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### **A comparative study of groundwater with special reference to fluoride concentration in some parts of Raigad District, (MS) India**

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#### **ABSTRACT**

Raigad district of Maharashtra is famous for industry and rice production. Major area of the district is covered by large number of small and big rice Production of land. Rice land use huge amount of fertilizers and pesticides, which are potential sources of fluoride. We, in this study, monitored the fluoride level and some other parameters of groundwater of a large area occupied by different types of small and big rice land of Raigad revenue circle and another nearby area of Raigad, revenue circle in which there is no rice land. Fluoride level in the groundwater of rice land area and industrial zone area is found slightly greater than other area.

**Keywords:** Groundwater, fluoride, rise land, Industrial zone etc.

#### **INTRODUCTION**

In the past, contaminated surface water killed many people than any other substances in the world. Because of the initiatives taken by central government and international agencies, people started to use groundwater. Use of groundwater saved many people from deadly water-born diseases but at the same time bring some new problems. Continuous use of groundwater in some specific areas created the problems – Arsenic poisoning and Fluorosis. Permissible level of fluoride in drinking water is 1.5 mg/L<sup>[1]</sup>. Fluoride concentration in groundwater excess of this leads many abnormalities to human body. Long-term use of drinking water containing fluoride concentration higher than the permissible level causes dental Fluorosis and in more severe cases causes skeletal Fluorosis. Leaching of fluoride bearing minerals such as Fluorite, cryolite, apatite, hornblende, mica etc. are the principal sources of fluoride in groundwater<sup>[6]</sup>. Some man made activities are also responsible for the rise of fluoride level of groundwater in some places. Cryolite and rock phosphate are used for the production of a pesticide and phosphate fertilizer respectively<sup>[7]</sup>. Cryolite is also used in the extraction of aluminium from its ore. These fertilizers and pesticides are used extensively in agriculture and thus they contribute to the rise of fluoride level in groundwater. Manufacturing processes of Ni, Cu, Steel, Glass, Brick, Ceramic, Glues, Adhesives, Drugs, Cosmetic products are also contributed to the rise of fluoride level in groundwater<sup>[8]</sup>. Groundwater with high and low concentration of fluoride is found in many parts of the world. Fluorosis is endemic in several countries viz. China, South Africa, West indices, Ethiopia, Srilanka, Spain, Holland, Italy, Mexico etc<sup>[10]</sup>. People of different regions of India, are also badly affected from Fluorosis. It is estimated that about 65 million people of India are suffered from Fluorosis<sup>[11,16]</sup>.

In this paper, the data interpreting to fluoride concentrations in the groundwater of Raigad district in Maharashtra state of India has been presented.

#### **Study area:**

Raigad is located in south western side of Maharashtra State. The District Head Quarter of Raigad District is Alibag. Raigad is situated on western coast of India and on shore of Arabian Sea. The Latitude of Raigad : 18.39 N and The

Longitude of Ragad : 72.55 E. Groundwater is the source of water, used for domestic purposes. The lithology is also responsible for the quality of groundwater.

## MATERIALS AND METHODS

### 2.1 Instruments & Chemicals

Fluorides colour comparator: The fluorides test kit contains a colour comparator, which has five numbers colour slots of colour, ranging from Red to yellow corresponding to the fluorides content in the water sample.

**Matching the colour:** For matching the colour of test water with the colours on the Comparator, place the test bottle (3 ml) contain water sample with Fluoride test reagent in comparator. Hold the comparator against light, placing it between source of daylight and the observer, at his eye level. Match the colour of test water with colour on comparator. There are five numbers colour slots provided for fluorides contents corresponding to 0.0, 0.5, 1.0, 1.5, and 2.0 ppm level.

The Water temperature measure by micro thermometer and pH value of water sample under investigation was measured using digital pH meter. The pH meter was standardise by buffer of pH 4.0 and pH 9.2.



Fig.1 Determination of fluoride in water by using kit

### 2.2 Sampling

Fifteen drinking water samples were taken from fifteen tehsils of Raigad district. Good quality half litre polythene bottles were used for sample collection. Samples were collected directly in the rinsed bottles without using any preservatives, from hand tube wells, bore well. After the water samples were transported to the laboratory, fluoride analyses were performed immediately. These analyses were done in the months from January to March of 2014.



Fig.2 Collection of Sample from the various Areas

### 2.3 Determination of Fluoride

A combination fluoride electrode was used to determine the fluoride concentrations in drinking water, juice and bottled water samples. The samples and fluoride standard solutions were diluted 1:1 with the TISAB. The solutions,

which contained 25ml of the sample and 25mL of TISAB solutions, were mixed with a magnetic stirrer for 3mins. The electrode potentials of the sample solutions were directly compared with those of fluoride standard solutions.

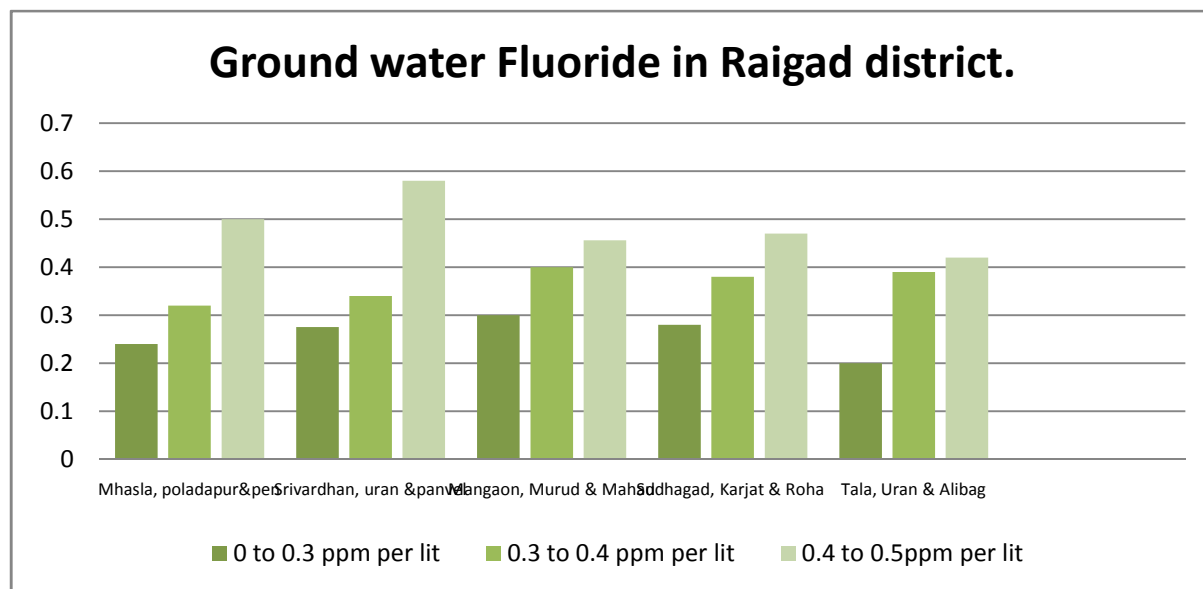
### RESULTS AND DISCUSSION

Physicochemical parameters pH and fluoride concentrations. In general, the ground water had no colour, odour and turbidity except few samples. Many of the water samples had slightly salty in nature.

Table – I: Fluoride concentration and other physico-chemical properties of ground and surface water of study area-A

Sr. No.	Locations	Depth in Ft.	Sources	pH	F ppm/3ml
1.	Mhasla	90	BW	7.1	0.24
2.	Poladpur	110	BW	7.2	0.32
3.	Pen	100	BW	7.0	0.50
4.	Srivardhan	105	BW	7.3	0.20
5.	Khalapur	115	BW	6.9	0.34
6.	Panvel	120	BW	7.2	0.58
7.	Mangaon	105	BW	7.1	0.30
8.	Murud	85	BW	7.4	0.40
9.	Mahad	100	BW	7.3	0.45
10.	Sudhagad	120	BW	7.2	0.28
11.	Karjat	110	BW	6.8	0.38
12.	Roha	105	BW	6.9	0.47
13.	Tala	100	BW	7.1	0.20
14.	Uran	120	BW	7.3	0.39
15.	Alibag	127	BW	7.2	0.42

BW: Bore Well



### CONCLUSION

The significance of fluoride in water has always been subject of debate. where as an intake fluoride is less quantity (less than 1 ppm) is known to be beneficial for human health in preventing in dental caries high fluoride concentration in water causes dental and skeletal fluorosis, In this method determination of fluoride study can be easily.

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