



RESEARCH ARTICLE

**Some Physico-Chemical Studies of Ground Water from Bore Wells Drinking Water
Quality Investigation in Middle Gujarat of Balasinor Tehasil**

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ABSTRACT

The study for some Physico-Chemical investigation of ground water of rural areas of Balasinor tehasil in middle of Gujarat State. The Physico-chemical properties like Temperature, PH, TDS, EC, Total hardness, Calcium, Magnesiumion, Alkalinity, Chloride, Bi-carbonate, Carbonate, Nitrate, Sodium, Potassium of bore wells water was analyzed from ten sampling of rural areas of Balasinor tehasil in the period of winter-2013 in the order of assess water quality index. This study is the aim for this research works to highlight the situation of current effect of Balasinor tehasil.

KEYWORDS

Physico-chemical, Investigation, Ground Water, winter, Balasinor tehasil

INTRODUCTION

Water plays a very useful role in human life. It is known to provide significant amount (~7%) of essential nutrients to the human life cycles. During last decade, it has been observed that the ground water is getting drastically polluted due to increased human activities^{1,2}. Consequently, number of cases of water borne diseases has been seen which a cause of health hazards³⁻⁵. That is why basic monitoring on water quality has been necessitated to observe the demand and pollution level of ground water⁶. A good number of water analysis experiments are regularly conducted by different groups of chemists and biologists across the country⁷⁻¹³. Different methods are available for improving the potability of water are gaining grounds these days.

MATERIALS AND METHOD

Ten different water samples were collected from different areas of Tehsil Balasinor and kept them into the brown bottles. Analysis of water samples was done as per standard process. All the chemicals used water 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, EC, dissolved oxygen (DO), total dissolved solid (T.D.S), alkalinity, calcium and magnesium hardness, sulphate, sodium^{20,21}, potassium²² and nitrate contents. Temperature, pH, dissolved oxygen (DO) total dissolved solid (T.D.S), Nitrate values were measured by water analysis kit and manual methods.¹¹⁻¹³ Calcium and magnesium hardness of water was estimated by complexometrics titration method.¹⁶ Chloride contents were determined volumetrically by silver nitrate titration method using potassium chromate as an indicator.

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RESULTS AND DISCUSSION

The average results of the physicochemical parameters for water samples are presented in Table-1.

Table 1: Analysis result of the sample collected in winter-2013

Sr. No	Parameter	Name of Village (Sample)									
		Jetholi	Pandva	Dolat porda-1	Dolat porda-2	Dolat porda-3	Dolat porda-4	Timba (pandva)	Maharajna muvada-1	Dev	Kuvechiya
	Deep of bore well Ft.	130	130	120	450	270	270	350	160	270	104
1	Temp.°c	28.7	29.6	30.3	30.6	30.2	30.9	29.7	31.0	31.6	29.3
2	pH	8.36	6.55	7.07	7.47	6.90	6.88	7.15	7.10	7.49	7.80
3	EC	0.5	1.3	0.7	0.7	1.2	1.3	1.2	1.4	0.6	1.4
4	Turbidity	1.2	1.1	2.1	1.9	1.8	1.9	2.3	1.1	2.2	1.7
5	Total Hardness	135.22	125.31	145.78	155.75	149.32	178.11	164.52	174.45	197.32	155.63
6	Calcium	27.33	23.65	31.24	28.55	30.44	33.14	26.41	34.11	30.07	18.77
7	Magnesium	43.74	47.21	39.34	35.88	34.53	36.11	46.83	31.14	28.42	29.53
8	Alkalinity	354	421	502	458	389	435	522	473	387	365
9	TDS	528	573	711	687	725	717	689	818	944	765
10	Chloride	36.75	41.25	45.87	47.24	46.91	48.13	37.42	43.47	57.39	38.71
11	Bicarbonate	281	448	479	498	412	384	295	343	513	456
12	Carbonate	28.14	26.37	33.89	29.54	28.13	31.22	36.57	23.61	28.17	32.15
13	Dissolve Oxygen	5.2	7.1	5.4	5.2	5.5	5.4	6.2	4.9	6.9	6.4
14	Sulphate	153	137	148	152	139	147	128	166	211	135
15	Nitrate	154	201	187	171	174	180	169	203	213	157
16	Nitrite	---	---	---	---	---	---	---	---	---	---
17	Fluoride	1.36	1.28	0.95	0.91	0.93	1.02	1.13	0.99	1.49	1.07
18	Sodium	303	298	268	271	265	282	302	287	310	276
19	Potassium	1.97	1.85	1.92	1.49	1.57	1.38	2.13	1.70	1.67	1.62

pH

Most of the waters are slightly alkaline due to presence of carbonates and bicarbonates. The pH values observe of water samples varied between 6.55 to 8.36.

Electrical Conductivity (EC)

Electrical conductivity is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts¹¹. EC values were in the range of 0.5micromhos/L to 1.4micromhos/L.

Total Dissolved Solids (TDS)

Total dissolved solids indicate the salinity behavior of groundwater. Water containing more than 500 mg/L of TDS is not considered desirable for drinking water supplies, but in unavoidable cases 1500 mg/L is also allowed¹². TDS values varied from 528 mg/L to 944 mg/L.

Dissolved Oxygen (DO)

Dissolved oxygen parameter is important in water quality assessment and reflects the physical and biological processes prevailing in the water. In the present study dissolved oxygen (D.O) ranged from 4.9 mg/l to 7.1 mg/l. The minimum tolerance range is 4.0 mg/l for drinking water.

Alkalinity

Alkalinity of water is its capacity to neutralize a strong acid and it is normally due to the presence of bicarbonate, carbonate and hydroxide compound of calcium, sodium and potassium. Total alkalinity values for all the investigated samples were found to be greater than the value prescribed by WHO. In the present study total alkalinity range is from 354 mg/l to 522 mg/l.

Calcium Hardness

The calcium hardness is ranging from 18.77 mg/l to 34.11mg/l. The tolerance range for calcium hardness is 75 to 200 mg/l. Calcium contents in all samples collected fall within the limit prescribed.^{18,19} Calcium is needed for the body in small quantities, though water provides only a part of total requirements.

Magnesium Hardness

From Results shows Magnesium hardness was ranging from 28.42 to 47.21 mg/l. The tolerance range for magnesium is 50 to 100 mg/l.¹⁷

Sodium (Na⁺)

Sodium concentrations were found in between 265 mg/L to 310 mg/L.

Potassium (K⁺)

The major source of potassium in natural fresh water is weathering of rocks but the quantities increase in the polluted water due to disposal of waste water. Potassium content in the water samples varied from 1.38 mg/L to 1.97 mg/L.

Chloride

The chloride was found between 36.75 mg/l to 57.39 mg/l. Natural water contains low chloride ions. The tolerance range for chloride is 200 to 1000mg/l.

Fluoride

The permissible limit of fluoride in drinking water is 1.0 mg/L, which can be extended to 1.5 mg/L in case of non availability of other water sources. Higher fluoride level in drinking water gives rise to dental decay and physical deformation. The dreaded disease "fluorosis" is a result of intake of high fluoride laden in drinking water. It has been observed that fluoride content in ground water ranged from 0.91 to 1.49 mg/L.

Nitrate

In the present study nitrate ranged from 154 mg/l to 213 mg/l. The tolerance range for nitrate 20mg/l to 45 mg/l. Nitrate nitrogen is one of the major constituents of organisms along with carbon and hydrogen as aminoacid, protein and organic compounds present in the bore wells water. In the present study nitrate nitrogen levels show higher values than the prescribed values. This may be due the excess use of fertilizers and pesticides in this area.

Sulphate

Sulphate ranged from 128 mg/l to 211 mg/l. The tolerance range for sulphate is 200 to 400 mg/l.

Table 2: Analysis result of the sample

Sr. No.	Parameters	Standard (WHO)	Maximum allowable limit
1	Temp.°c	----	----
2	pH	6.5 ---9.5	9.2
3	EC	1.4	
4	Turbidity	5 NTU	10 NTU
5	Total Hardness	100 mg/l (300 IS-10500)	500 mg/l
6	Calcium	75 mg/l	200 mg/l
7	Magnesium	50 mg/l	150 mg/l
8	Alkalinity	120 mg/l	
9	TDS	500 mg/l	1500 mg/l
10	Chloride	250 mg/l	600 mg/l
11	Dissolve Oxygen	---	5.0 (IS-10500)
12	Sulphate	250 mg/l	-----
13	Nitrate	45/50mg/l	-----
14	Sodium	---	200 mg/l
15	Potassium	---	

CONCLUSION

Potassium, Sodium and Fluoride is observed very normal in above samples. Nitrate the tolerance range in Borwell drinking water is ranged from 20mg/l to 45mg/l as per WHO(R) but in the present investigation we have found 154 to 213mg/ml amount of Nitrate. So it is noticeable point of view in the present study.

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