EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 8 | Issue: 3 | October 2020 | Journal DOI : 10.36713/epra0713 | SJIF Impact Factor (2020): 8.007

DEFLUORIDATION OF GROUNDWATER BY USING MODIFIED MORINGA OLEIFERA SEEDS POWDER

MD Nematulain Nazri
M tech Scholar, Department of Civil Engineering, Maharishi University Of Information Technology Lucknow, U.P, (INDIA)

Sana Karim Subhani
M tech Scholar, Department of Civil Engineering, Maharishi University Of Information Technology Lucknow, U.P, (INDIA)

Er Anupam Kumar Gautam
Assistant prof. Department of Civil Engineering, Maharishi University of Information Technology, Sitapur Road Lucknow UP INDIA.

ABSTRACTS

Defluoridation of groundwater is critical to decreasing the fluoride scale in potable water. The highest amount of fluoride in surface water ever found with a concentration of 2800mg/L recorded in lake Nakuru in Right valley in Kenya [Nanyaro et. al. 1984].

Excess fluoride in potable water can damage not only teeth and bone but also the whole part of the body, hence it becomes necessary to bring down the fluoride level from water. Fluoride concentration within the permissible limit of 1.5 mg/L according to WHO (World Health Organization).

Various techniques and materials were used for the elimination of fluoride from drinking water-like, precipitation methods, ion exchange process, membrane filtration method, Nano-filtration, Electro-coagulation and adsorption technique, etc. wherein adsorption approach may be very dominant and global used so on this experimental work the adsorbents have been used Moringa Oleifera seed powder that is a herbal adsorbent and feature from ninety to ninety-five percent fluoride elimination potency. This paper suggests the result of investigations finished for fluoride elimination strategies from groundwater by using Moringa oleifera seed power.

KEY WORDS: ***fluoride elimination approach, Moringa Oleifera Seed, Natural Adsorbent, groundwater,***

Fluorosis water is a very essential element for all forms of life and is indispensable to the maintenance of life on earth. Pure mineral water is the basic requirement of every human being. Water quality degrades by either natural or man manmade sources. Among the water contaminants, fluoride is such a contaminant that has dual significance within permissible limit it is beneficial and it can cause many problems when its limit exceed. fluoride is a compound form of fluorine(F). its concentration in water is depending on the sources of water.

Source of fluoride: Fluoride exists in the environment through both natural and manmade sources such as fluoride possessor rocks and industrial discharge

Effects of fluoride; High level of fluoride in water can reason dental and skeletal fluorosis. It can be a change inDNA structure if it is accumulated for a very long period. Benefits of fluoride; prevent tooth decay and cavities and upkeep of wholesome bone.

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 8 | Issue: 3 | October 2020 | Journal DOI : 10.36713/epra0713 | SJIF Impact Factor (2020): 8.007

The permissible range of fluoride in drinking water.

Name of organization	Permissible limit
1.Bureau of Indian standard (BIS)	0.6-1.2 mg/L
2. World Health Organization (WHO)	1-1.5 mg/L
3.Indian Council Of Medical Research (ICMR)	1 mg/L

Adsorption; Adsorption is the bond of molecules species from bulk solution for a solid surface by physical or chemical forces.

Advantage of adsorption

1. high-potency fluoride elimination and can eliminate from ninety to ninety-five percent.
2. Adsorption devices are easy in their operation and design.
3. It has the efficiency of fluoride removal even at a low amount.
4. It is economical, eco-friendly, and fit for groundwater treatment for small towns and villages on a small scale.

II. EXPERIMENTAL METHODS

Materials use;

1. Moringa oleifera seed powder.
2. 1 N Nitric acid (HNO3).
3. 0.5 N Sodium hydroxide (NaOH).
4. Fluoride containing a sample of water in which contains 2 mg/L.

Collection and guidance of adsorbent; Moringa oleifera seeds were used in this experiment were collected from local trees from Darbhanga (BIHAR). Washed properly with faucet water and after that washed with double distilled water to rid of dust and dried in solar until 6 days.

The dried sample changed into micronized in a grinder at home to powder, then sieve to get a particle length of 75,150,300,350 um, then used as adsorbent. 50 g of the powder was added to 500 ml of one NHNO3 for acid remedy and 50 g m powder was added to 0.5N NaOH for alkali remedy. The mixture was boiled about 25 minutes on a sand tub after that the sample of powder was washed using distilled water finally again dried in an oven at 55 degrees Celsius for 7 hours. The preparation of adsorbent was done by preparing a standard solution of 2 ppm fluoride. It was done by dissolving 2 mg of anhydrous sodium fluoride in a thousand ml of distilled water.

Preparation of the reagent; The SPADNS solution, 0.003725M used to be made through dissolving 0.4755g of SPADNS in250 ml deionized water, the zirconyl chloride acid solution, 0.0380M was made by dissolving 0.0670g of zrocl2.8h2O in 30 ml of deionized water. After that 30 ml of HCL was added and deionized water used to be introduced whilethe whole quantity of the solution used to be250 ml. the quantity of zirconyl acid-SPADNS reagent was made by blending the two options in the ratio of 1:1 and it was again diluted.

Water sample; for this research experiment samples are collected from tube-wells of Jori village of the Gaya district of Bihar during February 2020. 10 liters of the sample are collected and then parameters like pH, fluoride, iron, etc are examined by district-level water testing laboratory (DLWTL) P.H DIVISION. DARBHANGA

Procedure; fluoride bearing water having a fluoride ions attention of 2 ml/L was once used. This fluoride solution used to be filtered the usage of Whatman,s filter paper no forty-one to this filtrate SPADNS, and zirconyl acid solution of 5 ml each were used. The sample used to be checked to locate out fluoride the use of a spectrophotometer at wavelength 570 mm.

The elimination of fluoride experiment by Moringa Oleifera seed powder was performed in a 250 ml conical flask the use of 100 ml of groundwater sample containing different pH and preliminary concentration of fluoride ion . in these conical flask adsorbent with multiple dosages was added. then the contact period was given for a different particle size after giving a required contact time 160 minutes. the contents of the flasks were filtered using Whatman,s filter paper no 41. The filter was used for fluoride ion estimation using the SPADNS method. The fluoride content infiltrate was determined by the UV-visible spectrophotometer. The rate of present removal of fluoride by adsorbent was calculated using the following formula.

$$\text{Removal \%} = \text{Co—CI/ Co x 100}$$

Where co is the preliminary fluoride ion attention and CI is the final fluoride ion concentration.

The above manner was repeated for different Ph, different contact time, adsorbent doses, and different fluoride ion concentration.

Impact of pH on the elimination of fluoride; The existing study was carried out for acid-modified and alkali modified Moringa oleifera seed powder for finding out optimum pH. the Ph used to be various from 1 to 10 for acid modified Moringa oleifera seeds powder and 2 to 10 for alkali modified Moringa oleifera seeds powder. The adsorbent having 350 um size, acid modified as nicely as alkali modified, was once used to decide the most advantageous pH at which the adsorption used to be maximum. For these experiments, the preliminary fluoride

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 8 | Issue: 3 | October 2020 | Journal DOI : 10.36713/epra0713 | SJIF Impact Factor (2020): 8.007

ion attention used to be 2 mg/L. with an adsorbent dose of 2.5 mg/L and a contact time of 2 hours.

As proven in Table 1, the acid-modified adsorbent confirmed the most elimination potency eighty-five percentage atpH 1, whilst in the case of alkali modified-adsorbent the most elimination potency ninety percentage at pH 10.

Impact of contact time on fluoride elimination; the adsorbent dose of 2.5mg/L used to be introduced in the sample and stored consistently for the duration of the experimental work. The contact time used to be diverse from 0.5 to 2.5 h for acid modified as properly as alkali modified Moringa oleifera seeds powder of particle length 350 um. the practical work used to be carried out to decide the most efficient contact time use of acid and alkali modified adsorbents with the equal particle size. The pH was 8 and the dose was 2.5 mg/L for the learn about as proven in table-2. In the case of alkali modified adsorbent, it is observed that the elimination of fluoride ion expanded with a make bigger in contact time whereas in the case of acid-modified adsorbent the quantity of share elimination of fluoride ion elevated with an extension in time as nicely as most elimination was ninety-eight percent received at 2.5 hours.

Impact of adsorbent dose on fluoride elimination; the existing learn about suggests that the response of adsorbent dose on the elimination of fluoride is introduced in table-3, in the case of alkali -modified powder the observations that a make bigger in the adsorption happens with the corresponding expansion in the quantity of adsorbent. The make bigger in elimination efficiency with a simultaneous expansion in adsorbent dose is due to the extend in quantity, and for this reason, greater active sites have been reachable for the adsorption of fluoride.

The effects confirmed that the alkali modified Moringa oleifera seed powder was once environment friendly for ninety-five percent at the most dose of four hundred mg/L respectively at room temperature.

Impact of preliminary fluoride ion attention on fluoride elimination; the current find out about on the impact of preliminary fluoride awareness was one performed through various it from 0.5 to 2 mg/L preserving an adsorbent dose of 2.5 g/L, pH of 8, and contact time of 160 minutes. The reactance of extraordinary fluoride ion attention to the elimination of fluoride is applicable in table-4. For alkali as nicely as the acid-modified powder the statement reveals that with the increase in fluoride ion attention the percent elimination of fluoride additionally will increase with an amplify in the preliminary awareness of fluoride the using pressure for the transport of fluoride from the bulk to the floor of adsorbent increases, which effects in greater adsorption of fluoride per unit mass of adsorbent.

Table1. Impact of PH on fluoride elimination

S no	pH	Acid modified Moringa oleifera powder		pH	Alkali modified Moringa oleifera powder	
		Absorbance	% elimination potency		Absorbance	% elimination potency
1	1	0.022	85%	1	0.060	54%
2	2	0.025	83%	2	0.050	56%
3	4	0.027	76%	4	0.040	67%
4	6	0.032	72%	6	0.030	75%
5	8	0.045	62%	8	0.020	81%
6	10	0.060	50%	10	0.015	90%

EPRA International Journal of Economic Growth and Environmental Issues- Peer Reviewed Journal
ISSN: 2321-6247
Volume: 8 | Issue: 3 | October 2020 | Journal DOI : 10.36713/epra0713 | SJIF Impact Factor (2020): 8.007

Table 2. impact of contact time on fluoride elimination

S no	Time (min)	Acid modified Moringa oleifera powder		Time (min)	Alkali modified Moringa oleifera powder	
		Absorbance	% elimination potency		Absorbance	% elimination potency
1	30	0.017	85%	30	0.016	84%
2	60	0.015	87%	60	0.014	86%
3	90	0.013	89%	90	0.011	90%
4	120	0.012	90%	120	0.010	91%
5	150	0.006	95%	150	0.006	97%
6	160	0.002	96%	160	0.005	98%

Table 3. Impact of adsorbent dose on fluoride elimination.

S no	Adsorbent dose	Acid modified Moringa oleifera powder		Adsorbent dose	Alkali modified Moringa oleifera powder	
		Absorbance	% elimination potency		Absorbance	% elimination potency
1	100	0.002	98%	100	0.011	93%
2	150	0.004	97%	150	0.009	94%
3	200	0.006	95%	200	0.008	95%
4	300	0.008	93%	300	0.006	96%
5	400	0.010	91%	400	0.004	97%
6	500	0.012	89%	500	0.002	98%

Table 4 impact of initial fluoride concentration on fluoride elimination

S no	Fluoride ion concentration	Acid modified Moringa oleifera powder		Fluoride ion concentration	Alkali modified Moringa oleifera powder	
		Absorbance	% Removal efficiency		Absorbance	% Removal efficiency
1	0.2	0.021	82%	0.2	0.030	78%
2	0.3	0.020	83%	0.3	0.027	79%
3	0.5	0.018	85%	0.5	0.025	80%
4	01	0.010	91%	01	0.020	83%
5	1.5	0.006	95%	1.5	0.012	92%
6	02	0.003	97%	02	0.010	95%

III. OBSERVATION

The alkali modified Moringa oleifera seeds powder was proved better than acid-modified Moringa oleifera seeds powder for the elimination of fluoride ion from groundwater.

The elimination potency increase as the PH value increase.

The elimination cost used to be closing at an adsorbent dose of five hundred mg/L. The finest contact time used to be 2.5 hours for 350 um.

IV. CONCLUSION

Hence, the adsorption method the use of Moringa Oleifera seed powder that is ample and without difficulty on hand has been investigated. it is very low value and eco-friendly due to the reality the price is of primary consideration in growing nations such as India. Fluorosis cause major health problem in some part of India so suitable defluoridation scale must be found in the communities where Fluorosis is spatial.

V. SCOPE OF FUTURE WORK

The current perusal has to be expanded for

1. Diversity of different adsorbents.
2. Different particle size.
3. The combination of adsorbents.
4. Huge level application.

VI. REFERENCES

1. *S Awasthi, S.K. Gupta, and S.K. Awasthi, Indian j.Environ. protect, 22,228 (2002).*
2. *K.R. Bulusu and W.G.Nawalkhe, Indian. J.Environ. Health,32,107 (1998).*
3. *Soben peter; preventive and community dentistry;3rd edition, 2008.*
4. *Fluorosis in India Int J RES DEV Health April 2013 voll (2).*
5. *Shorbha tendon; Textbook of pedodontics.*
6. *WHO Committee on oral Health status and fluoride use Geneva, 1993.*
7. *Morya CM. A Textbook of Public Health Dentistry, Jaypee Brothers New Delhi. 2011.*
8. *Peter S. Essentials of preventive and community Dentistry 2nd edition Aryan publishing house, New Delhi 2003 p. 364-6.*
9. *Defluoridation of an update 2010 page 1-26.*
10. *Susheela AK. A treatise on fluorosis edition AK Susheela.*
11. *Srimurali M et al activated alumina for Dfluoridation of water and household application 2008 1-13,*
12. *Iyengar Defluoridation of water using activated alumina technology, A report by UNICEF, New Delhi. 2005.*
13. *Eswar p, Deraj CJ Water defluoridation field studies in India. Indian Journal Dental Advancements 2011.3 (2) 526-33*
14. *WHO Drinking water quality control in small community supplies Guidelines for Drinking-water Quality. Vol.8 Geneva: WHO; 1985.*
15. *Boruffcs. Removal of fluorides from drinking water. Ind Chem. 1934; 26 (1); 69-71.*
16. *Piddennavar R, Krishnappa p. Review on defluoridation technologies of water Ind J Eng Sci 2013; 2(3); 86-94.*
17. *Delhi E contact precipitation for Defluoridation of water. Paper presented at 22nd WEDC Conference, New Delhi 9-13 Sept 1996.*
18. *IRC.2007. Household water treatment FAQ sheet. http://www.irc.nl/page/8028.citedOctober2009.*
19. *UNICEF, 2009. Water, sanitation, and hygiene. http;//www.unicef.org/wash.cited August. 2009.*
20. *Harder, R 2008 fluoride. Toxin or medicine department of the water management Delft University of Technology, Delft, Netherland.*
21. *C M Vivek Vardhan and J Karthikeyan Removal of fluoride from water using low cost.*