



ASSESSMENT OF GROUND WATER QUALITY OF RURAL PARTS OF SIHOR, BHAVNAGAR DISTRICT, AND ITS IMPACT ON HUMAN HEALTH

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ABSTRACT

Assessment of ground water quality of rural parts of Sihor (Bhavnagar district). Its physico-chemical analysis such as temp., pH, EC, TDS, chloride, total alkalinity, calcium and magnesium hardness, sulphate of ground water was carried out from eleven sampling of rural parts of Sihor (Bhavnagar district) region are during Nov.-December 2015 in order to assess water quality Index.

Key words: Assessment , Physico-Chemical analysis , ground water, Sihor, Human health.

INTRODUCTION

Various physico-chemical parameters have a significant role in determining the water. As per World Health Organization (WHO), safe and wholesome drinking water is a basic need for human development.[1-3] Water is an excellent solvent for many

materials and is described as an universal solvents .It is the basic transport medium for nutrients and waste products in life processes. It also has the capacity to absorb heat without substantial rise in temperature. Because of this property there are no sudden charge in temperature, especially in large

water bodies. This protects aquatic organisms from instantaneous shock and also moderates the earth's climate. Water is most essential for existence of life on earth and is a major component for all forms of lives.[4-5] Here we report the Physico-chemical analysis of ground water of rural area of Sihor region. Here Sihor is located in Bhavnagar district of Gujarat State. Ground 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 ground water pollution. In order to assess water quality index, we have carried out the physico-chemical analysis of ground water.

EXPERIMENTAL

Analysis of water samples was done as per standard procedure. In the present study ground water samples from eleven different areas located in and around Sihor region were collected in Polythene bottles with necessary precautions.

Physico-chemical analysis

All the chemicals used were of AR grade. Double distilled water used for the preparation of reagents and solutions. [6-8] The major water quality parameters considered for the examination in this study are temperature, pH, TDS, EC, total

alkalinity, calcium and magnesium hardness, sulphate, chloride contents.

Temperature, TDS, pH were measured by Water analysis kit and manual methods. Calcium and Magnesium hardness of water was estimated by complexometric titration methods. Chloride contents were determined volumetrically by silver nitrate method using potassium chromate as indicator and was calculated in terms of mg/L. Sulphate contents were determined by Gravimetric method.

RESULTS AND DISCUSSION

The Physico-chemical data of the ground water samples collected in Nov.-Dec. 2015 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. All metabolic and physiological activities and life processes of aquatic organisms are generally influenced by water temperature.

Temperature

Temperature is one of the most essential parameter in water. The discharge of water used for cooling purposes in industries and power stations, into water bodies is another cause. This can increase the temperature of water increases. Temperature may also increase when tall

vegetation along the banks which give shade to the water body are cut. It has significant impact on growth and activity of ecological life and is greatly affects the solubility of oxygen in water. In the study temperature ranges from 26.9 °C to 29.8 °C.

pH

In polluted waters, pH is controlled by the balance between dissolved carbon dioxide, and the carbonate and bicarbonate ions. Natural waters usually have a pH between 6.0 and 8.5. Thus pH of a water body can change widely by the addition of industrial effluents and municipal sewage is from settlements including non points sources. Domestic sewage is generally alkaline while industrial wastes may be acidic or alkaline. Mine waters are usually acidic, with a pH that is less than 3 and released untreated into water bodies, can decrease the pH of these water body can indicate the presence of certain effluents, when it is continuously monitored. Most of water samples are slightly alkaline due to presence of bicarbonates and carbonates. pH below 6.5 starts corrosion in pipes. Resulting in release of toxic metals. The pH value observed 7.10 to 7.82, in this study, of water samples.

Electrical Conductivity (EC)

Electrical conductivity is the capacity of water to conduct electricity of water to

conduct electricity. Conductivity is an indirect measure of the salt concentration (Salinity). Greater the conductivity, greater is the amount of ions such as calcium (Ca^{+2}), magnesium (Mg^{+2}) in waters. Electrical Conductivity is a measure of water capacity to convey electric current. It signifies the amount of total dissolved salts. EC values were in the range of 1.02 milimhos/L to 3.290 milimhos/L.

Total Dissolved Solids (TDS)

Total dissolved solids indicate the salinity behavior of ground water. A large number of solids are found dissolved in natural water the common ones are carbonates, bicarbonates, chloride, sulphate, phosphate, iron, etc. There for TDS is sum of the cations and anions concentration. According to WHO and Indian Standards TDS values should be 500 mg/L for drinking water. In the present Study TDS ranged from 404 mg/L to 1050 mg/L.

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. Waters of low alkalinity, that is, those having a concentration lower than 24mg/l calcium carbonate (CaCO_3) have a low buffering

capacity and can therefore be susceptible or acid mine drainage. 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 from 40.0 to 240.0 mg/L.

Chloride

Chlorides are common constituents of all natural water. Higher value of it impacts a salty taste of water, making it unacceptable for human consumption. It is important for the determination of ground water quality near coastal areas since it can indicate salt water intrusion. The chloride contents in the samples was found between 46.0 to 289.9 mg/L. Natural water contains low chloride ions. As per ISI the tolerance range for chloride is 250 to 1000 mg/L.[9]

Calcium Hardness

Hardness of water increases due to industrial discharge of effluents containing salts of calcium and magnesium and also due to runoff of fertilizers from agricultural fields. The calcium hardness is ranging from 41.6 mg/L to 142.4 mg/L. The tolerance range for calcium hardness is 75 to 200 mg/L. Calcium contents

Magnesium Hardness

It helps in classifying water as soft and hard water which in turn helps in determining its

suitability for various purposes. From results shows Magnesium hardness was ranging from 11.0 to 60.0 mg/L. The tolerance range for magnesium is 50 to 100 mg/L.[10]

Sodium (Na⁺)

Sodium concentrations were found in between 53.0 mg/L to 297.5 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 water, in the present study, varied from 1.60 mg/L to 8.80 mg/L.

Sulphate

Sulphate contribute to the total solids content and are important. They impart a bitter taste and characteristic odour to water. Water containing high concentration of sulphate has a laxative effect which is enhanced when sulphate is consumed along with magnesium. Sulphates are expressed in mg/l or parts per million (ppm). Sulphate ranged from 148.1 to 337.5 mg/L. The tolerance range for sulphate is 200 to 400 mg/L. The high concentration of sulphate may induce diarrhea and intestinal disorders.[11]

Table No. 1 Physical Properties of Ground Water of Sihor Taluka Region

No.	Name of Village	Well/ Bore well	Depth in foot	Temp °C	TDS 1mg/L	EC milimhos/cm
1	Devgana	Well	60	26.9	780	1.920
2	Agiyali	Well	60	27.6	404	2.420
3	Tana	Bore Well	300	27.4	810	1.824
4	Jaliya	Well	200	29.8	790	1.025
5	Dhrupaka	Bore Well	900	28.3	740	2.390
6	Khambha	Bore Well	400	27.3	770	1.584
7	Sihor	Well	75	29.2	685	1.078
8	Bhadli	Bore Well	400	29.3	580	3.290
9	Kanad	Well	80	28.4	930	2.038
10	Jambala	Well	40	29.2	820	1.088
11	Boradi	Well	80	26.9	670	2.046

Table No. 2 Chemical Properties of Ground Water of Sihor Taluka Region

No.	Name of Village	pH	CO ₃ ⁻²	HCO ₃ ⁻²	Cl ⁻	Ca ⁺²	Mg ⁺²	Na ⁺	K ⁺	SO ₄ ⁻²
1	Devgana	7.48	0	292.0	251.9	142.4	40.8	185.30	4.85	238.7
2	Agiyali	7.41	0	240.0	289.9	93.6	60.0	152.30	4.37.	152.3
3	Tana	7.10	0	168.0	184.0	96.0	28.8	154.0	2.37	218.1
4	Jaliya	7.26	0	180.0	46.0	52.8	13.4	132.85	4.04	148.1
5	Dhrupaka	7.45	0	40.0	197.9	21.6	12.4	129.0	3.06	168.8

6	Khambha	7.36	0	124.0	167.9	48.8	20.2	84.50	2.50	230.5
7	Sihor	7.20	0	192.0	167.9	76.8	30.2	106.30	2.54	238.7
8	Bhadli	7.21	0	128.0	171.9	46.4	11.0	53.0	1.60	197.6
9	Kanad	7.29	0	152.0	231.8	91.2	35.0	297.50	8.80	296.3
10	Jambala	7.82	0	184.0	165.9	48.8	17.3	145.64	3.26	263.4
11	Boradi	7.48	0	220.0	189.9	41.6	15.4	195.30	8.62	337.5

Note: All parameters are in mg/L ,except pH ,EC and EC in miliomhos/cm.

Table 3: Analysis result of the sample

Sr. No.	Parameters	Standard (WHO)	Maximum allowable limit
1	Temp.	----	----
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

CONCLUSION

The important physico-chemical parameters of well/bore well water samples collected from 11 locations of rural areas of Sihor Taluka in Nov/Dec. 2015. This sample was taken in Nov-2015& Dec.-2015. It was observed that the pH ,EC, TDS, Total Alkalinity, Chloride, Total hardness and sulphate are normal for the water samples. Only very few samples showed values above the desirable limits India Standard Index.

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