

SEASONAL VARIATION OF PHYSICO-CHEMICAL PROPERTIES OF GROUND WATER ALONG THE VRUSHABHAVATHI RIVER STREAM

M.Harish Raju¹, ET Puttaiah²

Dept. of Chemistry, Atria Institute of Technology, Bangalore¹

Gulbarga University, Gulbarga²

Abstract: Water is a crucial constituent of the atmosphere and it sustains life on earth. For families of millions of rural and urban areas, the tube well water is the source for domestic use. According to one of the surveys ground water accounts for the 50% of urban water requirement and 80% of rural domestic needs. Keeping in view of the above, an attempt was made here to evaluate the physico-chemical properties of twenty four ground water samples along the Vrushabhavathi river stream in the pre monsoon season of 2009. The investigator carried out to study and analyse the level of contamination in the tube well water sample by determining the different physico – chemical parameters namely, Temperature, turbidity, pH, TDS, salinity, EC, total hardness, total alkalinity, chloride, fluoride, calcium, magnesium, sodium, potassium. The results were compared with standard prescribed by BIS & WHO. It was found that some samples of underground water were contaminated and few fall within the permissible limits of the above said standards.

Keywords: Vrushabhavathi river, Ground water, Physico Chemical properties, water pollution, seasonal variation.

I. INTRODUCTION

The precious gift of nature is undoubtedly the water after air, although three fourth part of earth is being surrounded by water a little portion of it can be used for drinking purpose. Water is polluted day by day with increasing urbanization and industrialization. Approximately 62.5 million people are suffering from –ve effects of Fluorine either by teeth or bones through fluorosis. The prominent source of water pollution is domestic sewage; industrial waste water and agriculture run off. Bangalore is the capital of the state Karnataka in India. With a population greater than 7 million, Bangalore is India's third largest city. It has earned the sobriquets "silicon valley of India," pub capital of India, and the city of gardens among others. Bangalore lies in the southeast of the south Indian state of Karnataka. It is in the heart of Mysore plateau at an elevation of 920m (3018 ft). It is positioned 12.97°N 77.56°E and covers an area of 741 km². The majority of the city of Bangalore lies in the Bangalore Urban district of Karnataka.

II. STUDY AREA

Currently, the river Kaveri provides around 75-80% of the total water supply to the city with the remaining 20-25% being obtained from the Thippagondanahalli, Hesaraghatta reservoirs of the Arkavathi River and Ground water. The Vrishabhavathi River is a minor river that flows north of the Indian city of Bangalore. Most of the sewage emanating from Bangalore is carried by these two rivers. Keeping this in view, the researcher tried to investigate the physio-chemical properties of bore well water along the Vrishabhavathi River.

III. Data and Methodology

Twenty four borewell samples have been collected during pre monsoon of 2009 at different stations along the Vrishabhavathi River (starting from Sumanahalli to Kumblagodu). At the spot the parameters like Temperature, pH, TDS, EC, Salinity, and DO are measured using systronics water analyser-371 and the remaining physio-chemical properties were determined in the laboratory as per the standard methods. Sodium and potassium concentrations were determined by Flame photometer (Systronics

FPM digital μ controlled based). Calcium and Magnesium were determined by EDTA method, Argentometric, SPADNS, titrimetric, methods were employed to find Cl^- , F^- and Alkalinity concentrations. All the parameters were measured twice for accuracy.

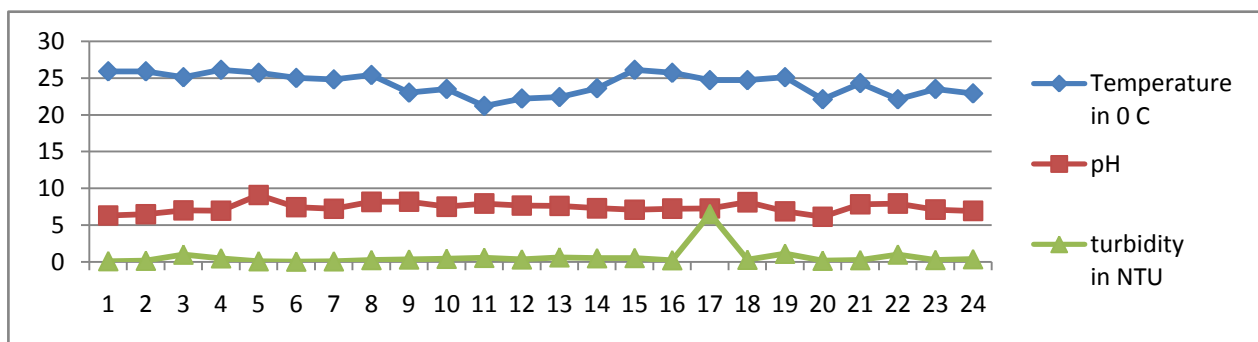
IV. RESULTS and DISCUSSION

Physical Parameters: All the physical parameters were depicted in the Table – 1 and its variation is showed in Graph – 1 & Graph – 2.

Table - I
The Physical parameters of Ground Water

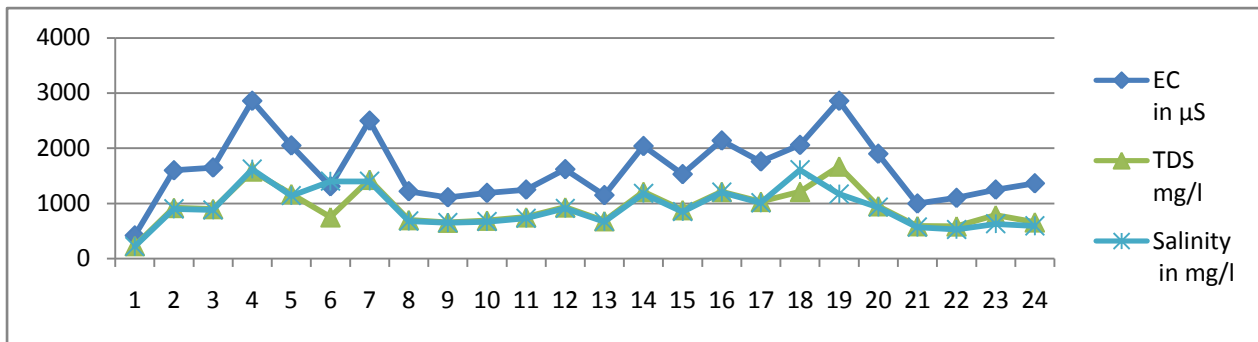
Sample No.	Temperature in ° C	pH	turbidity in NTU	EC in μS	TDS mg/l	Salinity in mg/l
1	25.9	6.32	0.09	418	229	220
2	25.9	6.49	0.15	1600	920	900
3	25.1	7.01	0.98	1650	900	880
4	26.1	6.96	0.48	2860	1580	1620
5	25.7	9.1	0.08	2050	1170	1140
6	25	7.45	0.03	1310	750	1400
7	24.8	7.22	0.07	2500	1430	1400
8	25.4	8.17	0.24	1220	700	680
9	23	8.19	0.32	1110	653	650
10	23.5	7.52	0.41	1190	690	670
11	21.2	7.95	0.54	1250	750	730
12	22.2	7.67	0.33	1620	930	910
13	22.4	7.64	0.61	1150	680	670
14	23.6	7.3	0.49	2040	1210	1180
15	26.1	7.11	0.52	1530	880	850
16	25.7	7.25	0.22	2140	1210	1200
17	24.7	7.29	6.5	1760	1030	1010
18	24.7	8.13	0.28	2060	1210	1610
19	25.1	6.87	1.1	2860	1670	1170
20	22.1	6.15	0.15	1900	951	930
21	24.3	7.85	0.23	997	590	570
22	22.1	7.95	0.99	1100	586	527
23	23.5	7.12	0.25	1250	786	629
24	22.9	6.95	0.36	1364	659	593
WHO	-	7.0 – 8.5	5 – 25	-	500– 1500	-

Graph - 1 Showing Temp., pH and Turbidity



Graph - 2

Showing EC, TDS & Salinity



Temperature: The temperature ranged between 21.2⁰C to 26.1⁰C among all the tested bore wells.

PH: Seventeen bore well samples out of twenty four samples were within the permissible limits of WHO (1993), the other seven samples crossed the permissible limits of WHO.

Turbidity: All the twenty four bore well samples tested for turbidity were within the permissible limits of WHO (1993).

Electrical Conductivity: The EC values ranged between 418µS to 2860µS.

Total Dissolved Solids: The TDS values found in the range of 229 mg/l to 1670 mg/l for the above said 24 bore well samples. Except two samples crossed the permissible limits of WHO

Salinity: The values for salinity were ranged between 220mg/l to 120 mg/l.

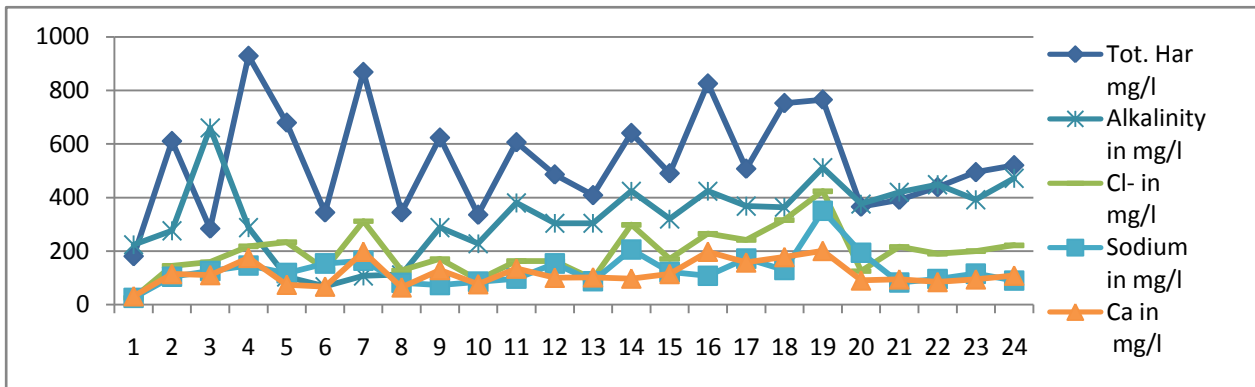
Chemical Parameters : Total hardness, alkalinity of water, chloride, sodium, calcium, magnesium, potassium and fluoride values were depicted in Table – 2, there variation is showed in Graph -3,4 and 5.

Table - 2

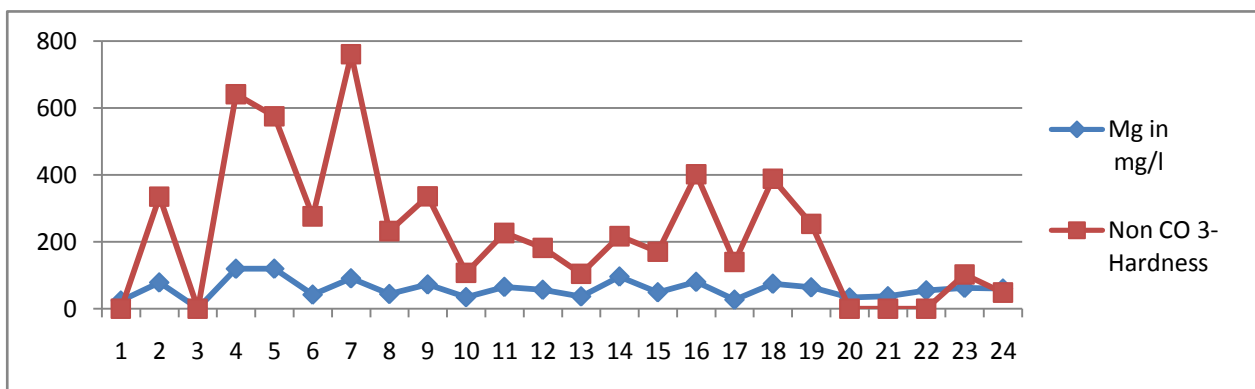
The Chemical parameters of Ground Water

Sample No.	Tot. Har mg/l	Alkalinity in mg/l	Cl- in mg/l	Sodium in mg/l	Ca in mg/l	Mg in mg/l	K in mg/l	F- in mg/l
1	181	224	26	26	32	25	1	0.01
2	611	276	145	105	115	79	4	0.09
3	284	660	159	126	111	2	12	0.1
4	929	288	218	146	175	120	1	0.04
5	679	104	234	118	75	120	1	0.02
6	344	68	132	154	68	42	1	0.1
7	869	108	312	164	198	91	1	0.11
8	344	112	128	82	65	44	3	0.21
9	624	288	171	74	130	73	5	0.021
10	335	228	92	86	77	35	8	0.025
11	606	380	163	98	135	66	4	0.028
12	486	304	163	154	101	57	7	0.01
13	409	304	96	88	103	37	5	0.2
14	641	424	299	206	98	97	5	0.019
15	490	320	171	122	115	49	8	0.085
16	826	424	265	108	198	81	3	0.028
17	507	368	242	172	158	27	2	0.09
18	753	364	316	130	178	75	11	0.06
19	765	512	424	350	201	64	3	0.07
20	366	376	126	194	91	34	1	0.09
21	391	420	216	83	95	38	1	1
22	439	448	191	96	85	55	15	0.02
23	495	392	200	116	95	63	12	0.03
24	520	472	222	90	109	60	21	0.08
WHO		500 - 1000	200 - 600	200	75-200	50-150		1.0-1.5

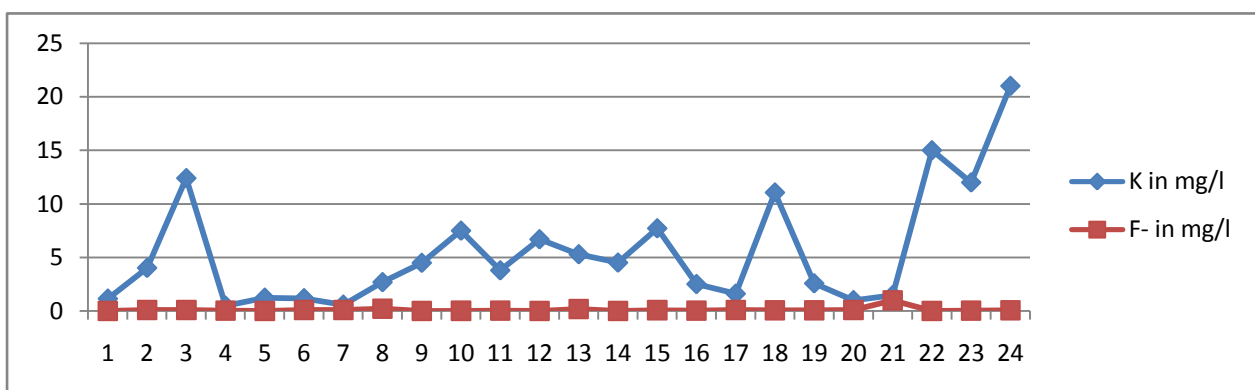
Graph-3 showing values of Total hardness, Alkalinity, Chloride, Sodium & Calcium.



Graph - 4 showing values of Mg & Non carbonate values



Graph-5 showing values of potassium & Fluoride



Total Hardness: Out of 24 samples of bore well water tested for total hardness ten samples crossed the permissible limits of WHO (Table – 2). The values ranged between 181 mg/l of CaCO₃ to 929 mg/l of CaCO₃.

Alkalinity: The alkalinity values were found to be varying between 68 mg/l to 660 mg/l, all the samples were within the permissible limits of WHO (Table – 2)

Chloride: All the samples collected for measurement were found to be containing chloride within the permissible limits of WHO (Table – 2) they found varying in the range of 26 mg/l to 424 mg/l.

Sodium: Table – 2 shows that all the samples tested for the presence of sodium were found in the range of 26mg/l to 350 mg/l, except two samples all the other twenty two samples were within the permissible limits of WHO

Calcium: Twenty samples of water were within the permissible range of WHO (Table – 2), they varied in the range of 80 mg/l to 503 mg/l.

Magnesium: All the collected samples for analysis were found to be within the permissible limits of WHO. They varied in the range of 02 – 120 mg/l (Table -2)

Potassium: All the collected samples were containing potassium and they varied in the range of 01 – 21 mg/l (Table – 2).

Fluoride: All the samples collected for analysis were containing fluoride less than the permissible limits of WHO, (Table -2) and they varied in the range of 0.01 – 01.0 mg/l.

V. REFERENCE

- [1]. Mayur C Shah, Prateek G Shilpkar and Pradip. B Acharya E-Journal of Chemistry Volume 5, No. 3, pp-435-446, July 2008
- [2]. APHA standard methods for examination of water and waste water 18th edition APHA Washington DC
- [3]. World health Organisation Guidelines for drinking water quality, Volume 1,2 and 3 WHO Geneva
- [4]. CGWB (2002): Ground water balance. Mass awareness programme in Ernakulam district January 5th 2002 by CGWB, Kerala region, Thiruananthapuram, Kerala.
- [5]. Appelo, C.A.J and GEirnaert, W. (1991): Process accompanying the intrusion of salt water, - In; Breuk, W. de (ed): Hydrogeology of salt water intrusion, a selection of SWIM papers I.A.H. v 11/1991, Vrlag Heinz Heise.
- [6]. P.N. Kamble, S. S Bhusal, and S. R. Kuchekar, *RASAYAN J. Chemistry.*, **1, 3 (2008)**.
- [7]. D.V. Sonwane, S.P Lawande, V B Gaikwad, P. N. Kamble and S.R . Kuchekar, *RASAYAN J. Chemistry.*, **2, 421-423 (2009)**.
- [8]. Internet sources about Bangalore.