

Physico-Chemical Studies of Bore Wells Water of Various Places in and around Limkheda (Gujarat)

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Physico-chemical studies such as temperature, pH, dissolved oxygen, total dissolved solids, chloride, total alkalinity, calcium and magnesium hardness, sulphate, phosphate and nitrate of bore wells water was carried out from eighteen sampling stations of Limkheda town and its some interior adivasi (backward) area during the year 2001, in order to assess water quality index.

Key Words: Physico-chemical studies, Bore wells Water, Limkheda, Gujarat.

INTRODUCTION

In continuation of our earlier studies on bore wells water¹, here, we report the physico-chemical studies of bore wells water of Limkheda town and its some interior adivasi (backward) area. Limkheda town is located in Dahod district of Gujarat. Bore wells water is generally used for dinking 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 bore wells water pollution². Due to geographical isolation and remoteness people residing in the interior adivasi area do not have access to safe drinking water. In absence of fresh water supply, people residing in this area are forced to take bore wells water for their domestic and drinking consumption. In order to assess water quality index, we have carried out the physico-chemical studies of bore wells water.

EXPERIMENTAL

In the present study bore wells water samples from eighteen different areas located in and around Limkheda town were collected in brown-glass bottles with necessary precautions³.

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 contents⁴.

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 complexometric titration methods⁵. 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 method⁵.

RESULTS AND DISCUSSION

The physico-chemical data of the bore wells water samples collected in April 2001 and August 2001 are presented in Table-1 and Table-2. The results of the samples vary with different collecting places because of the different nature of soil contamination⁵. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature. In the present study temperature ranged from 26–33°C.

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 of toxic metals. In the present study pH ranged from 6.60 to 7.10, which lies in the range prescribed by APHA⁶. In the presented study dissolved oxygen ranged from 4.20 to 9.30 mg/L.

According to WHO and Indian standards, TDS values should be less than 500 mg/L for drinking water. In the present study TDS ranged from 260 mg/L to 440 mg/L which lies in the range suggested by WHO and Indian Standards⁷.

The chloride content in the samples is in between 50 to 145 mg/L. Natural water contains low chloride ions. The findings indicate that all are below the permissible limits of chloride in drinking water, prescribed⁷ by Indian Standard Index.

In the present study total alkalinity ranged from 210–390 mg/L.

The limits of calcium and magnesium have been prescribed in the range 75–200 mg/L and 50–100 mg/L respectively⁸. Calcium and magnesium contents in all samples collected fall within the limits prescribed. Calcium is needed for the body in small quantities, though water provides only a part of total requirements⁸.

The concentration of sulphate in water sample is observed to be within the limits prescribed⁹ for sulphate content and it varies from 70 to 212 mg/L. The high concentrations of sulphate may induce diarrhoea⁹.

In the present study phosphate ranged from 0.12 mg/L to 0.79 mg/L. The evaluated values of phosphate in the present study are higher than prescribed values¹⁰. The higher values of phosphate are mainly due to the 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 consumer¹⁰.

Nitrate nitrogen is one of the major constituents of organism along with carbon and hydrogen as amino acids, protein and organic compounds, in the bore well water¹¹. In the present study nitrate nitrogen levels show higher values than the

TABLE-1
ANALYSIS RESULTS OF THE SAMPLES COLLECTED IN APRIL-2001

No.	Sample Station	Temp. (°C)	pH	D.O. (mg/L)	T.D.S. (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.	Arts College	30.0	6.8	7.4	440	89.0	320.0	106.0	40.2	110.0	0.60	14.0
2.	Bus Stand	31.0	6.8	6.6	330	117.0	390.0	120.0	66.0	74.4	0.48	22.0
3.	Gram Udyog Wadi	31.0	6.9	7.2	410	72.4	370.0	94.0	44.0	92.4	0.60	40.0
4.	Health Centre	32.0	6.9	8.2	300	72.0	298.0	95.0	52.1	140.0	0.60	20.0
5.	Kumbhar Wad	30.0	6.9	7.4	260	72.0	318.0	75.0	46.0	172.0	0.12	24.0
6.	Limkheda Padar	32.0	6.7	5.4	345	109.0	270.0	74.0	60.2	212.0	0.20	36.0
7.	Mahadev Mandir	29.0	7.0	6.0	300	145.0	290.0	108.0	48.6	210.0	0.20	25.0
8.	S.B.S.	28.0	6.8	7.5	370	68.1	286.0	76.0	36.7	74.6	0.28	34.0
9.	Bhil Seva Mandal	30.0	6.6	6.0	290	108.1	344.0	81.0	40.4	112.0	0.20	24.0
10.	Dabhda	33.0	6.7	8.3	410	90.1	370.0	104.0	62.0	162.0	0.32	30.0
11.	Dabhda Padar	32.0	6.7	7.2	370	89.0	314.0	84.0	75.0	152.0	0.20	40.0
12.	Dhadhela Stand	32.0	6.8	7.9	280	127.0	344.0	109.0	70.0	192.0	0.16	48.0
13.	Hathi Zara	31.0	6.8	9.2	270	84.0	312.0	82.0	56.0	212.0	0.36	35.0
14.	Kachla	30.0	6.6	6.6	290	79.0	284.0	7.0	48.6	144.0	0.40	47.0
15.	Kamboi	29.0	6.6	5.2	400	75.0	312.0	84.5	55.0	210.0	0.80	46.0
16.	Kanya Chatralaya	28.0	6.5	7.6	470	110.0	212.0	123.0	48.1	170.0	0.52	35.0
17.	Mangal Mahudi	32.0	6.7	7.6	380	65.0	316.0	72.0	44.0	92.2	0.62	45.0
18.	Usra	31.0	6.7	4.2	310	127.0	210.0	62.0	74.0	127.4	0.72	47.0

TABLE-2
ANALYSIS RESULTS OF THE SAMPLES COLLECTED IN APRIL-2001

No.	Sample Station	Temp. (°C)	pH	D.O. (mg/L)	T.D.S. (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.	Arts College	26.0	6.8	7.6	380	60.0	290.0	86.0	36.4	96.0	0.42	20.0
2.	Bus Stand	26.0	6.9	6.7	320	115.0	380.0	92.0	60.6	70.0	0.49	20.0
3.	Gram Udyog Wadi	27.0	6.9	7.4	400	90.2	350.0	74.0	33.9	77.0	0.79	36.0
4.	Health Centre	28.0	7.0	7.4	260	92.0	278.0	70.0	48.4	110.0	0.23	17.0
5.	Kumbhar Wad	28.0	7.0	7.5	270	113.0	298.0	70.0	47.4	162.0	0.23	22.0
6.	Limkheda Padar	30.0	6.8	7.2	315	79.0	214.0	67.0	58.6	174.0	0.76	26.0
7.	Mahadev Mandir	30.0	7.1	6.8	290	109.0	270.0	78.0	48.0	170.0	0.40	27.0
8.	S.B.S.	28.0	7.0	8.5	330	50.2	216.0	72.0	40.2	70.0	0.29	30.0
9.	Bhil Seva Mandal	28.0	6.6	6.6	337	77.0	310.0	70.0	48.6	100.9	0.23	26.0
10.	Dabhda	30.0	6.7	9.3	315	110.0	321.0	87.0	60.6	107.0	0.49	22.0
11.	Dabhda Padar	31.0	6.7	7.0	340	79.0	214.0	81.0	70.2	150.0	0.25	42.0
12.	Dhadheia Stand	31.0	6.9	8.0	280	79.7	314.0	99.0	80.0	170.0	0.26	46.0
13.	Hathi Zara	30.0	6.8	9.0	290	60.2	300.0	77.0	70.0	200.0	0.39	27.0
14.	Kachla	30.0	6.8	7.2	300	48.0	300.0	62.0	52.4	140.0	0.40	36.0
15.	Kamboi	28.0	6.7	5.0	350	51.0	290.0	87.0	60.6	190.0	0.70	40.0
16.	Kanya Chatralaya	26.0	6.8	6.6	410	54.0	216.0	101.0	55.4	164.0	0.32	37.0
17.	Mangal Mahudi	27.0	6.7	8.2	380	45.2	306.0	76.0	50.6	90.0	0.73	31.0
18.	Usra	27.0	6.7	5.4	290	77.0	270.0	55.0	70.2	130.4	0.79	27.0

prescribed values¹¹. This may be attributed to the use of fertilizers and pesticides in this remote adivasi area.

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