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Physic-Chemical Properties of Ground Water in Selected Village of Kheralu Taluka, Gujarat, India

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

ABSTRACT

Study of the ground water quality in KeraluTaluka is an essential ingredient for a healthy population. In this study of drinking water samples for twenty water sources wells in the Kheralu field has been carried out. The purpose was to ascertain the quality of water from these sources. The samples were collected during the month of March-April, 2013 in clean polyethylenebottles. The physical properties such as PH, EC, TDS and TH,Cl^-, Na^+, K^+, Ca^{+2}, Mg^{+2}, F^-, $S0_4^{-2}$ and SAR have been measured using standard techniques.

Keywords: SAR (Sodium Adsorption Ratio), EC (Electric Conductivity), TH (Total Harness)

I. INTRODUCTION

Ground water is a valuable natural resource various human activities.1 The safe potable water is absolutely essential for healthy living. Water is important to the mechanics of the human body and the body cannot work without.Groundwater extraction for various purposes has made a major contribution to the improvement of social and economic life of the people. However, the development and unsystematic, unplanned and uncontrolled use of water resources resulted into imprudent exploitation of resources and have many undesirable and irreversible environmental consequences. Water is the elixir of life system and without it, life can not exist. The presence of safe and reliable drinking water is an essential pre-requisite for a stable community.2 During last decade, this is observed that the ground water gets polluted drastically because of Industrialization, population growth and some other different human activities are playing their roles in multiplying the level of underground water contamination.3-4 Consequently number of cases of water borne diseases have been seen, whichcauses health hazards.5-6 So, basic monitoring of water quality has become necessary to observe the demand and pollution levelof ground water.7 A good number of water analysis experiments are regularly conducted bydifferent groups of chemists and biologists all across the country.9-11

The natural water analysis for physical and chemical properties including traceelement contents is very important for public health. These studies form a main part ofpollution studies in the environment1, 2, 6-11. The determinations of these parameters indrinking water have been performed using classical analytical techniques includingtitrimetry, gravimetry and modern instrumental techniques.

The people of North Gujarat region have been facing potable water crisis due toinadequate rains. In Gujarat, ground water is considered as the first water source forirrigation and other uses. The climate of the Kheralu plain can be described as being hot, windy arid with humidity; air temperature is over 43°C in the period from May toSeptember. The aimof this study was to investigate the quality of the ground water. Samples were collected from the selected willege of Kheralutaluka wells. Chemical and physical characteristics were determined analytically.

In all, about 18 samples of water were examined for electrical conductivity, pH andthe proportion of various cations and anions. The chemical analysis was carried outfollowing standard procedures. Chemical analysis data of the water samples are given in Table

It presents different ratios to judge the quality of these water samples fromirrigation and drinking viewpoints. All thechemicals of AR grade were used. The estimated

physico-chemical parameters are- pH, Conductivity, Alkalinity, Hardness, Total Dissolved Solids, Fluoride, Sulphate, Calcium,Magnesium. For pH, Systronics micro pH system 361, for Conductivity Systronics Conductivity meter 306 were used.

II. METHODS AND MATERIAL

The ground water samples were collected from 18 bore wells in selected stations ofKheralutaluka. The samples were collected as per the standard methods recommendedby APHA (1995)[3] Before water sampling, all the double-stopper polythene containerswere cleaned and rinsed thoroughly with water samples to be analyzed. The physicochemical Analysis was done using the standard methods.

III. RESULTS AND DISCUSSION

The physical, chemical and bacteriological parameters exhibited considerablevariations from sample to sample. All the measurements were carried out in the vicinity oftemperature 300 C. The observations are summarized in the Table 1. The results are also analyzedgraphically (Figs. 1-10). Instead of plotting the values of parameters individually against thesamples, it was thought appropriate to plot some of the interrelated values together against the samples.

Based on the tabulated values and the figures, the following observations aremade. It is observed that the pH of the water was slightly alkaline (6.9 to 8.3) and onlyminor fluctuation in pH was recorded. The pH levels were within the limits set for domestic use as prescribed by APHA. Abnormal value of pH cases bitter taste to water affects mucous membrane causes corrosion and also affects aquatic life.

The WHO has suggested a limiting value of 500 mg/L of TDS for potable water. Inthe present investigation, this limit is crossed i.e. 432-1202 mg/L of the samples. However, in the sample No. 4 (sakary), the TDS value is about to reach the maximum permissiblelimit (1202 mg/L). The water of the remaining samples has reasonable values of TDS (480-500 mg/L). These values are acceptable for domestic use and agricultural purposes. high concentration of TDS may affect persons who are suffering from Kidney and heart disease.

The summation of calcium hardness and magnesium hardness is regarded as the totalhardness of water. In the present investigation, it has been observed that the calcium andmagnesium concentration of the samples has registered a high value of calcium magnesium hardness (3.7-8.1meq/L) (Tables 1 and 2). These minerals in water can cause some day-to-day problems, as they react with soap and produced a deposit called “soap curd.”

A significant presence of anions like chloride and sulfate was also observed in thewater samples under investigation. It has been reported that greater amount of sulfate in drinking water causes diarrhea. The chloride and sulfate amounts in the samples ranged from 2.2-16.4 meq/L and 38.9-210.0 mg/L, respectively. Here, it was observed that the sulfate Concentration in the samples fall well within the prescribed limit, but the chloride content ismuch higher than the permitted values of WHO13 and ISI.

The sodium and potassium ions were investigated in drinking water samples. Theirconcentrations were in the range of (3.48-14.28 meq/L) and (0.01-0.27meq/L) respectively. These results were within the permissible limits by WHO.14

The values of HCO3-in the water samples varied from 3.1to 9.1meq/L. Thelowest value of 3.1meq/L was observed in the water sample obtained from Lalawada, where as the highest value of 9.1meq/L was observed in Ambawada Village. All thesamples were far below the permissible limit of 120 meq/L.

Fluoride content of ground water samples of the study areas ranged from 0.14 to2.11 mg/L. Maximum allowable limit is 1.5 ppm (WHO, 1984).13 It is under permissiblelimit. Small concentration of fluoride in drinking water has some beneficial effect also onhuman body. Low concentration of fluoride below 0.5 ppm causes dental caries and higherconcentration beyond 1.5 ppm causes dental and skeletal fluorosis The suitability of the well and bore well water samples was judged by determining.

The SAR value and these were categorized under different irrigation classes on the basis ofsalinity and alkalinity hazards. Which affects the availability of the water to the crop. SAR is Na+/(Ca+2+Mg+2)1/2/2

Sodium adsorption ratio (SAR) was computed by usingvalues of water soluble cation (Table 1). The SAR values varied from 1.16 to 12.84 meq/L. The data revealed of the water samples of the taluka under study have low Values (< 10.0).

IV. CONCLUSION

i. The analytical data of TDS, chloride ion and sodium ion concentrations werein the permissible limit by WHO,
ii. The concentration of sulphate ion was higher than the permissible limitgiven by WHO and
iii. The concentration of fluoride ion was higher than the permissible limitgiven by WHO.

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