Assessment of Fluoride content in ground Water of Rahuri Tahsil of Ahmednagar, Maharashtra

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Abstract: The dominance of fluorosis is primarily due to the intake of additional fluoride through drinking water. The objectives of this study are to assessment the fluoride exposure through drinking water. Assessment of fluoride exposure was completed through the SPANDS technique. The present investigation was undertaken to study the level of fluoride contents in groundwater of Rahuri Tahsil of Ahmednagar. A whole of 32 samples were collected from 32 villages of Rahuri Tahsil. Among these villages, 4% drinking water samples from two locations contain 1 mg/l of fluoride, 96% of the samples contain fluoride 0.5 mg/l. The results indicate that the fluoride satisfied in all the sampling stations was found within the permissible levels as per WHO standards.

1. Introduction

Fluorine is the most abundant element in nature, and about 96% of fluoride in the human body is found in bones and teeth. Fluorine is essential for the normal mineralization of bones and formation of dental enamel Park (2011). Fluoride is a naturally occurring compound derived from fluorine, the 13th most abundant element on earth's crust DHHS (1991). It is generally present in almost all foods and beverages including water, but levels of which can vary widely. Fluoridation is the addition of fluoride compounds into drinking water, to adjust concentrations to levels between 0.8 and 1.0 mg/lit for the beneficial effect of tooth decay prevention. The fluoride accumulation of ground water varies according to the source of water, geological formulation of the area and amount of rain fall etc. The concentration in seawater averages 1.3 ppm. Fresh water supplies generally contain between 0.01–0.3 ppm, whereas the ocean contains between 1.2 and 1.5 ppm WHO (2002). The recommended level of fluoride in drinking water in India is 0.5 to 0.8 mg/l Jolly et al., (1969).

The available data suggest that 15 States in India are endemic for fluorosis (fluoride level in drinking water >1.5mg/l), and about bout 62 million people in India suffer from dental, skeletal and non-skeletal fluorosis. Out of these; 6 million are children below the age of 14 years Susheela AK. (2001). In India 62 million people including 6million children are estimated to have serious health problems due to consumption of fluoride contaminated water Times of India (2012). Drinking-water is typically the largest single contributor to daily fluoride intake (Murray, 1986). High concentration of fluoride causes dental fluorosis (disfigurement of teeth), bending of vertebral column, deformation of knee joints, and other bones of the body, and even paralysis. At the same time concentration less than 0.6 ppm results in dental caries and dental motling (Rao and Venkateshwarulu 2000). Hence it is essential to maintain fluoride concentration between 0.6 to 1.2 ppm in drinking water (ISI 1983 and WHO 1994).

In some locations, the fresh water contains dangerously high levels of fluoride, leading to serious health problems. So therefore the objectives of the present work are to analysis and discuss the suitability of water for drinking purpose.

The primary objective of this study is to develop an integrated simulation model, which can be used for engineering analysis and design. The dynamic kinetics of the whole composting processes and all key factors, which limit the kinetics, will be considered. The model describes substrate degradation, microbial growth, moisture change, oxygen concentration and aeration on-off situation as a function of substrate and oxygen concentration in the exhaust air, compost temperature and moisture content. Realistic economic aeration will be included to evaluate and optimize a rotation vessel composting process with the numerical simulation results. At the same time optimal composting conditions will be identified.

2. Material and Methods
2.1 Study Area

The Rahuri Tahsil in Ahmednagar district of Maharashtra has been selected for the present investigation work. The tahsil comprises of 95 villages and two urban centers spread over an area of 1, 00,898 hectares. The geographical extension of the study area is form 19°15' N to 19°34' North latitude and 74°23' E

to74°50' East Longitude. The Rahuri tahsil lies in the rain shadow zone of the Western Ghats in Mula and
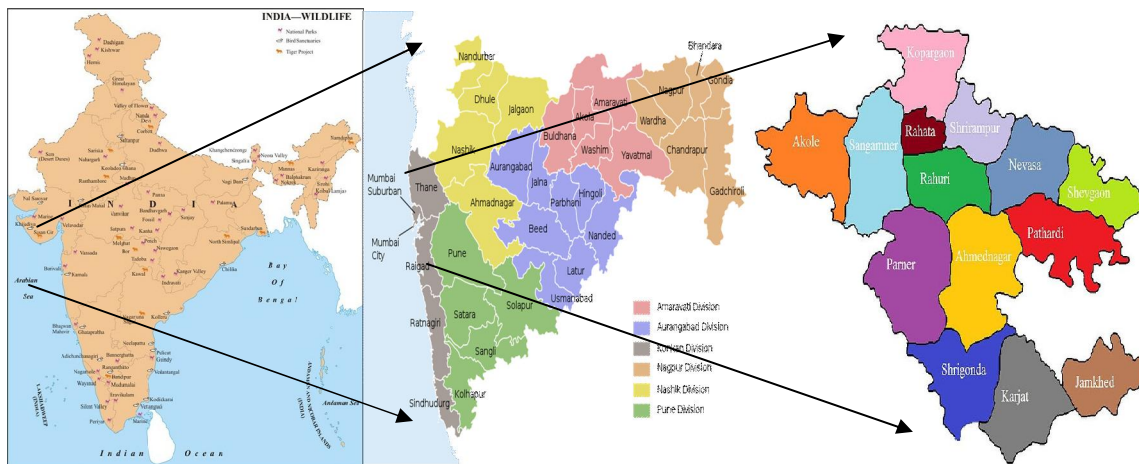
Pravara basin.

Figure: 1 showing map of the study area

2.2 Sampling Methods

The water quality parameters estimated by the standard methods given by APHA (1998). For the present investigation groundwater samples were collected every month during the study year from June 2013 to May 2014 from 32 different sampling stations of Rahuri tahsil. The water samples collected from the Rahuri tahsil and taken in pre-cleaned polyethylene bottle. The fluoride is estimated by SPANDS method. A calibration standard ranging from 0 to 1.4 mg F–/L was prepared by diluting an appropriate volume of standard F– solution. To 50 mL of standard solution, 10.0 mL the SPADNS reagent was added and mixed well. The spectrophotometer was set at wavelength of

570 nm, and a calibration graph was prepared from different standard concentrations.

3 Result and discussion

A total of 32 samples were collected from 32 villages of Rahuri Tahsil of Ahmednagar. Among these villages, 4% drinking water samples from two locations contain 1 mg/l of fluoride, 96% of the samples contain fluoride 0.5 mg/l. The results indicate that the fluoride content in all the sampling stations was found within the permissible levels as per WHO standards. The drinking water fluoride levels of all locations in each village of Rahuri Tahsil are shown in figure 1.
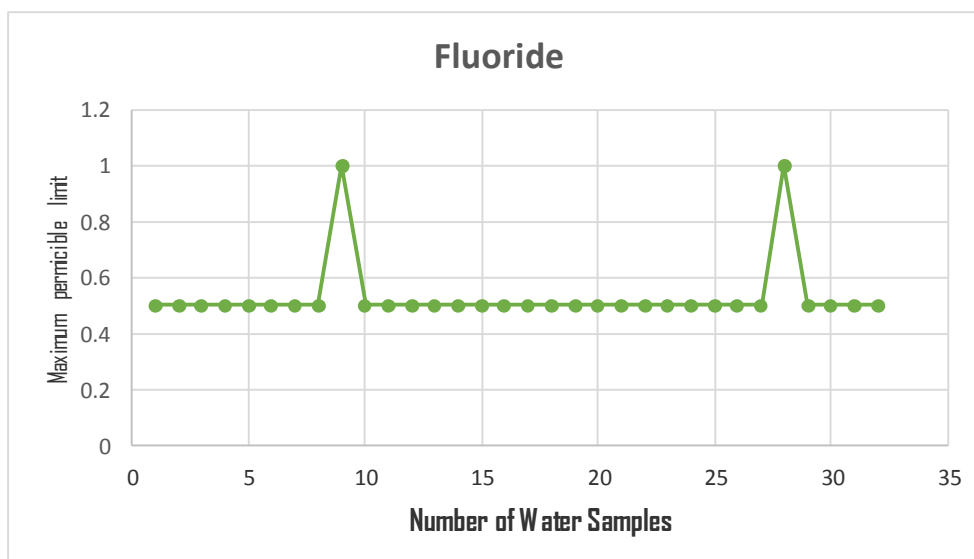

Figure 2. Comparison of Fluoride contents in different water samples.

Similar trend was observed by Rao et al. in (2001), he get fluoride content ranged from 0.5-1.0 mg/L from western, Eastern zone and BED village drinking water ponds of Kolleru lake region. Yannawar et al., (2013) investigated the fluoride level is 0.89 mg/L at Unkeshwar Spring of Maharashtra, respectively. Yannawar et al., (2013) observed at Lonar Lake of Maharashtra all the samples found within the permissible levels as per WHO standards.

4. Conclusion
On the basis of above discussion it is concluded that the water out of 32 sampling stations studied in all most 32 stations, fluoride concentration remained within the permissible limits for drinking water. The other important natural phenomenon that contributes to high fluoride is evaporation of water in wells. Due to it there should be chances of increasing fluoride in the study area.

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References
1. APHA, 1998, Standard Methods for the Examination of Water and Wastewater. American Public Health Association, 20th edition, Washington. D.C.
2. DHHS (Department of Health and Human Services) 1991, Review of Fluoride benefits and risks. Department of Health and Human Services, Washington, D.C.
3. Environmental Health Criteria 227: Fluorides. World Health Organization (2002) pp. 38.
4. http://articles.timesofindia.indiatimes.com/2012-07-26/nagpur/32868877_1_fluoride-dental-fluorosisgroundwater).
5. Indian Standard Institution (ISI) (1983) Indian Standard specification for drinking water IS: 10500.
6. Jolly SS, Singh ID, Prasad S, Sharma R, Singh BM, Mathur OC. (1969) an epidemiological study of endemic fluorosis in Punjab. Indian J Med Res., Vol. 57 No. 7 pp. 1333-46.
7. Murray J.J. [Ed.] (1986) Appropriate Use of Fluorides for Human Health, World Health Organization, Geneva.
8. Park K. (2011) Park's text book of preventive and social medicine. Ed 21. Banarasisdas Bhanot Publishers, 1167. Premnagar, Jabalpur, India pp.577.
9. Rao A. Sreenivasa, P. Rammohan Rao and M. Someswara Rao ,2001, Quality of Drinking water from ponds in villages of Kolleru Lake region, Indian Journal of Environmental Health, Vol.43 ,No.1, pp. 45 - 52.
10. Rao and Venkateshwarulu (2000) Physicochemical characteristics of underground water in Nagarcoil town (South) IJEP 24 (i): 53-56.
11. Sheeja B.D., Ebanasar J., and Francis S., (2008) Progressive changes in the physicochemical characteristics of the Thamparani River (West) during its flow, Journal of Basic and Applied Biology, Vol.2, No.1, pp. 14-18.
12. Susheela AK. (2001) Fluorosis: Indian scenario: A treatise on fluorosis. Fluorosis Research and Rural Development Foundation; New Delhi, India.
13. WHO (1994) Guidelines of drinking water quality Vol. II Recommendations. 2nd Edition, World Health Organization Geneva p. 192.
14. Yannawar V.B., Bhosle A.B., Shaikh P.R., and Gaikwad S.R. (2013) Water Quality of Hot Water Unkeshwar Spring of Maharashtra, India. Int J of Innovation and Applied Studies Vol. 3 No. 2, pp. 541-551.
15. Yannawar Vyankatesh B. and Bhosle Arjun B. (2013) Cultural eutrophication of Lonar Lake, Maharashtra, India. Int J of Innovation and Applied Studies Vol. 3 No. 2, pp. 504-510.

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