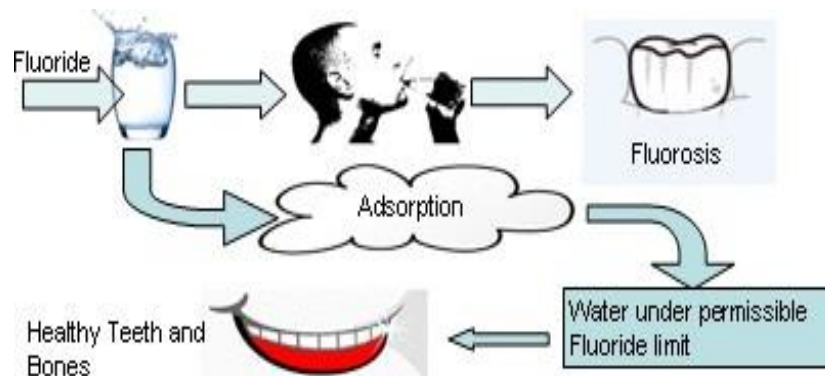
STATEMENT OF THE PROBLEM:

Fluoride is the major inorganic pollutant of natural origin found in ground water. Fluoride in minute quantity is an essential component for normal mineralization of bones and formation of dental enamel. The safe limit of fluoride in drinking water is 1mg/L. Fluoride beyond desirable amounts (0.6-1.5mg/l) in ground water is a major problem in many parts of world.

Many Conventional methods available which of them removed excess of fluoride from water. Generally they are

1. Ion exchange methods
2. Precipitation methods
3. Adsorption methods.

But most of these methods have high operational, maintenance cost, low fluoride removal capacity, lack of selectivity for fluoride ,generation of large volume of sludge and complicated procedure involved in treatment .With this in perspective current work was taken to explore feasibility of fluoride adsorption from aqueous solutions with cost effective cheap adsorbents.



2. AIMS AND OBJECTIVES:

Taking severity of the problem into consideration, the present study is carried out to know the adsorption capacities of effective, cheap and naturally occurring, synthetic biomass materials like

1. Chalk Powder,
2. Horse Gram Seeds Powder,
3. Orange Peel Powder,
4. Red Soil and Multanimitti

So a considerable attention has been devoted to develop the better and suitable adsorbents for de fluidization purpose that would be cheaper and simply accessible to provide Safe drinking water with fluoride content within permissible limits of 1 mg/L for domestic and community use.

3. REVIEW OF LITERATURE:

A variety of methods for fluoride removal are known. They involve precipitation and adsorption methods. Precipitation methods involve in addition of chemicals and formation of fluoride precipitate or co-precipitate. The chemicals included lime, magnesium compounds and aluminum Sulphates. Nalgonda Technique is preferable at all levels because of the low price and ease of handling.

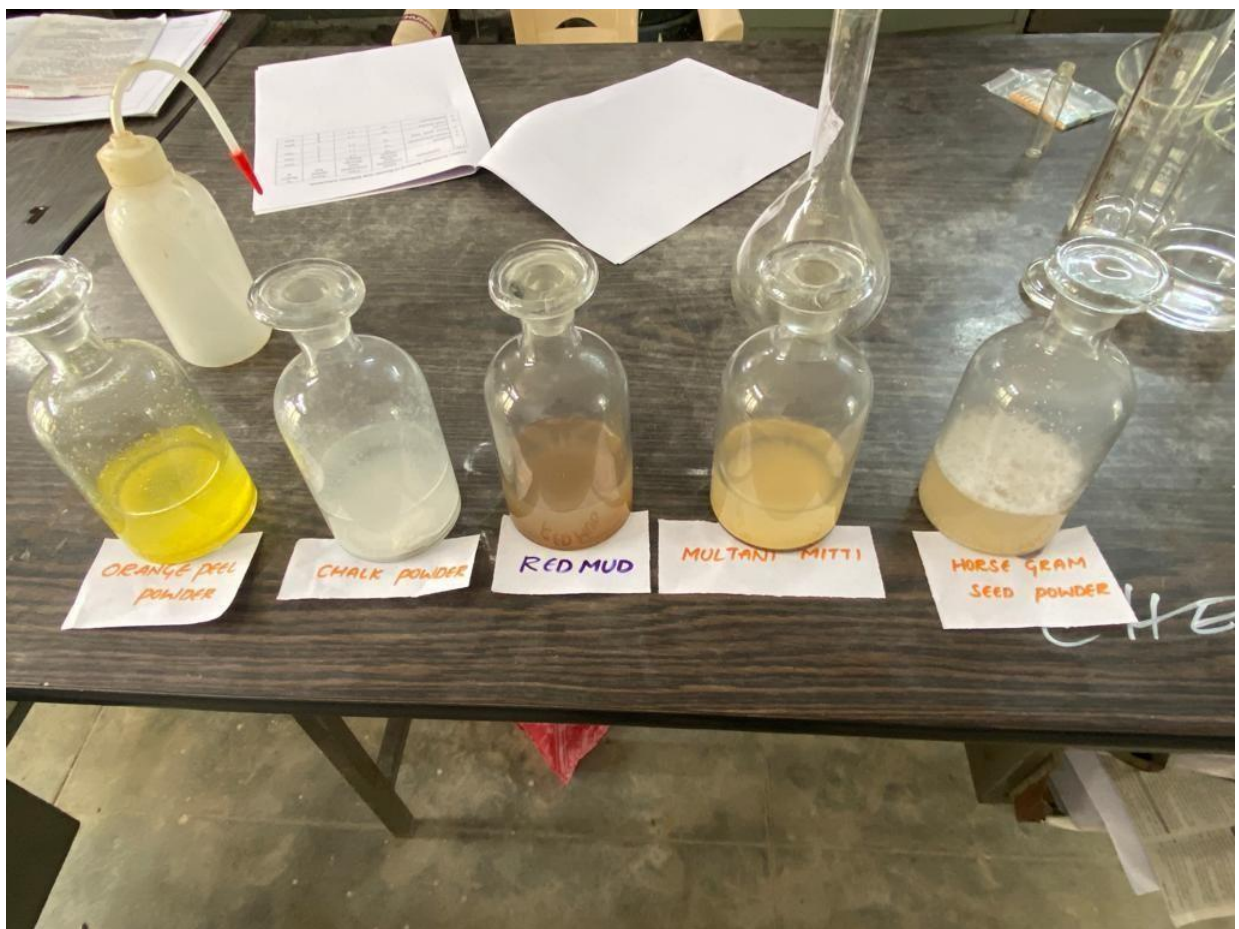
The Nalgonda Technique has been introduced in Indian villages and studied at pilot scale in e.g. Kenya, Senegal and Tanzania (Gitonga 1984, Lagaude et al. 1988, Gumbo 1987). This paper describes a modified design and an organizational setup of the Nalgonda Technique in household scale, as it has been introduced in Ngurdoto village in Tanzania by the Defluoridation Technology Project (a research collaboration between the University of Dar es Salaam, the Tanzanian Water Authorities and the Technical University of Denmark).

The well known Nalgonda technique involves in the addition of lime and bleaching powder followed by thoroughly mixing. The drawbacks of this method include the necessity for additional reagents, high treatment cost and the large volume of sludge produced. Adsorption methods utilize the passage of fluoride containing water through contact bed. Fluoride is removed by ion-exchange resins and adsorbents like zeolite , Phosphatic compounds with activated alumina and activated carbon. Venkatramanetal reported“avaram”bark based Cation exchange resins for fluoride removal. Active carbon prepared from coffee powder, rice husk, and Coconut shell, used tea powder, dried Alma bark; saw dust and their sulphonated compounds with alums have also been so far used. Freshly fired brick pieces are used for the removal of fluoride .It is reported that the efficiency depends on the quality of freshly burnt bricks.

The use of bone charcoal is reported to be an effective means for the reduction fluoride, but it is found to be pH depend.

4. RESEARCH METHODOLOGY

In this paper an attempt has been made to suggest certain low cost materials as effective adsorbents of fluoride. The adsorbents primarily screened were multanimatti, red mud, horse gram powder, chalk powder, and orange peel powder. Initially all the adsorbents are screened by adding 1gm of each of adsorbent to 100 ml of stock solution of fluoride



5. Experiment:

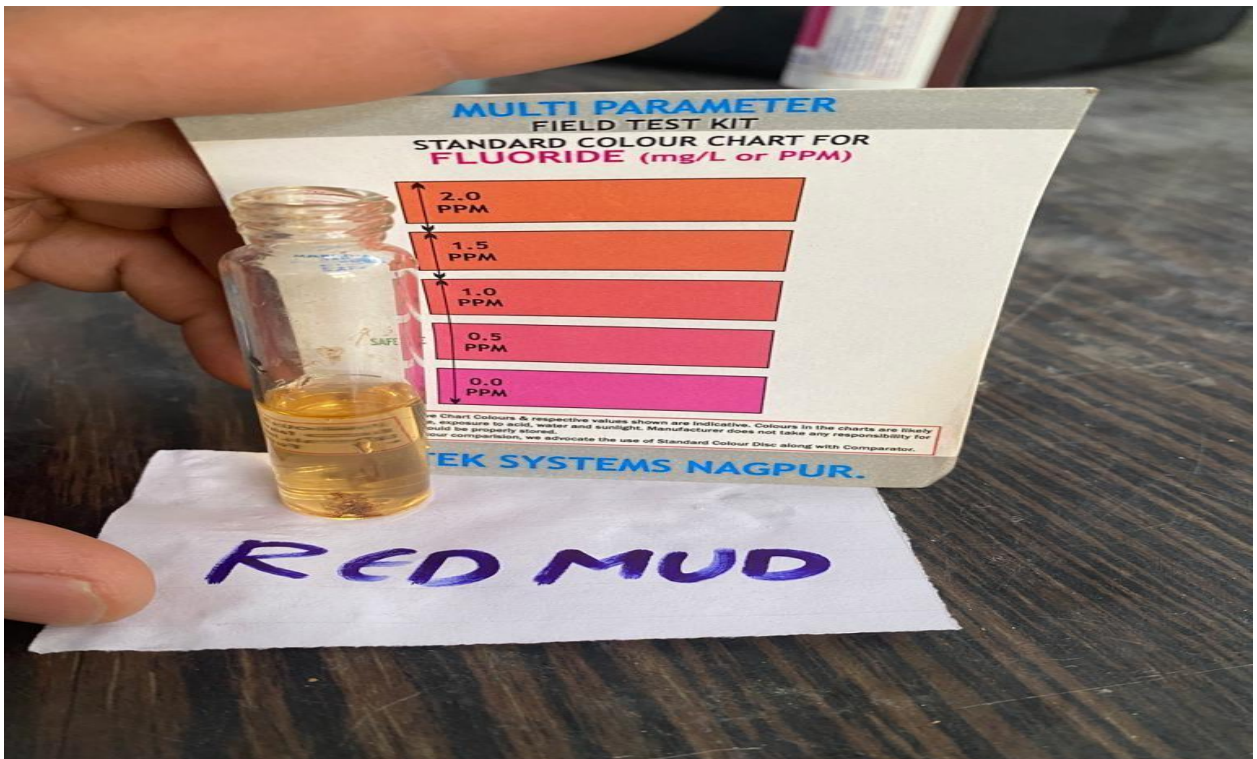
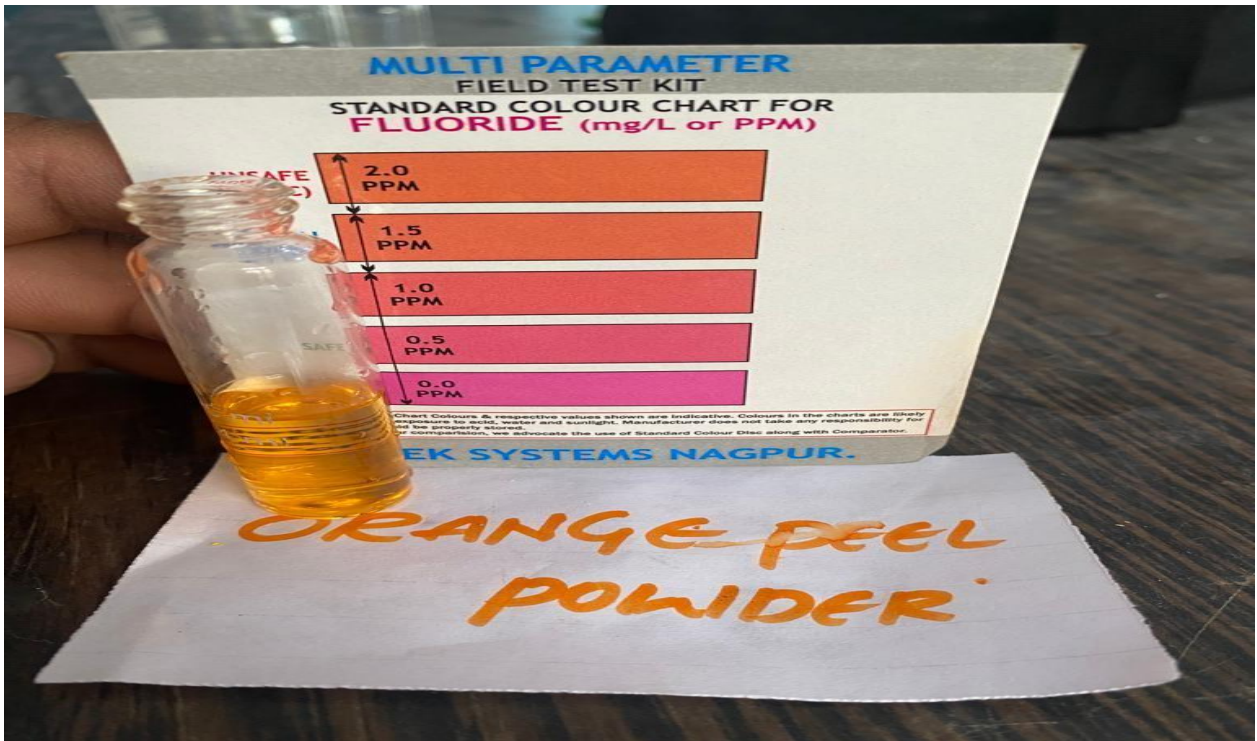
PREPARATION OF FLUORIDE STOCK SOLUTION.

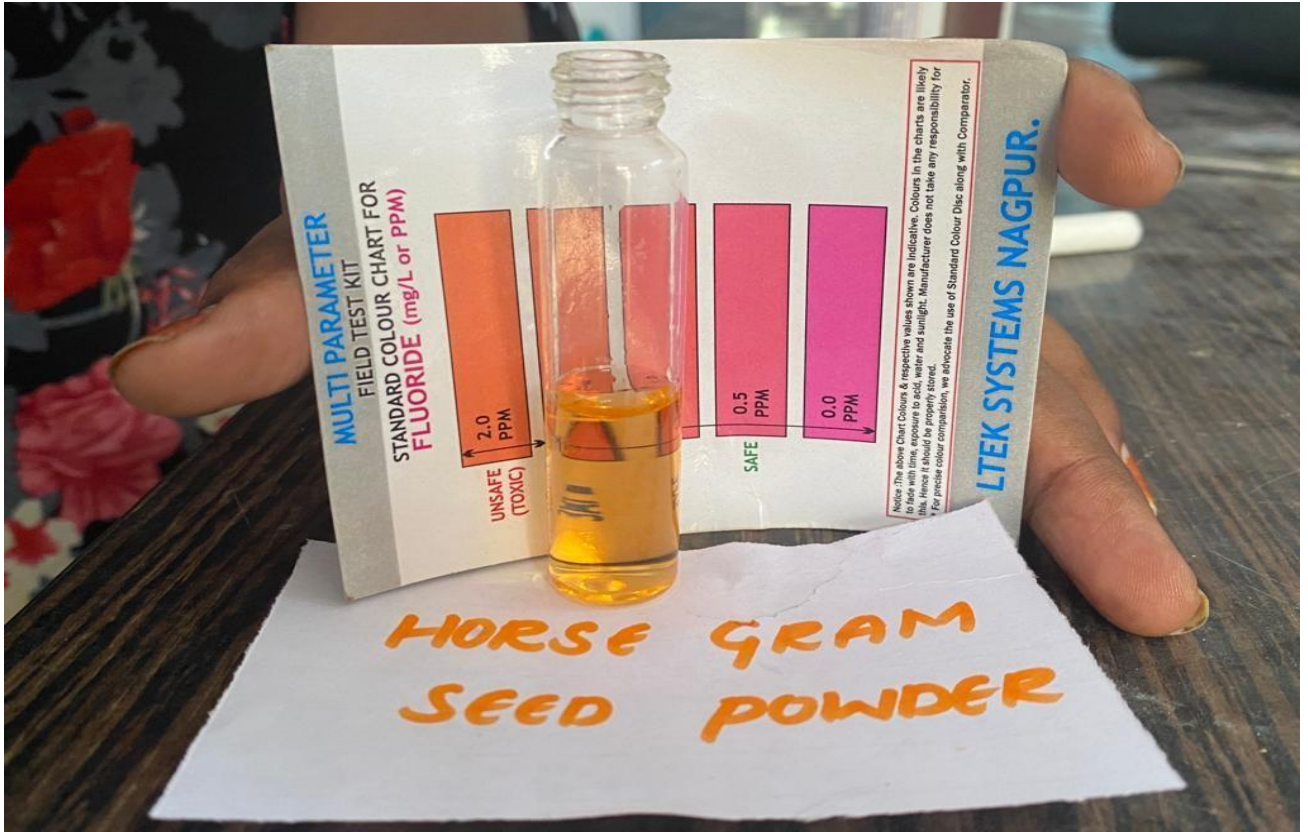
Dissolve 0.2210 grams of anhydrous NaF in distilled water and dilute to 1000ml which is having concentration of 100 ppm.

These adsorption methods are adopted for the removal of fluoride and these methods are suitable when the fluoride is present in low concentrations. For this purpose an aqueous solution of 100 ml quantities of various concentrations of fluoride that are prepared from stock solution of fluoride are taken in 100 ml stoppered bottles and 1 gram of each of the adsorbents is added to the respective solutions. Batch adsorption experiments are carried at room temperature by varying contact times. The initial and final concentration of fluoride in different test solutions were determined by spectrophotometer and percentage removal of fluoride was determined which were produced below.









REAGENTS USED IN THE EXPERIMENT

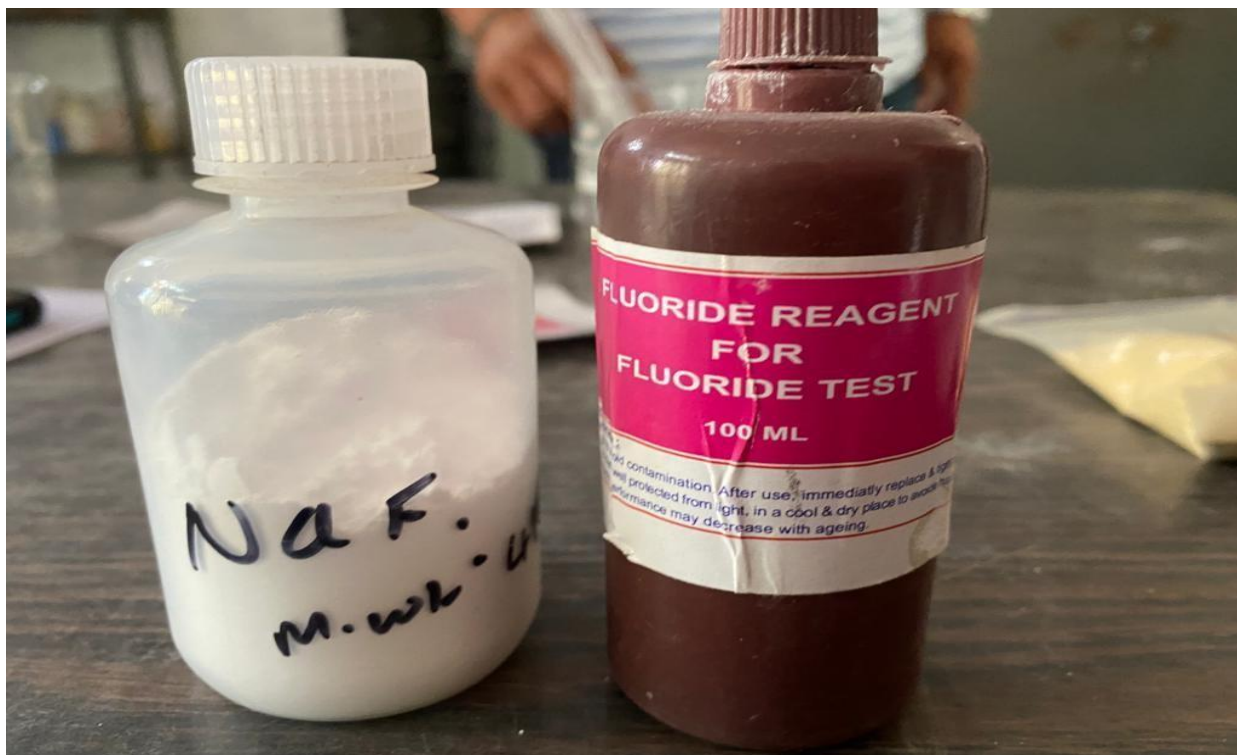


Table: Percentage Removal of fluoride with Different Adsorbents

s.no	Adsorbents	Initial Concentration of fluoride in mg/L	Final Concentration of fluoride in mg/L	Amount adsorbed	% Removal
1	Red mud	10	2.9	7.1	71%
2	Orange peel powder	10	2.1	7.9	79%
3	Horse gram seed powder	10	2.5	7.5	75%
4	Chalk powder	10	1.4	8.6	86%
5	Multanimitti	10	4.4	5.6	56%

6. RESULTS AND DISCUSSION:

The adsorbents selected for the present study are chalk powder, horse gram seed powder, orange peel powder, red mud, and multanimatti. From the values obtained from the experiment, it is observed that the order of adsorption is in chalk powder > orange peel powder > horse gram seed powder > red mud > multanimatti.

The adsorption capacity is more at lower concentrations compared to higher concentrations of fluoride. In the current study, it is observed that the physical adsorption by these natural adsorbents leads to the cheap, non-toxic, easily and locally available materials. The parameter like contact time of adsorbent with the fluoride sample solution was also investigated. It is found that removal of fluoride ions increased with increase in contact time at initial stages of addition. It is noticed that typically 70-80% of the fluoride adsorption occurs within the initial hours of the contact time of adsorbents.

As part of Jignasa we the students of GDC Bellampally Dist manchiryal under the supervision of Paka Swamy lecturer in chemistry collected the water samples from the Bore well of villages, Lingapur , Govt Degree College Bellampally , Tallagurijala of bellampally Mandal, Govt Degree college (w) (N) Asifabad, bendara, Jankapur village of Asifabad Mandal, and we estimated at WATER QUALITY MONITORING LABORATORY MB – ITNTRA SUB DIVISION ASIFABAD REPORT ON CHEMICAL ANALYSIS OF DRINKING WATER and we estimated the levels of,

- 1) Turbidity of water
- 2) PH
- 3) Total Hardness of water

- 4) Calcium
- 5) Chloride
- 5) Fluoride
- 6) Nitrites and
- 7) Sulphate

According to data reported that the tested water of all the areas except Jankapur village of Asifabad Mandal is consisting of the minerals is under the acceptable limits and it is suitable for drinking

**WATER SAMPLE COLLECTED FROM GOVT. DEGREE COLLEGE BELLAMPALLY PREMISIS BY:
SK.SHABANAAZMI BZC II YR**



**WATER SAMPLE COLLECTED FROM VILLAGE LINGAPUR BY B.SHIRISHA BZC
I YR**



**WATER SAMPLE COLLECTED FROM VILLAGE TALLAGURIZALA BY
J.ANUDEEPTHI BZC I YR**



GOVERNMENT OF TELANGANA
WATER QUALITY MONITORING LABORATORY MB-INTRA SUB DIVISION ASIFABAD
REPORT ON CHEMICAL ANALYSIS OF DRINKING WATER

Sl.No	Name of the Testing Parameter	Colour (T.C.U.) Units	Turbidity (N.T.U.) Units	PH Value	Total Dissolved Solids (Mg/Lt)	Alkalinity		Total Hardness (Mg/Lt)	Calcium (Mg/Lt)	Chloride (Mg/Lt)	Fluoride (Mg/Lt)	Nitrites (Mg/Lt)	Sulphate (Mg/Lt)	Iron (Mg/Lt)	Remarks
						Methyl Orange (Mg/Lt)									
	Requirement (Acceptable Limit)	5 Units	1 Units	6.5 to 8.5	500	200	200	200	75	250	1.0	45	200	0.3	
	Permissible Limit the absence of Alternate source	15 Units	5 Units	No relaxation	2000	600	600	600	200	1000	1.5	No relaxation	400	1.0	
1	Date of Testing	13.04.2022													
	NAME OF THE Mandal	Bellampally													
	SAMPLE Collection Point	Lingsapur													
2	Date of Testing	13.04.2022													
	NAME OF THE Mandal	Bellampally													
	SAMPLE Collection Point	Govt Degree College-Bellampally													
3	Date of Testing	13.04.2022													
	NAME OF THE Mandal	Bellampally													
	SAMPLE Collection Point	Talagurijala													

Note: Standards as per Bureau of Indian Standards I.S. 10500:2012


Asst. Chemist

MB-INTRASub Division Lab Asifabad

Office of the

Executive Engineer
WSS Sub-Division Asifabad

GOVERNMENT OF TELANGANA

WATER QUALITY MONITORING LABORATORY MB-INTRA SUB DIVISION ASIFABAD

REPORT ON CHEMICAL ANALYSIS OF DRINKING WATER

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Sl.No	Name of the Testing Parameter	Colour (T.C.U. Units)	Turbidity (N.T.U. Units)	PH Value	Total Dissolved Solids (Mg/Lt)	Alkalinity		Calcium (Mg/Lt)	Chloride (Mg/Lt)	Fluoride (Mg/Lt)	Nitrites (Mg/Lt)	Sulphate (Mg/Lt)	Iron (Mg/Lt)	Remarks
						Methyl Orange (Mg/Lt)	Total Hardness (Mg/Lt)							
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	Permissible Limit the absence of Alternate source	15 Units	5 Units	No relaxation	2000	600	600	200	1000	1.5	No relaxation	400	1.0	
Date Of Testing	NAME OF THE Mandal Point	Source												
1	13.04.2022 Asifabad	Govt Degree Collage- (W) (N) Asifabad	BW	Nil	Nil	7.20	1013	440	120	113	0.3	30	0.1	Potable
2	13.04.2022 Asifabad	Jankapur	BW	Nil	Nil	7.30	1017	460	120	113	1.3	70	0.2	Potable
3	13.04.2022 Asifabad	Bandara Village	BW	Nil	Nil	7.20	520	350	80	85	0.3	20	0.1	Potable

Note: Standards as per Bureau of Indian Standards I.S. 10500:2012


Asst. Chemist

MB-INTRASub Division Lab Asifabad

7. CONCLUSIONS AND SUGGESTIONS:

This paper provides an overview of various low cost adsorbents used for the effective removal of fluoride from water. Most of the adsorbents performance depends on contact time. The removal capacity increases by increasing contact time to certain extent. The other untreated adsorbents are also available and hope that it will encourage even more rapid and extensive developments for the treatment of fluoride in drinking water.

8. REFERENCES:

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