Correlation of Physico-Chemical Analysis of Ground Water of Manendragarh Area (Hasdeo basin), Chhattisgarh, India

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***Abstract*--**Manendragarh city is developing rapidly due to coal fields since 6 decades. It is considered as one of big area of Korea District, Chhattisgarh, India. The present study was carried out with a view to have an understanding about the water status of Manendragarh area, particularly water quality in vicinity of some colliery. Environmental studies were carried out on ground and surface water to find out the physico-chemical parameters like pH, alkalinity, Total hardness,iron, chlorides, dissolved solid, calcium, nitrate, fluoride, sulphate and DO. Ten samples were collected from different sites, in order to evaluate the drinking water quality in and around this area. The analysis of various parameters using standard methods (APHA/NEERI) and their comparison with WHO standard values, suggested that most of the parameters were within permissible limit given by Bureau of Indian standards (BIS). Concentration of parameters beyond the limits in some stations could be reduced and could be an invaluable source for domestic purposes in the region. The present paper accounts water quality of various sites situated in Manendragarh area and their efficiencies respectively.

Keyword: *Surface water, Ground water, Physico-Chemical Parameters, APHA.*

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INTRODUCTION

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.

SITE DISCRIPTION

Manendragarh is a municipal city of the Korea district that is a part of the state of Chhattisgarh. It is located at $23^0$1922'N , $82^0$2003' E. The city housing the taluk headquarters is sited near the Koriya- Madhya Pradesh border.

Region of Manendragarh has vast reserves of high grade coal. The main coal belts are in the Hasdeo basin. There are small deposits of limestone, fire clay and red oxide in Manendragarh.

Gopad is the major tribute of Son and originates about 10 miles north of Mendra village. It drains the northern portion of district. Hasdeo a major tributary of Mahanadi has its origin in Mendra village. Manendragarh City is situated beside Hasdeo river.

MATERIALS AND METHODS

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

Water analysis- Samples were analyzed for various parameters such as *pH, alkalinity, Total hardness, iron, chlorides, dissolved solid, calcium, nitrate, fluoride, sulphate and DO.*

RESULTS AND DISCUSSION

The pH values in the ground water of Manendragarh area are mostly confined within the range 7.43 to 8.24. 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 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. Alkalinity of the samples are varied between 12 to 24 mg/l which are within the permissible limit.

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 the study area ranged from 196 to 380 mg/L . Seven sample were found within the permissible limit while three samples limit were slightly higher than permissible limit.

Iron content from all samples was found below the detection limit.

The concentration of chloride varied from 22 to 46 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 Manendragarh area, all the samples analyzed were found within the desirable limit.

In the present study the values of total dissolved solids (TDS) in water samples varied from 336 to734 mg/L. 6 samples were found within the desirable limit where as 4 samples were found more than desirable limit. 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 desirable limit for calcium for drinking water is 75 mg/L respectively (BIS,1991). In the study area the values of calcium ranged from 43.2 to 107.2 mg/l. In ground water, the calcium content generally exceeded the magnesium content in accordance with their relative abundance in rocks.

In the study area Nitrate, Fluoride, Sulphate content ranged from 1.32 to 8.41ppm , 0.21 to 0.57 ppm and 42 to 118 ppm respectively. All the samples were found within the permissible limit.

Dissolved oxygen is the assessment of purity of water. D.O. content for the samples was ranged between 5.8 to 6.2 ppm. All the samples were within the permissible limit,

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