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Physico-chemical analysis of borewells drinking water of Kapadwanj territory

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ABSTRACT

Physico-chemical analysis such as temperature , pH, dissolved oxygen, total dissolved solids, chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate, nitrate of bore wells water was carried out from twenty sampling stations of Kapadwanj territory area during the May - 2009 and October - 2009 in order to assess water quality index.

Key words: Physico-chemical analysis, Borewells drinking water, Kapadwanj, Gujarat.

INTRODUCTION

In continuation of our earlier analysis on Bore wells water[1-3], here we report the Physico-Chemical analysis of Bore wells drinking water of kapadwanj territory. Kapadwanj is located in Kheda District of Gujarat. Borewells water is generally used for Drinking and other domestic purposes in this area. The use of fertilizers and pesticides, manure, lime, septic tank, refuse dump, etc. are the main sources of Borewells water pollution[4]. In the absence of fresh water supply, people residing in this area forced to use Bore wells water for their domestic and drinking consumption. In order to assess water quality index, we have carried out the Physico-Chemical analysis of Bore wells drinking water.

EXPERIMENTAL

In the present study Bore wells water samples from twenty different areas located in and around Kapadwanj territory were collected in brown glass bottles with necessary precautions.

Physico-chemical analysis

All the chemicals used were of AR grade. Double distilled water was used for the preparation of reagents and solutions. The major water quality parameters considered for the examination in this study are temperature, pH, dissolved oxygen (D.O.), total dissolved solid (T.D.S.), total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate contents[6].

Temperature, pH, D.O., TDS, Phosphate, Nitrate values were measured by water analysis kit and manual methods. Calcium and Magnesium hardness of water was estimated by complexometic titration methods[7]. Chloride contents were determined volumetrically by silver nitrate titrimetric method using potassium chromate as indicator and was calculated in terms of mg/L. Sulphate contents were determined by volumetric method[7].

RESULTS AND DISCUSSION

The Physico-Chemical data of the Bore wells water samples collected in May-2009 and October-2009 are presented in Table-1 and Table-2 respectively. The results of the samples vary with different collecting places because of the different nature of soil contamination [7]. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature.

Table 1: Analysis result of the samples collected in may- 2009

No.	Sample Station	Temp. C^0	PH	TDS mg/L	DO mg/L	Chloride mg/L	Total Alkalinity mg/L	Ca Hardness mg/L	Mg Hardness mg/L	Sulphate mg/L	Phosphate mg/L	Nitrate mg/L
1	Kapadwanj	34.1	8.1	210	8.6	81.0	388	49.07	76.79	307.44	15	90
2	Dana	32.0	7.1	920	10.0	86.6	460	32.07	104.12	192.15	40	335
3	Shankarpura	33.2	7.4	280	7.2	65.6	520	40.08	41.80	269.01	20	428
4	Abaliyara	32.3	6.90	380	7.0	121.7	320	83.37	19.44	257.31	12	405
5	Anklai	33.2	6.93	500	7.4	79.52	480	136.28	92.34	269.01	13	317
6	Narana muvada	33.1	7.1	220	8.6	76.68	440	144.3	92.34	192.15	10	440
7	Vasana	32.1	7.3	430	8.0	120.70	380	24.05	55.40	46.12	42	185
8	Charania	33.0	7.5	310	7.6	191.7	800	12.22	56.38	230.58	18	290
9	Bhagavanji na muvada	34.3	7.1	440	8.5	49.7	608	16.23	41.80	288.23	19	450
10	Torana	33.0	7.2	1100	7.1	184.7	392	27.26	55.40	153.72	18	285
11	Antroli	32.7	7.5	510	6.9	44.2	580	33.67	28.19	215.21	19	115
12	Antarsumba	33.8	7.2	780	7,2	85.2	336	11.23	38.89	257.48	35	390
13	Betawada	34.1	7.5	1380	7.1	115.1	580	28.86	60.26	115.29	11	70
14	Navagam	33.4	7.0	480	7.5	184.4	336	11.23	38.89	288.23	19	250
15	Danadara	33.8	8.0	790	6.9	190..4	612	43.29	61.24	115.29	20	395
16	Motizer	34.2	7.2	410	8.2	85.20	432	51.31	182.74	288.23	30	115
17	Zanda	33.4	7.1	500	7.5	285.4	440	43.29	55.41	269.91	28	365
18	Thavad	34.1	8.0	1070	7.2	46.86	340	35.27	63.19	134.51	13	420
19	Lalpur	33.8	8.3	340	7.2	38.34	460	17.63	25.27	46.12	15	405
20	Garod	33.9	7.5	500	7.5	52.54	404	19.24	56.38	365.08	15	440

Table 2: Analysis result of the sample collected in october- 2009

No.	Sample Station	Temp. C^0	PH	TDS mg/L	DO mg/L	Chloride mg/L	Total Alkalinity mg/L	Ca Hardness mg/L	Mg Hardness mg/L	Sulphate mg/L	Phosphate mg/L	Nitrate mg/L
1	Kapadwanj	30.5	7.98	200	7.6	28.48	328	36.87	88.45	345.87	8.0	70
2	Dana	31.8	7.05	840	8.3	80.94	384	16.03	56.38	230.15	9.0	250
3	Shankarpura	31.7	7.2	250	6.9	41.18	512	11.22	19.44	249.79	20.0	310
4	Abaliyara	30.5	6.95	210	6.4	116.3	148	12.82	31.10	184.46	5.0	250
5	Anklai	31.2	6.90	440	7.2	82.36	360	36.87	66.10	211.36	7.0	205
6	Narana muvada	29.4	7.20	185	8.2	102.4	364	76.94	38.90	84.54	6.0	305
7	Vasana	29.8	7.25	410	7.8	100.3	360	16.03	29.16	19.41	15.0	110
8	Charania	29.7	7.40	240	7.4	149.10	856	12.82	45.68	80.70	6.0	170
9	Bhagavanji na muvada	30.7	7.05	380	8.3	44.02	560	22.44	64.15	172.93	5.0	250
10	Torana	29.7	7.0	980	6.9	65.03	380	19.24	27.22	38.43	9.5	120
11	Antroli	30.4	7.3	480	6.5	44.03	624	8.02	19.44	384.30	9.0	205
12	Antarsumba	30.8	6.92	710	6.9	142.0	504	19.24	27.14	353.56	15.0	60
13	Betawada	31.9	7.25	1250	6.8	61.03	520	28.85	65.12	249.79	6.0	155
14	Navagam	29.5	6.90	490	7.2	116.44	504	8.02	19.44	165,25	9.0	170
15	Danadara	29.7	7.8	670	6.7	167.56	580	41.68	81.64	122,97	10.0	80
16	Motizer	29.5	7.05	450	7.8	61.06	408	35.27	95.26	134.07	5.0	225
17	Zanda	31.9	6.90	460	7.2	49.10	368	72.14	34.02	76.86	9.5	305
18	Thavad	31.2	7.82	970	6.9	52.54	325	44.88	50.54	161.41	7.0	220
19	Lalpur	29.7	8.05	370	6.8	32.66	480	11.22	20.41	188.31	4.0	325
20	Garod	30.4	7.3	480	7.3	46.86	380	24.05	34.02	172.93	6.0	230

Temperature

In the present study temperature ranged from 29.4° C to 34.3° C.

PH

In the present study PH ranged from 6.9 to 8.3 which lies in the range prescribed by APHA[8] The PH value of drinking water is an important index of acidity, alkalinity and resulting value of the acidic-basic interaction of a number of its mineral and organic components. PH below 6.5 starts corrosion in pipes .Resulting in release if toxic metals.in .The tolerance PH limit is 6.5 to 8.5.

TDS

In the present study TDS ranged from 185 mg/L to 1380 mg/L. According to WHO [9] and Indian standards TDS values should be less than 500 mg/L for drinking water. All the sample station except sample station no 2, 10, 12, 13, 15, 18 higher ranged as prescribed by WHO and Indian standard[10].

D.O.

In the present study dissolved oxygen (D.O.) ranged from 6.4 to 10 mg/L. The minimum tolerance range is 4.0 mg/L for drinking water.

Chlorides

: The chlorides contents in the samples between 28.48 mg/L to 285.40 mg/L Natural water contains low chloride ions. In the present study sample station No. 18 shows 285.40 mg/L chloride. Which is highest value in twenty different sampling station. The tolerance range for chloride is 200-1000 mg/L[10].

Total Alkalinity

In the present study total alkalinity ranged from 148mg/L to 856 mg/L.

Calcium Hardness

The Calcium hardness ranged from 8.02-144.3mg/L The tolerance range for calcium hardness is 75 - 200 mg/L. Calcium contents in all samples collected fall within the limit prescribed. Calcium is needed for the body in small quantities, though water provides only a part of total requirements[1 1].

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Magnasium Hardness

Magnesium hardness ranged from 19.44 -182.74 mg/L. The tolerance range for Magnesium is 50 - 100 mg/L

Sulphate

Sulphate ranged from 19.41 mg/L to 384.30 mg/L. The tolerance range for sulphate is 200-400 mg/L. The high concentrations of sulphate may induce diarrhoea [12].

Phosphate

In the present study phosphate ranged from 4.0 mg/L to 42 mg/L. The evaluated value of phosphate in the present study are much higher than the prescribed values [13.] The higher value of phosphate is mainly due to use of fertilizers and pesticides by the people residing in this area. If phosphate is consumed in excess, phosphine gas is produced in gastro-intestinal tract on reaction with gastric juice. This could even lead to the death of consumer.

Nitrate

In the present study Nitrate ranged from 60 mg/L to 450.0 mg/L. The tolerance range for Nitrate 20-45 mg/L. Nitrate nitrogen is one of the major constituents of organisms along with carbon and hydrogen as amino acids, proteins and organic compounds present in the bore wells water [14]. In the present study nitrate nitrogen levels show higher values than the prescribed values[14]. This may be due the excess use of fertilizers and pesticides in this area.

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