



Physico-chemical assessment status of ground water of some villages of Petlad Tahsil

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ABSTRACT

The ground water quality of some villages of Petlad Tahsil, of Gujarat, India, are determined by physico-chemical methods. Fifteen water samples from different villages are under studied for assessment of ground water. One sample from each village is under assessment of Physico-chemical solution and various quality parameter are measured including pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), content of calcium (Ca^{2+}), magnesium (Mg^{2+}), total alkalinity (TA), chloride (Cl^-) and sulphate (SO_4^{2-}) concentration present in water. The chemical analysis of water samples show considerable variations and also most of the samples comply with WHO standards for the parameter measured. The results of physico-chemical analysis of water are discussed.

Keywords: conductometry, temperature, sampling, physico-chemical and TDS.

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 Petlad territory. It is located at Anand district of Gujarat. Borewell water is generally used for Drinking and other domestic purposes in this area. The use of fertilizers like manure, lime, waste dump, pesticides etc. are the main sources of bore well water pollution. 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 SECTION

Study area:

Petlad located in Anand district, Gujarat (INDIA). On global map its location is (North Latitude $22^{\circ} 28' 48''$ and East Longitude $72^{\circ} 47' 24''$). The study of Fifteen villages borewell water of Petlad Tahsil sites were selected for samples collection. The samples were collected by standard methods given by WHO. Total 15 water samples were collected and analysed by physico-chemical methods.

Collection of water Samples

Groundwater samples were collected from 15 locations during pre-monsoon period (May-2012). Sample method is adopted as suggested in WHO, Methods for collection and analysis of water samples. Sampling is done at each station in polythene bottles of two-litre capacity. Sampling has been done in the month of May. The samples have been analyzed in the Shri R.K. Parikh Arts and Science College, Petlad. The sampling points are given in Table-1

Table-1 Sampling locations around villages of Petlad

Sr. No.	Sample locations (Village Name)	Source	Sample Number	Distance from Petlad	Side from Petlad
1	Bhavanipura	Bore Well	S ₁	3.00km	North
2	Porda	Bore Well	S ₂	6.00km	North
3	Palaj	Bore Well	S ₃	6.00km	West
4	Dantali	Bore Well	S ₄	1.00km	East
5	Fangani	Bore Well	S ₅	3.00km	East
6	Bhatiyel	Bore Well	S ₆	3.00km	East
7	Aashi	Bore Well	S ₇	4.00km	East
8	Simrada	Bore Well	S ₈	5.00km	East
9	Meherav	Bore Well	S ₉	10.00km	North
10	Bandhani	Bore Well	S ₁₀	8.00km	North
11	Vatav	Bore Well	S ₁₁	3.00km	North
12	Ardi	Bore Well	S ₁₂	3.00km	North
13	Sunav	Bore Well	S ₁₃	6.00km	North
14	Rangaipura	Bore Well	S ₁₄	2.00km	North
15	Jesrava	Bore Well	S ₁₅	2.00km	West

Sample Analysis of water

The analysis is carried out for determination of physico-chemical properties of fifteen villages water such as: pH, electrical conductivity (EC), total dissolved solids (TDS), total hardness (TH), content of calcium (Ca²⁺), magnesium (Mg²⁺), total alkalinity, chloride (Cl⁻) and sulphate (SO₄²⁻) were determined using standard method [4]. AR grade reagents were used for the analysis and double distilled water was used for preparation of solutions. The methods used for estimation of various physico-chemical parameters are tabulated in Table-2.

Table 2: Methods used for estimation of Physico-chemical parameters

Sr.No	Parameters	Method
1	Temp.	Thermometric
2	pH	pH metr
3	Electrical Conductivity	Conductometry
4	Total Dissolved Solid	Filtration Method
5	Total Hardness	EDTA titration
6	Calcium	EDTA titration
7	Magnesium	EDTA titration
8	Chloride	Silver Nitrate Method
9	Sulphate	Turbidimetric Method
10	TA	Titration Method

RESULTS AND DISCUSSION

The results are obtained from analysis of ground water samples of 15 villages of Petlad tahsil are given in Table-3. The results of the physico-chemical parameters of these samples were determined by using standard procedure [5-11]. All the water samples were collected during the month of May 2012. All the drinking water samples were clear, colourless & odourless.

1. Temperature:

It is one of the most essential parameters in water. It has significant impact on growth and activity of ecological life and it greatly affects the solubility of such as oxygen in water. Oxygen levels have decreased as the temperature tends to increase the molecular motion of the water and any dissolved oxygen. The temperature of the water samples of different villages were found to be in the range 21.1°C to 23.7°C the measured temperature were reported in table-3.

2. **pH:** The pH is determined by Digital pH meter, Elico, model LI.120 which gives direct pH value. pH of drinking water varies from 6.85 to 7.77. The acceptable limit prescribed by the drinking water standard is 6.5 – 8.5

3. **Electrical Conductivity:** The conductivity is determined by using digital conductivity meter. The Conductivity meter used is Lavibond made Senso Direct Con.200.

4. **Total Dissolved Solid:** The 50 ml of water sample is filtered through ordinary filter paper and water is collected in the evaporating dish of known weight. Further it is heated and water is totally evaporated. Whatever dissolved solid matter is present gets accumulated at the bottom of evaporating dish. The evaporating dish is cooled and weighed. By weight difference method the total dissolved solid is determined. The upper limit of TDS recommended for drinking water is 500mg/l by USEPA AND 1000mg/l by WHO. In the present study TDS ranged from 490mg/l to 1990mg/l.

Table-3. Average results of the physico-chemical parameters

No.	Parameter	WHO Standard value	ISI	Sampling points of villages of Petlad														
				S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉	S ₁₀	S ₁₁	S ₁₂	S ₁₃	S ₁₄	S ₁₅
1	Temp.	--	--	22.8	21.9	21.8	21.6	21.4	21.1	22.0	21.6	22.6	22.7	22.1	22.0	23.6	23.5	23.7
2	pH	7.0–8.0	6.5–8.5	7.04	7.7	6.89	7.04	6.90	7.77	7.33	7.51	7.30	7.48	7.18	7.47	7.15	7.52	7.30
3	EC	1400	--	1050	3160	1960	1330	1680	1200	770	1440	1610	1230	1290	900	1920	910	1700
4	TDS	1000	500	660	894	1230	830	1060	750	490	910	1020	780	810	560	1210	560	1080
5	Ca ⁺²	75	75	54	55	140	110	161	144	73	60	160	90	78	49	108	93	117
6	Mg ⁺²	150	30	49	64	66	32	70	74	30	29	56	38	165	130	180	35	36
7	TH	100	300	103	270	206	142	231	219	103	90	256	128	243	179	288	128	153
8	Chloride	250	250	97	190	278	218	170	121	121	97	204	180	181	120	241	144	241
9	Sulphate	250	200	25	65	40	16	161	128	76	90	16	40	50	45	19	10	45
10	TA	120	200	472	430	470	268	560	310	652	517	458	450	416	360	460	355	421

All Parameter are in mg/l except Temperature, pH and EC. EC in micro mhos/cm

5. **Total Hardness:** The 50 ml water sample is titrated against 0.01M EDTA (Disodium Salt) solution by using EBT as an indicator. The EDTA of qualigens is used with 98% purity. This gives the total hardness of water.

6. **Alkalinity:** The alkalinity of water sample is determined by titrating it against standard acid solution using indicators like phenolphthalein and methyl orange.

7. **Chloride content:** The chloride content of water sample is determined by titrating the water sample against 0.02M silver nitrate solution using potassium chromate as an indicator.

8. **Sulphate content :**The sulphate content in the water sample is determined by using nephelometer.

CONCLUSION

In the current study, the groundwater samples showed deviations from water quality standards indicating groundwater contamination. The ground water sample from point S₃, S₅, S₉, S₁₅ showed high EC and TDS than the prescribed limits given by WHO standards indicating poor water quality and water from these sites is unfit for drinking purpose. The ground water samples from point S₁, S₂, S₄, S₆ to S₈ and S₁₀ to S₁₄ showed most of the parameters within the limits of water quality standards showing good water quality and the water from these sampling points is fit for drinking purpose.

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