© 2015 IJSRST | Volume 1 | Issue 4 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

Physico-Chemical Analysis of Ground Water Samples of Selected Villages of Mahesana Region of Gujarat State

D. N. Joshi
R. R. Mehta College of Science & C. L. Parikh College of Commerce Palanpur, Gujarat, India

ABSTRACT

The present work is aimed at assessing) for the ground water of Mahesana region. This has been determined by collecting ground water sample and subjective the samples to a comprehensive physico-chemical analysis. The following 9 parameters have been considered; pH, total hardness, calcium, magnesium, bicarbonate, chloride, carbonate, sodium, total dissolved solids. The results of analysis have been used to suggest models for predicting water quality. The analysis reveals that the groundwater of the area needs some degree of treatment before consumption.

Keywords: Groundwater, Water Quality Standards, Water Quality Index, India.

I. INTRODUCTION

Understanding the groundwater quality is important as it is the main factor determining its suitability purposes [1]. In developing countries like India around 80% of all diseases are directly related to poor drinking water quality and unhygienic conditions [2]. Water is extremely essential for survival of all living of all living organisms. The quality of water is vital concern for mankind since it is directly linked with human welfare. In India most of the population is dependent on groundwater as the only source of drinking water supply. The ground water is believed to be comparatively much clean and free from pollution than surface water. But prolonged discharge of industrial effluents, domestic sewage and solid waste dump caused the ground water to become polluted and created health problems. As the assessment of ground water quality has not been given due importance, water borne disease have become very common. About 80 percentages of the disease in the world are due to poor quality of water [3].

The problems of groundwater quality are much more acute in the areas which are densely Populated, thickly industrialized and have shallow groundwater tables. The rapid growth of urban areas has further affected groundwater quality due to overexploitation of resources and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of groundwater quality [4].

Much of the current concern with regards to environmental quality is focused on water because of its importance in maintaining the human health and health of the ecosystem. Fresh water is finite resource, essential for agriculture, industry and even human existence, without fresh water of adequate quantity and quality, sustainable development will not be possible [5]. Fresh water resource is becoming day-by-day at the faster rate of deterioration of the water quality is now a global problem [11].

Discharge of toxic chemicals, over pumping of aquifer and contamination of water bodies with substance that promote algae growth are some of the today's major cause for water quality degradation. Direct contamination of surface water with metals in discharges from mining, smelting and industrial manufacturing, is a long-standing phenomenon. Today there is trace contamination not only of surface water but also of groundwater bodies, which are susceptible to leaching from waste dumps, mine tailings and industrial production sites [6-7].

Electrical conductivity of water is a direct function of its total dissolve salts[8]. Hence it is an index to represent the total concentration of soluble salts in water[9]. The

permissible total dissolved salts for drinking water is 500mg/L. In the absence of potable water source the permissible limit is up to 2000 mg/L. High values of TDS in groundwater are generally not harmful to human beings but high concentration of these effect persons, who are suffering from kidney and heart disease[10]. Water containing high solids may cause laxative of constipation effects [11].

Our nation is an agro based country. Agriculture is very essential for economical development of the nation. Quality of irrigation water is directly related to crop production so farmers must have knowledge of quality of irrigation water which they use for irrigation purpose and must to know its effects on soil and crop growth.

Quality of irrigation water is one of the main factors to be understood in irrigation agriculture. All the water (well/Tube well water) used for irrigation purpose always contain soluble salts irrespective of their source, but total concentration and the kind of salts present in any irrigation water are important in deciding whether the water will be suitable for irrigation or not. The investigation in groundwater resources in any region in primarily concerned with its utility for irrigation. The quality of water is influenced by nature the rock. Minerals through which it passes, it may undergo changes due to ion exchange, dissolution of salts and hydrolysis of the material of the rocks as well as surface soils. The ground water resources are generally classified on the basis of total dissolved salts (TDS) as measured by electrical conductivity (EC), as well as the ratio to total Cations, ration of chloride to bicarbonate and the excess of bi-carbonate over calcium plus magnesium.

All irrigation waters that have been used successfully for a long period have a conductivity value less than 2250 micro mhos.per centimetre. High TDS ground water may be used for irrigation purpose, withsuitable condition and precautions, but under normal conditions they are harmful to be soil structure and their continuous use will result in salinity hazard, with ultimate effect on plant growth. Usually the surface water are relatively free from electrolytes but the ground water applied for irrigation, create some problems of either salinity and/or alkalinity in the soil due to use to dissolved salts. Salinity hazard which is associated with high soluble salts in water and measured in terms of Electrical conductivity (EC). The Alkali hazard is related to the development of alkalinity in the soil and is expressed as SAR(sodium adsorption ratio).Residual sodium carbonate (RSC) is an indirect expression of CO3-2 and HCO3-1 of sodium in ground water. Various workers have suggested the criteria of irrigation waters on the basis of analysis made (Richards 1954, Paliwal and Yadav 1976, Agers and Westcott 1976). Some important acceptable ratings are given below.

Parameter	Permissible	Moderately Safe	Moderately unsafe	Unsafe
RSC(Meq/L)	<1.25	---	1.25 to 2.50	>2.50
SAR	<10	10 to 18	18 to 26	>26
EC mmho/cm	0.0 to 0.75	0.25-0.75	0.75-2.25	>2.25

II. METHODS AND MATERIAL

The area under study lies between 23^0 29’ 53" N and 72^0 02’ 35" E.

In all about ten samples of ground water were examined for electrical conductivity, pH, TDS and the proportion of various cations and anions the chemical analysis was carried out following standard procedures. Chemical analysis of some typical samples is given in Table I and Table II presents different ration of judge the quality of these waters from irrigation viewpoints.

III. RESULTS AND DISCUSSION

As per results of chemical analysis, PH of most of the ground water samples is nearly7.81.All ground water samples may be classified as Very high EC value. As per RSC value 100% of the ground water samples may be classified as per permissible safe water. None of sample found as doubtful to unsafe (UN suitable) for irrigation purpose. As per Sar value Fourty percent ground water samples may be classified as per permissible safe water. As per Sar value Fifty percent ground water samples may be classified as per Moderately safe water. On the whole, the ground water of Hahesana region may be considered suitable for irrigation.

Table I: Chemical Properties of the Ground Water of Mahesana Region

S. No	Sample no	Location/ Village	Type (well /tube well)	Depth in foot. Tubewell	PH	EC	Total Dissolved Solids (PPM)	Categories (EC)
1	1	Lilapura	Tubewell	600	7.89	4.38	1580	**Very high**
2	2	Ratej	Tubewell	1000	7.87	2.87	1210	**Very high**
3	3	Asjol	Tubewell	1200	7.8	2.46	1180	**High**
4	4	Rajpura	Well	30	7.81	3.57	1480	**Very high**
5	5	Rantej	Tubewell	700	7.84	3.1	1230	**Very high**
6	6	Karansagar	Tubewell	750	7.88	3.99	1470	**Very high**
7	7	Saduthala	Tubewell	840	7.67	6.15	1970	**Very high**
8	8	Saduthala	Tubewell	900	7.76	3.53	1370	**Very high**
9	9	Pratapnagar	Tubewell	850	7.89	4.52	1630	**Very high**
10	**10**	**Devgath**	**Tubewell**	**900**	**7.75**	**4.83**	**1600**	**Very high**

Table II: Chemical Properties of the Ground Water of Mahesana Region

S. No	Sample No.	Millie equivalents per litre					
		$Ca^{+2}+Mg^{+}$ 2	Na^{+} 1	$_{K}+1$	CO_3^{-2}	HCO_3^{-2}	$_{Cl}-1$
1	1	11.7	30	0.004	0.6	7.7	30
2	2	11.2	17.5	0.007	0.2	5.1	20
3	3	8.5	17.5	0.008	0.2	4.5	24
4	4	9.5	33.5	0.016	0.6	9	24
5	5	11.9	17	0.008	0	7.3	22
6	6	14.3	23.75	0.007	0.2	5.3	26
7	7	17.1	47.5	0.005	0	9.7	44
8	8	9.6	47.5	0.005	0.4	7.4	24
9	9	12.8	29.35	0.005	0.2	6	32
10	10	14.9	32	0.004	0.4	9.6	30

Table III: Chemical Properties of the Ground Water of Mahesana Region

Sr. No.	Sample No	SAR	SAR Classification	RSC	RSC Classification
1	1	12.4	S_2	-3.4	Safe
2	2	7.4	S_1	-5.9	Safe
3	3	8.49	$^{S}1$	-3.8	Safe
4	4	15.4	S_2	0.1	Safe
5	5	6.97	S_1	-4.6	Safe
6	6	8.88	$^{S}1$	-8.8	Safe
7	7	16.2	S_2	-7.4	Safe
8	8	21.7	S_3	-1.8	Safe
9	9	11.6	$^{S}2$	-6.6	Safe
10	10	11.7	S_2	-4.9	Safe

IV. REFERENCES

[1]. T. Subramani, L. Elango & S. R. Damodarasamy., Environ. Geol., 2005; 47, 1099.

[2]. Olajire & Imeokparia., 2001., Prasad, 1984.

[3]. R. E. Raja, Lydia Sharmila, J. Princy Merlin & G. Chritopher., Indian J Environ Prot., 2002, 22(2), 137.

[4]. P. R. Patil, S. R. Badgujar & A. M. Warke., Oriental J Chem., 2001, 17 (2), 283.

[5]. N. Kumar., Ecol. Env & Cons., 1997, 3, 3.

[6]. H. B. Mahananda, M. R. Mahananda, & B. P. Mohanty., Ecol. Env & Cons., 2005, 11(3-4), 537.

[7]. P. D. Moore, Jr. T. C. Daniel, J. T. Gilmour, B. R. Shereve, D. R. Edward, & B. H. Wood., J. Env.Qual., 1998, 27, 92.

[8]. C. C. Harilal, A. Hashim, P. R. Arun & S. Baji & J. Ecology., Envirionmental and Conservation., 2004, 10(2), 187.

[9]. B. K. Purandara, N. Varadarajan & K. Jayashree., poll Res., 2003, 22(2), 189.

[10]. S. Gupta, A. Kumar, C. K. Ojha & G. Singh., J Environmental Science and Engineering., 2004, 46(1), 74.

[11]. N. Kumarswamy., J pllut Res., 1999, 10(1), 13.

[12]. APHA (American public Health Association) Standard methods for examination of water and waste water, NW, DC 1994, 20036.