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Monitoring fluoride concentration and some other physico – chemical properties of ground water of Tinsukia district, Assam, India.

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Abstract: It is very essential to know the concentration of fluoride in ground water as ground water is considered one of the principal sources of drinking water. We therefore monitored the concentration of fluoride and some other parameters in the ground water of Tinsukia district. Ground water of Tinsukia district was found slightly acidic in nature. Only two samples out of 30 were found slightly basic in nature. Calcium and magnesium concentrations were found quite low. Fluoride concentration was found in the range .0639 mg/L to .7149 mg/L, which was quite lower than the permissible level 1.5 mg/L.

Keywords: Ground water, fluoride and Fluorosis.

Introduction:

Fluoride, one of the important species present as dissolved state in water has different affects on human at different concentrations. It is beneficial if its concentration is within the range 0.6 to 1.2 mg/L [1]. Concentration below 0.6 mg/L causes dental carie, specially to the children. Concentration above 1.2 mg/L leads to dental and skeletal Fluorosis. The permissible level of fluoride in drinking water is 1.5 mg/L [2].

Fluorosis is a worldwide problem. Several countries of the world viz. China, South Africa, West indices, Ethiopia, Sri Lanka, Spain, Holland, Italy, Mexico etc facing this problem [3]. About 42.5 million people suffer from dental Fluorosis due to excess fluoride in drinking water and coal smoke pollution in China. Another two million cases of skeletal Fluorosis found in the same country [4].

In many parts of India, high level of fluoride in ground water is found. Number of affected people is

also not less. About 62 million people, including 6 million children are suffering from Fluorosis in India

[5]. In Assam, severely affected district is Karbi Anglong [6]. Dental and skeletal Fluorosis is common among the people in many parts of this district. Fluoride level in the ground water of Kamrup [7], Nagaon, Morigaon, and Golaghat districts were also studied and found high level in some areas of these districts.

Fluoride bearing minerals are the main sources of fluoride in ground water. Fluorite, cryolite, apatite, hornblende, mica etc are some of the fluoride containing minerals [8]. As a result of the leaching of these minerals, fluoride released into the ground water. Some human activities such as use of phosphate fertilizers, fluoride-containing pesticides in agriculture and some manufacturing processes such as steel, copper, glass, brick, glues, adhesives are also released fluoride into the environment [9].

Experimental:

Study area

Tinsukia district is about 532 km from the state capital, Dispur, Assam. The district is situated between the longitude 95°22' to 95°38'E and latitude 27°23' to 27°48' N. It is surrounded by Arunachal Pradesh in the East-south, in the Southwest by Dibrugarh district and in the North by Dhemaji district. Dhemaji district is separated from Tinsukia district by the river Brahamaputtra. The average maximum temperature of the district is about 31.1 °C and minimum 8.9°C and average annual rainfall is 250 cm. One of the major towns of the district is Tinsukia. Large numbers of industries including steel manufacturing, oil supported, plastic based industries, petroleum, tea based, paper and wood products, candle, brick and cement products are situated here. Digboi refinery, Coal India limited at Margherita, Coalfields at Ledo, Borgolai, Tipam,



Hindustan Lever Ltd cosmetic industries and many other small-scale industries are distributed throughout the district. Moreover entire district is covered by large number of tea gardens. The number of small tea growers in the district is 11000 and the number of tea gardens is 120. These tea gardens use huge amount of phosphate fertilizers and pesticides, which contain fluoride as impurities. The fluoride level in the ground water of this district is not monitored earlier. Since there is the possibility of contamination of ground water by fluoride in this district, we therefore try to measure the level of fluoride in this district. The district has three sub divisions – Sadia, Margherita and Tinsukia sub division. The map of the study is shown in figure – I. The analyzed data are presented in three different tables (Table - I, II & III) according to different sub divisions.



Good quality half liter polythene bottles were used for sample collection. Samples were collected from hand tube well, well and public water supply scheme. The samples were collected directly in the rinsed bottles without using any preservatives. These analyses were done in the month of April 2011.Generally ground water is used as for drinking purpose in this district; therefore, we collected only the ground water samples. One sample collected from river in Tipam area of Margherita sub division.

Methodology:

Ion selective electrode method was employed for measuring fluoride concentration. For this purpose, the electrode ORION 9609BNWP was used in ELICO ion analyzer (Model: LI 126). A pocket pH meter (HANNA made) was employed for measuring the pH of the samples at the time of collection. A water and soil analysis kit (LT-61) was used for measuring conductivity and TDS. Hardness, calcium and magnesium concentration were measured by EDTA Titrimetric method. Using standard AgNO₃ solution, concentration of chloride was measured. Procedures and calculations of all parameters were followed that describe in APHA [10].

Table – I: Sadia Sub division:

Sl.	Locations	Depth	Nature	pН	EC	TDS	TH	F	Ca	Mg	Cl
No.		Ft.	of	_	μS/cm	ppm	mg/L	mg/L	mg/L	mg/L	mg/L
			sources				_	_	_	_	
1	Lachit	15	TW	5.8	184	125	55	.2650	9	7	27
	Nagar										
2	Anth Mail	20	TW	6.8	379	257	316	.6550	38	53	21
3	Islampur	16	TW	6.9	250	171	185	.3400	27	28	26
4	Sapakhowa	20	TW	5.8	210	143	143	.3550	21	22	30
5	Borjhira	15	TW	6.2	181	124	152	.7149	23	23	31
6	5 No.	15	TW	6.5	180	122	147	.6s00	18	25	28
	Santipur										
7	Santipur	16	TW	6.3	297	202	198	.6100	28	31	26

Table – II: Margherita sub division:

Sl.	Locations	Depth	Nature	pН	EC	TDS	TH	F	Ca	Mg	Cl
No.		Ft.	of		μS/cm	ppm	mg/L	mg/L	mg/L	mg/L	mg/L
			sources								
1	Tipong		River	5.7	155	105	110	.0981	16	17	34
	(Dhalai)		water								
2	Tipong	15	Well	5.4	200	195	89	.0921	10	11	41
3	Tipong	12	Well	6.2	205	198	105	.0931	16	15	28
	(Colony)										
4	2 NoTirap	15	Well	6.2	126	122	105	.0942	14	17	27
5	Tirap	17	Well	6.3	381	258	245	.1026	38	36	23
6	Tikak	15	well	5.8	582	395	548	.1052	47	104	25
7	Tikak	45	Tw	5.9	88	60	46	.0942	7	7	30
8	Margherita	46	tw	5.9	1882	1278	105	.0981	13	18	30

Sl.	Locations	Depth	Nature of	pН	EC	TDS	TH	F	Ca	Mg	Cl
No.		Ft.	sources	-	μS/cm	ppm	mg/L	mg/L	mg/L	mg/L	mg/L
1	Dhola	65	Tw	5.3	475	323	456	.4600	64	71	33
2	Tenga goan	65	Tw	5.9	156	152	160	.2980	9	33	20
3	Talap	46	Tw	5.3	458	310	354	.2810	35	65	54
4	Talap	66	Tw	4.7	73	50	63	0680	4	13	17
5	Rupai	65	Tw	5.3	86	58	63	.0723	8	10	16
6	Doomdoma	66	Tw	6.5	323	220	295	.0639	28	55	23
7	Borhapjan	46	Tw	6.3	291	198	274	.0920	25	51	21
8	Makum	46	Tw	5.9	279	190	190	.9201	18	35	18
9	Panitola	65	Tw	7.0	163	153	97	.1937	16	14	16
10	Laipoli	65	Tw	7.3	188	126	68	.1187	12	9	16
11	Hizuguri	64	Tw	6.5	301	206	114	.2500	27	11	26
12	Gurijan	45	Tw	7.1	126	85	63	.2561	10	9	17
13	Rongpur	50	Tw	6.8	161	156	84	.1937	18	9	17
14	Thermal	120	Supply	6.2	181	389	114	.1041	18	14	13
15	Sripuria	55	Tw	5.9	505	301	198	.1026	34	20	30

Table – III: Tinsukia sub division:

TW: - tube well

Result and Discussion:

The measured values of different parameters are given in three tables as sub division wise. It is clear from the analysis that groundwater of whole district is almost acidic in nature. Only two water samples collected from Laipoli and Gurijan area were found very slightly basic in nature. Alkaline environment is favorable for the release of fluoride into ground water [11]. The fluoride concentration was found quite low and the range is .0639 mg/L to .7149 mg/L. Because of low

References:

- ISI, Indian standard specification for drinking water. IS: 10500. Indian Standard Institution, New Delhi, 1983.
- [2] WHO, Guidelines for Drinking water Quality, World Health Organization,1, 2004
- [3] Nectar to Poison, Centre for Science and Environment, New Delhi, 2005, 53
- [4] WHO, Fluoride in Drinking- water, 2006, 99-100
- [5] Susheela, A.K., Fluorosis management programme in India, curr. Sci.1999, 7, 1250 – 1256
- [6] Chakraborti D., Fluorosis in Assam, Curr. Sci., 2000, 78(12), 1421 – 1423
- [7] Das B., Talukdar J., Sarma S., Gohain B., Dutta R.K., Das H.B. and Das S.C., Fluoride and other inorganic constituents in groundwater of

level of fluoride in ground water there is a possibility of occurring dental caries among the children. Samples collected from Margherita sub division were minimum in fluoride concentration and that were collected from Sadia sub division were higher in fluoride level.

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Guwahati, Assam, India, Curr. Sci., 2003, 85(5), 658 – 660

- [8] Hem J.D. Study and Interpretation of the chemical characteristics of natural water, University press, Hawaii, 1970, p-177.
- [9] http://www.greenfacts.org/en/fluoride/fluorides-2/02environment.htm#3.
- [10]APHA. Standard method for the examination of the water and wastewater. 17th edition, American Public Health Association, New York, U.S.A, 1989.
- [11]Saxena V.K., Ahmed S., Inferring the chemical parameters for the dissolution of fluoride in groundwater, Environmental Geology, 2003, 43, 731-736.