DEFLUORIDATION EFFECT OF TULSI (OCIMUM SANCTUM, LAMINAACE) ON GROUND WATER

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ABSTRACT

Tulasi is known for its therapeutic value, as it contains number of photochemical which possesses antibacterial, antiviral, antioxidant and adaptogenic properties. Studies carried out by some workers showed that the Tulasi is effective in removal of 95% fluoride from ground water with in 20 mts. The effect of Tulasi on fluorinated water studied by some authors revealed that it has negligible defluoridation property. In the present study, the defluorination effect of Tulasi on ground water was studied and it found to be variable. Among the 31 samples studied showed that the fluoride content raised in 27 samples, decreased in 4 samples and no change in 12 samples after treating with Tulasi.

KEYWORDS

Tulasi (Ocimum Sanctum), Ground Water, Defluoridation.

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INTRODUCTION

Water is an important requirement for human life to exist. Though ground water contains some impurities, the presence of fluoride with concentration >1.5 ppm will cause hazards to human health. It can cause dental fluorosis, skeletal fluorosis, etc.

In India, people of 196 districts are drinking fluoride contaminated water above maximum allowed concentration (MAC) of 1.5 ppm (Goswami et al, 2004).¹ Concentration of fluoride in drinking water in different parts of India varies between 0.5 to 50 ppm. Out of 6 lakh villages in India, at least 50% have fluoride content in drinking water exceeding 1.0 ppm (Gupta, 1995).

Fluoride ingested through water is considered as the principle cause of fluorosis in endemic areas (Somvanshi et al 1990) despite the fact that in many areas fluorosis ingested through food is also known to be critically high.

The amount of water that is ingested varies widely with age, climatic conditions, bodyweight, muscular activity, dietary habits and socio-economic conditions. So the average fluoride ingested through drinking water varies widely with climatic conditions in non-endemic areas also. The presence of fluoride in water provides a substantial reduction in dental caries of human, but if the concentration exceeds 1.5 ppm it causes several adverse effects like mottling of teeth called dental fluorosis, skeletal fluorosis, crippling fluorosis, osteoporosis, etc.

Varies methods have been evolved to remove excess of fluoride concentration from water. These methods are based on the principle of adsorption, ion exchange, precipitation, electro dialysis and reverse osmosis. Nawlakhe et al (1974) stated addition of aluminium as defluoriding agent with increasing concentration of fluoride and alkalinity of raw water.

The adsorption behaviour of fluoride on synthetic hydrous zirconium oxide was investigated by Goswami et al (2004).¹

To implement these techniques for defluoridation of water much difficulties has to overcome such as cost, effectiveness, acceptability, adaptability, etc. An attempt was made to find out effective and efficient method for reduction of excess fluoride concentration within the permissible limit of Indian Standard for drinking water. Studies were carried out by using basil leaves, stems and leaf extract to remove the excess fluoride concentration.

MATERIALS AND METHOD

Ground water samples of different locations are collected with necessary precautions (Brown et al 1974). The fluoride concentration was measured by using "Zirconium-alizarin visual method." To execute the study, 100 mg of Tulasi powder (Tulasi Powder Contains - leaves, stem, flower, root, seeds and even whole plant) is added to 100 mL of fluorinated water having more than 2 ppm fluoride and kept for 12 hrs. after thorough mixing. As the samples developed colour change, they were decolorized by the addition of activated charcoal and filtered with Gr. 1 filter paper (Whatman qualitative filter paper having 11 um used for clarifying liquids) and then fluoride content was measured with same method.

RESULTS AND DISCUSSION

The raw water fluoride concentration and fluoride concentration after treatment with Tulasi for 12 hours was shown in Table 1. It is noted that there is variable results of fluoride concentration after treatment with Tulasi shown in Table 2 and Figure 1.

Sl. No.	Initial F con ppm	Tulasi Rx ppm	Sl. No.	Initial F con ppm	Tulasi Rx ppm
1	2.2	2.2	17	4.4	5.2
2	2.6	2.6	18	2.2	3.0
3	4.4	4.4	19	2.2	3.0
4	3.4	3.4	20	2.6	3.3
5	3.6	3.6	21	2.6	3.0
6	2.2	2.2	22	2.0	2.2
7	2.0	2.0	23	2.2	2.6
8	2.6	2.6	24	9.0	7.0

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9	2.6	2.6	25	2.2	1.8
10	2.2	2.2	26	2.6	2.2
11	2.2	2.2	27	2.2	2.0
12	3.0	3.0	28	2.8	3.0
13	3.6	4.4	29	3.6	3.0
14	2.2	3	30	2.2	2.4
15	2.8	3.6	31	5.2	6.0
16	2.8	3.0			

Table 1: Fluoride Concentration Before & After Treatment of Tulasi

No. of Samples	Initial ppm	After ppm		
		Raised	Fall	No Change
22	2 to 2.9	11 (50%)	3 (13.63%)	8 (36.36%)
5	3 to 3.9	1 (20%)	1 (20%)	3 (60%)
4	4 and above	3 (75%)	0	1 (25%)
31		15 (48.38%)	4 (12.9%)	12 (38.7%)

Table 2: Variations in Fluoride ppm after Treatment of Tulasi

Fig. 1: The Water Having 2 to 2.9 ppm Initially had Raised ppm in 50% (11) of Cases, Fall in 13.6% (3) and No Change in 36.36% (8) After Adding Tulasi Powder

Fig. 2: The Water Having 2 to 2.9 ppm Initially had Raised ppm in 50% (11) of Cases, Fall in 13.6% (3) and No Change in 36.36% (8) After Adding Tulasi Powder

Fig. 3: In Samples Having 3 to 3.9 ppm Samples (5) Showed No Change in 60% (3), Rise in 20% (1), and Fall in 20% of Cases

Fig. 4: The Water Having 4 ppm and Above (4) Showed that 75% (3) Rise and 25% (1) No Change in Fluoride Concentration

The defluoridating effect of Tulasi was studied by various authors. The effect of Tulasi leaves on fluoridated water studied observed that it has negligible defluoridation property.² It was reported earlier that fresh, dried leaves and stem of Tulasi plant had a fluoride reported efficiency of 74 to 78%.^{3,4,5} (Raaz Maheshwari and Bina Rani, 2013; Kamble, 2012; Raaz et al 2012).

From the results of earlier studies concluded that Tulasi leaves and stem (Fresh and dry) can be used as defluoridating agent. It can remove 80% of fluoride from the synthetic solution. The resulting concentration of fluoride after treatments with tulasi comes within the permissible limit of Indian Standard for drinking water (IS 10500:1991, Fluoride 1.0-1.5 ppm).⁶

In this study Tulasi has 48.38% adverse defluoridation effect, 38.7% no effect and 12.9% has beneficial defluoridation effect.

CONCLUSION

In the present study, it is observed that on treating the ground water samples containing high fluoride concentration with Tulasi powder (Mixture of leaves, stem and flowers and roots), there is a variable change in fluoride concentration. In the study, it is observed that there is rise of ppm in 48.38% (15), fall in 12.9% (4) and no change in 38.7% (12) in Conc of Fluoride with treatment of Tulasi. From this study, it is concluded that there is no fixed change in the concentration of fluoride in ground water samples on treating it with Tulasi and further it is showing more adverse effect by rising fluoride concentration in 48.38% of samples than beneficial effect by fall in fluoride concentration in 12.9% of samples.

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