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A Project Report on the Analysis of Fluoride Content in Drinking Water in Eruthenpathy Panchayath

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***Abstract:** Fluoride is distributed universally throughout soils, plants, and animals, and is assumed to be an essential element in animals, including humans. Fluoride has an important role in bone mineralization and formation of dental enamels. Fluoride, when consumed in inadequate quantities (less than 0.5 ppm), causes health problems such as dental caries, lack of formation of dental enamel, and reduced bone mineralization, especially among children. Drinking water samples were collected from different locations of Eruthenpathy panchayath, near Chittur, Palakkad, Kerala and analysed to assess physicochemical parameters and suitability of water for drinking purpose. Physicochemical parameters such as PH , hardness, electrical conductivity (EC), total dissolved solids (TDS), alkalinity, chloride, calcium, magnesium, fluoride, iron were determined. The found values were compared with the World Health Organisation water quality standards.*
***Keywords:** Physicochemical parameters, Fluoride, Water quality.*

I. INTRODUCTION

Environmental impact assessment (EIA) is a process of evaluating the likely environmental impact of a proposed project or development, taking to account inter-related socio-economic cultural and human health impacts, both beneficial and adverse By using EIA both environmental and economic benefits can be achieved, such as reduced cost and time of project implementation and design, avoided treatment/clean-up costs and impacts laws and regulations.

Water is an essential natural resource for sustaining life. Water is certainly no free everywhere. However, chemical, composition of surface or subsurface is one of the prime factors on which the suitability of water for domestic, industrial, or agricultural purpose depend. Though ground water contributes only 0.6% of the total water resources on earth, it is the major and referred source of drinking water in rural as well as urban area, particularly in developing countries like India. It caters to 80% of the total drinking water requirement and 50% of the agricultural requirement in rural India. Fluoride is one of the most abundant anions present in ground water worldwide and creates a major problem in safe drinking water supply. Fluorine is the most electronegative and reactive among all the elements in the periodic table. Because of its great reactivity, fluorine cannot be found in nature in it elemental state. It is exists either as inorganic fluorides or as organic fluoride compounds, always exhibiting an oxidation number of -1. In the environment, inorganic fluorides are much more abundant than organic fluoride compounds.

Fluorides in drinking water may be beneficial or detrimental depending on their concentration and total amount ingested. Fluoride in beneficial especially to young children for classification of dental enamel below 8 years of age when present with in permissible limits of 1.0-1.5mg/l and an allowable fluoride concentration of 1.5mg/l in possible waters.

The problem of excess fluoride in drinking water is growing day by day, as noted by a growing number of surveys to assess the ground water qualities that have been undertaken. Fluoride in water derives mainly from dissolution of natural minerals in the rocks and soils with which water interacts. Reaction times with aquifer minerals are also important high fluoride concentration can be built up in ground waters, which have long residence times in the host aquifers. Surface waters usually have low concentrations, as do shallow groundwater from hand-dug wells as they represent young, recently infiltrated, rainwater.

A. Aim & Ojectives

The Environment Impact Assessment of fluoride content in drinking water in Eruthenpathy panchayath, Palakkad.

1) To analyse the fluoride content in drinking water and compare with standard provided by BIS.
2) To assess the health problems due to the higher consumption of fluoride in water.
3) Recommend some remedial measures if fluoride level is above the permissible limit.

II. MATERIALS AND METHODS

The present study was carried out in Eruthenpathy panchayath of ward 14 , Palakkad, was taken. The area had rich vegetation and open wells are the main source of drinking water. The panchayath is bounded on the north by Vadakarapathi, south and west by Kozhinjapara, and east by Pollachi. Extremely warm climate with an average annual temperature is 30^0C, through the year temperature vary by 5.1^0 C. The data were collected through field visit and field survey.

A. Physical Parameters

1) Colour: Observe the colour of 50ml samples taken in a beaker.

Taste and odour.

For qualitative determination of odour place 250ml of the sample in wide mouth Brlenmayer flask and sniff the odour. Also take the required amount of sample and taste it.

B. Chemical Parameters

P^H

On the basis ionization theory acid are those substances that yield H^+ ion and bases that then yield hydroxyl ion [OH^-] on dissociation. According to the concept strong acids and bases are highly ionized substances and weak acid are poorly ionized substances in an aqueous solution.

To measure H^+ ion concentration consider the dissociation of pure water at 25^0C which yield OH^- ions for each H^+ ions i.e. the no of both ions is equal and which yield neutral P^H. A strip of wide range of P^H paper when dipped into water sample. The colour developed is compared with the P^H chart and P^H was determined.

C. Total Hardness

50ml of the water sample were collected in a clean conical flask. Add 2ml of ammonium chloride, ammonium hydroxide buffer solution followed by a pinch of Eriochrome Black –T indicator. The sample was titrated against EDTA. The end point showed the colour from wine red to blue.

$$\text{Total hardness in mg/l} = \frac{\text{Volume of EDTA*Normality of EDTA*Eq. weight } CaCO_3\text{*1000}}{\text{Volume of sample}}$$

D. Calcium Hardness

Take 100ml water sample in a conical flask then added approximate 1ml buffer solution and a pinch of EBT indicator. Titrated against standard EDTA solution until wine red colour change to blue not the volume of EDTA used.

$$\text{Calcium in mg/l} = \frac{\text{volume of EDTA*Normality of EDTA* Eq.weight of } CaCO_3\text{*1000}}{\text{Volume of sample}}$$

E. Magnesium Hardness

Find out the volume of EDTA used in Calcium determination. Also find out the volume of EDTA used in hardness (Ca^{++} + Mg^{++}) determination with same volume of the sample as taken in the calcium determination.(Magnesium Hardness=Total Hardness-Calcium Hardness*0.243).

F. Chlorine

50ml of the sample was taken and 2ml of k_2CrO_4 solution was added. It was titrated against standard silver nitrate solution; the end point was the persistent brick red colour. The chloride present in the given water sample;

$$\text{Chloride in mg/l} = \frac{\text{Volume of } AgNO_3\text{*Normality of } AgNO_3\text{*35.5*1000}}{\text{Volume of sample}}$$

G. Total Dissolved Solids(TDS)

A material of well mixed sample filtered through filter paper the weighed china dish and evaporated below the boiling point of water after evaporation the dish was dryed for at 1.8^0 and cooled in diluter and weighed.

H. Fluoride

Pipette 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, 6.0, and 7.0ml of fluoride standard solution into 50ml Nessler tube and make up to the mark with distilled water. Add exactly 10.0ml acid-zirconyl-spadns reagent to the tube and mix well. Set the spectrophotometer or filter photometer to zero absorbance using reference solution at 570mμ and measure the absorbance of the standards immediately. Plot a calibration curve.

Place 50ml of the sample or an aliquot dilute to 50ml to a Nessler tube. If the sample contains any residual chlorine added one drop of sodium arsenate solution for each 1ml Cl_2 and mixed well. Add exactly 10ml of the acid-zyrconyl-spadns reagent and mix well. After settling the spectrophotometer to zero absorbance with the reference solution, measure the absorbance of the sample. Find out the mg fluoride of the sample equivalent to the observed optical density from the calibration graph. Express the result as mg fluoride per liter of the sample.

I. Iron

Place 100ml of the well shaken sample in a 250ml beaker, and add 5ml 1+1HCl. Reduce the volume to 40ml by placing on a hot place. cool and added potassium permanganate drop by drop until a pink colour persists for at least 5minutes.transfer to a 50ml Nessler tube and make up to the mark.

Pipette 1ml, 2ml, 3ml, 4ml, 5ml and 6ml iron standard solution into 50ml Nessler tube. Add 1ml dil. HCl and 2 drops of potassium permanganate solution mix well and make up to the mark with distilled water.

Add to the standards and sample 1ml thiocynate solution and mix well. compare the colour of the sample with that of the standards and find out the mg equivalent of iron present in the sample.

Alkalinity:

Alkalinity is directly determined by titration with 0.02N H_2SO_4 using phenolphthalein and methyl orange indicator.

$Ca(OH)_2 + H_2SO_4 \rightarrow CaSO_4 + 2H_2O$

$2CaCO_3 + H_2SO_4 \rightarrow Ca(HCO_3) + CaSO_4$

Take 50ml of water sample in clean conical flask. Add 5 drops of methyl orange indicator titrate the above sample the standard 0.02N H_2SO_4 solution taken in the burette. The end point is change of colour from yellow to reddish orange.

Sl.No.	Parameter	Unit	Limit (BIS)	Test Result				
				040 (E1)	041 (E2)	042 (E3)	043 (E4)	044 (E5)
1	P^H	-	6.5-8.5	7.5	7.02	8.06	8	7.67
2	Taste	-	-	-	-	-	-	-
3	Colour	Hazen	-	-	-	-	-	-
4	Odour	-	-	-	-	-	-	-
5	EC	µS/cm	500	1160	1142	1658	793.3	556.1
6	TDS	Ppm	500	643.3	630.2	911.3	435.5	312.9
7	Alkalinity	Mg/L	200	290	250	340	210	190
8	Chloride	Mg/L	250	207.32	197.38	231.46	95.14	53.96
9	Hardness (as C_aCO_3)	Mg/L	300	472	462	462	256	222
10	Calcium	Mg/L	75	44.08	12.02	24.04	60.12	55.31
11	Magnesium	Mg/L	30	87.64	104.97	97.67	25.72	20.38
12	Fluoride	Mg/L	1.5	0.73	0.82	1.21	0.29	0.66
13	Iron	Mg/L	0.3	0.02	0.08	0.26	0.02	0.09

Electrical conductivity (Using conductivity meter) :

The electrode of the conductivity meter is dipped into the sample, and the readings are noted for stable value shown as mS/cm.

III. RESULT & DISCUSSION

Five water samples are randomly collected from the study area and estimated the drinking water quality by the analysis of various physicochemical parameters. Colour, Taste and Odour of the samples are unobjectionable. **P^H**The acidity or basicity of water is expressed in p^H. The normal P^H range of water is from 6.5-8.5. Value range of P^H from 7 to 14 is alkaline, from 0 to 7 is acidic and 7 is neutral. The P^H content of all sample lies within the permissible limit. Conductivity of the samples are above than the permissible limit. The BIS provided for TDS is 500 ppm. (Aydin 2007). TDS of the samples are above the permissible limit. The out limit of TDS is cause to kidney stone.etc. The BIS provided for alkalinity is 200Mg/L. Alkalinity of the samples are above the permissible limit. (F. N. Scatena 2000)also studied the drinking water quality and Alkalinity is dangerous because it cause nutritional imbalance, Normal cells die in excessively alkaline environments; cancer cells don't mind the alkaline environment it just increase the P^H values when they feel threatened.(S. Khan et al 2013)Hardness of water decreases the lather formation of soaps and increases scale information in hot water heaters and low pressures boilers at high levels . The BIS provided for hardness is 300 Mg/L. (BIS 1992) ,APHA (1995) also reported examination of Water and Wastewater by Standard Methods .Hardness of the samples are above the permissible limit. It causes yellowing of food and toughness vegetables cooked in water. All types of natural and raw water contain chlorides. The BIS provided for chloride is 250 mg/l. chloride ,Flouride, Calcium and Iron content of the samples are below the permissible limit. **(**Taiwo O.A 2006)(Ramamohana N. V et al. 1993) also supported the view that low calcium content of rocks and soils, and the presence of high levels of sodium bicarbonate in soils and waters are important factors favoring high levels of F in waters. (Venkata et al. 2006) reported high positive correlation between TDS-Mg, TH-Ca and TH-Mg. The present study also supports this observation, as there is a positive correlation between the values of magnesium, calcium, TDS and total hardness in different samples (Sunil J.Wimalawansa 2015) indicated that the consumption of water contaminated with heavy metals, fluoride, and other toxins causes insidious illnesses that lead to protracted, non-communicable diseases and death. Magnesium of the samples are above the permissible limit **(**K.Brindha et.al 2012). (Jinjie chen et.al 2013) showed that food intake, growth, serum osmolality, body composition, and biochemical measures in the blood were affected by fluoride. (Chun-Yuh Yang and Hui-Fen Chiu 1999) demonstrated a negative association between blood pressure and calcium and magnesium levels. The out limit of magnesium in the results low blood pressure, urine retention, and cardiac attack in individuals .

IV. CONCLUSION

From our present study the important observation have emerged in Eruthenpathy panchayath exposure to high hardness, magnesium, electrical conductivity, TDS, alkalinity. Water quality of five open wells representing the Eruthenpathy panchayath was studied to assess the suitability of the well waters for domestic purposes. We found that the hardness, magnesium, EC, TDS, alkalinity are in highest values that the permissible limit provided by BIS and others are with in the limit. So we concluded that the drinking water in Eruthenpathy panchayath is not suitable for drinking purposes.

REFERENCES

[1] APHA: American Public Health Association, Standard Methods: For the Examination of Water and Wastewater, APHA, AWWA, WEF/1995, APHA Publication, 1995.
[2] Aydin, A. 2007. The microbiological and physico-chemical quality of groundwater in West Threce, Turkey. Polish J. Environ. Stud., 16(3):377-383.
[3] BIS 1992. Indian Standard Specification for Drinking Water, IS: 10500,Bureau of Indian Standards, New Delhi.
[4] Brindha.K, Rajesh.R, Murugan.R,Elango.L (2011) The Effects of Fluoride on Plants, Pharmacology of fluorides. Journal of Environmental Monitoring and Assessment Volume 172, Issue 1, pp 481-492.
[5] Chun-Yuh Yang, Hui-Fen Chiu (1999) Calcium and magnesium in drinking water and the risk of death from hypertension . American Journal of Hypertension. 12, (9) 894–899.
[6] Jinjie chen,jundog wang,jinling cao (2013)-Effects of on growth,bodycomposition, and serum biochemical profile in a fresh water teleost,Cyprinus carpio. Journal of Environment Toxicology and Chemistry,Vol-32 , Issue-10,Page-2315-2321.
[7] S. Khan, M. Shahnaz, N. Jehan, S. Rehman, M. T. Shah, and I. Din, "Drinking water quality and human health risk in Charsadda district, Pakistan," Journal of Cleaner Production, vol. 60, pp. 93–101, 2013.
[8] Ramamohana Rao N. V, Rao N, Schuiling R. D, Surya Prakash Rao K (1993) - Fluorine distribution in waters of Nalgonda District, Andhra Pradesh, India, Journal of Environmental Geology, 21(1) pp 84-89.
[9] F. N. Scatena(2000) "Drinking water quality," in Drinking Water from Forests and Grasslands: A Synthesis of the Scientific Literature, G. E. Dissmeyer, Ed., General Technical Report SRS-39, pp. 246, Department of Agriculture, Southern Research Station, Asheville, NC, USA.
[10] Sunil J. Wimalawansa (2015) Radioactivity and fluoride contamination derived from a phosphate fertilizer plant in Egypt. Environmental Geochemistry and Health pp 1-4.
[11] Taiwo.O.A(2006)-. A health risk assessment for fluoride in Central Europe Volume 249(2) pp 297- 308.
[12] Venkata Subramani, R., Meenambal, T. and Livingston Peter Goldwyn.2006. Correlation study on physico-chemical characteristics of groundwaters in Coimbatore District. Poll. Res., 5(2): 371-374.