INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

Short Communication

CORRELATION OF PHYSICO-CHEMICAL ANALYSIS OF GROUND WATER OF JAIPUR CITY (RAJASTHAN, INDIA)

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ABSTRACT
Groundwater quality is a very sensitive issue, which transcends national boundaries. It is influenced by many factors, including atmospheric chemistry, the underlying geology, the vegetation (or organic matter decay) and anthropogenic agents. This study attempts to capture the environmental and socio-economic impacts of ground water in different locations in Jaipur city through primary surveys and secondary information. This paper examines cases which reflect different causes of sea and river pollution, the seriousness of this pollution, the effect of this pollution on trade, and a possible global solution to this problem. Detailed survey by random sampling method was conducted to determine the physicochemical characteristics of ground water of Jaipur City. A Total of 39 samples were collected from different villages and were analyzed for different physico-chemical parameters such as pH, electrical conductivity, total dissolved solid (TDS), alkalinity, chloride, total hardness, calcium hardness, magnesium hardness and fluoride. pH value in the study area were found from 7.0 to 8.54. Electrical conductivity (EC) ranged from 620 to 2002µmho/cm and total dissolved solids between143 to 1383 mg/L. Calcium hardness ranged from 16.40 to 290 mg/L and alkalinity from 117 to 410 mg/L.Total hardness (TH) varied from 92 to 495 mg/L and magnesium from 2.65 to 57.12 mg/ L. Chloride varied from 28.46 to 146.28 mg/L and fluoride from 0.16 to 2.18 mg/L. Most of the parameters were exceeding the permissible limit.

KEY WORDS: - Quality, Groundwater, Socio-economic impact, physico-chemical parameters

INTRODUCTION

In present scenario, Water plays very important role for survival of the life and development of nations. Certain problems have beset the use of groundwater around the world. Over the few decades, competition for economic development, associated with rapid growth in population and urbanization, has brought in significant changes in land use, resulting in more demand of water for agriculture and domestic activities. Due to inadequate availability of surface water, to meet the requirement of human activities, groundwater remains the only option to supplement the ever-increasing demand of water. Groundwater is the primary source of water for domestic, agricultural and industrial uses in many countries, and its contamination has been recognized as one of the most serious problems in India. Water of groundwater, from pollutants released to the ground that can work their way down into groundwater, can create a contaminant plume within an aquifer. Movement of water and dispersion within the aquifer spreads the pollutant over a wider area, its advancing boundary often called a plume edge, which can then intersect with groundwater wells or daylight into surface water such as seeps and springs, making the water supplies unsafe for humans and wildlife. The interaction of groundwater contamination with surface waters is analyzed by use of models'. Srinivas *et al*. (2000) and Jha and Verma (2000) have reported the degradation of water quality in Hyderabad and Bihar, respectively. Untreated industrial waste effluents when discharged in unlined drains can percolate underground directly affecting the quality of groundwater. Abbasi *et al*. (2002) have studied the impacts of wastewater inputs on the water quality. Jagdap *et al*. (2002) classify the water in order to assess the water quality for various purposes. Fluoride levels in drinking water from various sources in and around Jaipur and many villages and trace metals have been carried out in our laboratory (Jangir *et al*. 1990) earlier. Study of industrial wastewater, ground water and pollution problems in ground water have also been studied in our laboratory (Singh and Chandel 2006) recently. The Study area Jaipur is the headquarters of the Jaipur district which is situated in the eastern part of Rajasthan. It is located at 26°55′N 75°49′E / 26.92°N 75.82°E / 26.92; 75.82. It has an average elevation of 431 meters (1417 ft).The major rivers passing through the Jaipur district are Banas and Banganga.

MATERIALS AND METHODS

The detailed survey by random sampling method was conducted to determine the physic- chemical characteristics of ground water. Water samples were collected from different villages in clean plastic bottle from different sources viz. tube well, hand pumps, open well.

Water analysis- Samples were analyzed for various parameters such as pH, total dissolve solid (TDS), conductivity, alkalinity, chloride, total hardness, calcium hardness, magnesium hardness and fluoride. And Fluoride concentrations in water samples were analyzed with the

help of Orion Research Ion Analyzer Model 407 A, using fluoride ion selective electrode.

RESULTS AND DISCUSSION

The pH values in the ground water of metropolitan city of Jaipur are mostly confined within the range 7.0 to 8.54. The pH values for most of the samples are within the limits prescribed by BIS (1991) and WHO (1993) for various uses of water including drinking and other domestic supplies. The measurement of electrical conductivity is directly related to the concentration of ionized substance in water and may also be related to problems of excessive hardness and / or other mineral contamination.

The Electrical conductivity (EC) values in the ground water samples of the metropolitan city varied widely from 620 to 2002μS/cm. The maximum conductivity value of 2002μS/cm was observed at Durgapura. In natural waters, dissolved solids consists mainly of inorganic salts such as carbonates, bicarbonates, chlorides, sulphates, phosphates and nitrates of calcium, magnesium, sodium, potassium, iron etc. and small amount of organic matter and dissolved gases.

In the present study the values of total dissolved solids (TDS) in the ground water varied from 400 to 1383 mg/L indicating high mineralization in the area. More than 50% of the samples were found above the desirable limit. Similar results were reported by Belkhiri *et al*., 2010. TDS is not considered desirable for drinking water supplies, though more highly mineralized water is also used where better water is not available. For this reason, 500 mg/L as the desirable limit and 2000 mg/L as the maximum permissible limit has been suggested for drinking water (BIS, 1991). Water containing TDS more than 500 mg/L causes gastrointestinal irritation (BIS, 1991).The presence of carbonates, bicarbonates and hydroxides are the main cause of alkalinity in natural waters. Bicarbonates represent the major form since they are formed in considerable amount from the action of carbonates upon the basic materials in the soil.

In the study area fluoride content ranged from 0.16 ppm to 2.18ppm. The alkalinity value in the ground water varied from 117 to 410 mg/L. About 36% of the samples exceeded the desirable limit of 200 mg/L. The high alkalinity values at few locations may be due to the action of carbonates upon the basic materials in the soil. Calcium and magnesium along with their carbonates, sulphates and chlorides make the water hard. A limit of 300 mg/L as desirable limit and 600 mg/L as permissible limit has been recommended for drinking water (BIS, 1991). The total hardness values in thestudy area ranged from 92 to 495 mg/L .About 48% of the samples of the metropolitan city of Jaipur fall within the desirable limit of 300 mg/L while 28% sample crosses the desirable limit but is well within the permissible limit of 600 mg/L and 24% sample even crosses the permissible limit of 600 mg/L.

The desirable limit for calcium and magnesium for drinking water are 75 and3 0 mg/L respectively (BIS, 1991). In the study area the values of calcium and magnesium ranged from 16.40 to 290 mg/L and 2.65 to 57.12 mg/L respectively.In ground water, the calcium content generally exceeded the magnesium content in accordance with their relative abundance in rocks. The concentration of chloride varied from 28.46 to 146.28 mg/L. The limits of chloride have been laid down primarily from taste considerations. A limit of 250 mg/L chloride has been recommended as desirable limit and 1000 mg/L as the permissible limit for drinking water (BIS, 1991; WHO, 1993). However, no adverse health effects on humans have been reported from intake of waters containing even higher content of chloride. In the metropolitan city of Jaipur, all the samples analyzed were found within the desirable limit of 200mg/L.

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