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Physico-Chemical Quality Assessment of Ground Water at Agra District

Abhinav Krishna Singh
Environmental Engineering, Bundelkhand Institute of Engineering and Technology, Uttar Pradesh, India

ABSTRACT

Ground water is contaminated due to various human and industrial activities. This is a serious problem. So the analysis of water quality is very important to preserve the eco system. The assessment of the ground water quality was carried out in the different area of Agra city for the evaluation of the current status of physico-chemical contaminants and their sources in groundwater. Groundwater samples were obtained from fifteen different sampling stations in Agra city. The results were compared with standards prescribed by CPCB and BIS. Different parameters were analyzed that are pH, alkalinity, turbidity, TDS, total hardness and chlorides. The sampling sites showed that the physicochemical parameters were within the water quality standards and the quality of water was found to be fit for drinking purposes.

Keywords : Quality assessment, physico-chemical paramenters of ground water Quality

I. INTRODUCTION

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life (S.P. Gorde et al., 2013). Groundwater is used for domestic and industrial water supply and also for irrigation purposes in all over the world. Discharge of urban, industrial and agricultural wastes have increased the quantum of various chemicals that enter the receiving water, which considerably alter their physico-chemical characteristics. Advancement in technology has boosted the human population and also enhanced wateruse and simultaneously put burden on the existing water bodies to fulfill the industrial, agricultural and domestic use of water; which is said to be unending process of development (Agarwal et al., 2012). According to WHO organization, about 80% of all the diseases in human beings are caused by water (Kavitha R et al., 2010).

Groundwater is generally considered safe for drinking purposes. Groundwater is also used for irrigation and industrial purposes. In many regions ground water sources are the single largest supply for serving drinking water to the community. Moreover, for many communities it may be the only economically viable option for drinking. Thus the availability of clean ground water is most essential, as it serves as the basic and critical component in different spheres of human life for a large number of habitations (Tewari et al., 2010). In the last few decades, there has been a tremendous increase in the demand for fresh water due to rapid growth of population and the accelerated pace of industrialization. A variety of land and water-based human activities are causing pollution of this precious resource. Its over-exploitation is causing aquifer contamination in certain instances (Tewari et al., 2010).

The growing urbanization and industrialization and the consequent pollution of surface water sources, also increased the necessity of using groundwater for various domestic and industrial purposes (Abbulu and Rao, 2013). With this background, the present study was initiated to determine the concentration of contamination and the suitability of groundwater for drinking purpose. The present investigation deals with the study of physico-chemical parameters like temperature, pH, total hardness, total dissolved solids, chlorides, turbidity and alkalinity.

II. STUDY AREA

Agra is a city on the banks of the river Yamuna in the northern state of Uttar Pradesh, India. It is 378 kilometres west of the state capital, Lucknow, 206 kilometres south of the national capital New Delhi. In geographical terms, the exact location of the city of Agra is 27.10° north and 78.05° east. The city is located at an average altitude of 171 meters or 561 feet above the sea level. Agra features a semiarid climate that borders on a humid subtropical climate. The city features mild winters, hot and dry summers and a monsoon season. However the monsoons, though substantial in Agra, are not quite as heavy as the monsoon in other parts of India. This is a primary factor in Agra featuring a semiarid climate as opposed to a humid subtropical climate.

III. MATERIALS AND METHODS

A total of fifteen water samples were collected from different locations (Khandari, Dayal Bagh, Kamla Nagar, Rambagh, Kendriya Hindi Sansthan, Holy Public School, Sanjay Place, Sikandra, Sadar Bazar, Astha City Centre, Shilpgram, Lohamandi, Bichpuri, Asopa Hospital, and Anand Engineering College) in Agra, UP, India. All the samples were collected in sterilized bottles and were stored at 4°C till further investigation. The collected water samples were analyzed for various physico-chemical parameters.
The procedure for analysis was followed as per standard methods of analysis of water and wastewater. The parameters analyzed were temperature, pH, hardness, total dissolved solids (TDS), turbidity, alkalinity and chlorides. All the chemicals and reagents used for the study were of analytical grade and instruments were of limit of precise accuracy.

IV. RESULTS AND DISCUSSION

1. pH

pH of solution is taken as –ive logarithm of H2 ions for many practical practices. Value range of pH from 7 t0 14 is alkaline, from 0 to 7 is acidic and 7 is neutral. Mainly drinking water pH lies from 4.4 to 8.5. The pH scale commonly ranges from 0 to 14.
In the present study all the samples have pH values were between 6.5- 7.8 and were within the prescribed limits.

2. Total dissolved solids

Difference of total solids and suspended solids is used to determine the filterable solids by the help of filtrate and following the procedure as above. In water sample it can also be estimated from conductivity measurement. The acceptable and permissible limits As per IS: 10500-2012 is 500 and 2000 mg/l respectively.

The total dissolved solids (TDS) observed in the study area is found to be between 743- 1894 mg/L. Generally, the higher TDS causes gastro-intestinal irritation to the human beings, but the prolonged intake of water with the higher TDS can cause kidney stones and heart diseases (Garg et al., 2009).

3. Total Hardness

As per IS: 10500-2012 Desirable limit and Permissible limit for hardness is lies between 200 to 600 mg/l respectively. Hardness is the property of water which prevents the lather formation with soap and increases the boiling points of water15. The total hardness is an important parameter of water quality assessment and conveys if the water can be used for domestic, industrial or agricultural purposes.

The hardness is caused due to the presence of excess of Ca, Mg and Fe salts (Kumar and Kumar, 2013). The maximum total hardness value was observed as 547mg/L and minimum was 323 mg/L in the study area.

4. Turbidity

Suspension of particles in water interfering with passage of light is called turbidity. Turbidity is caused by wide variety of Suspended particles. The turbidity in the present area of study was found to be between 6- 9 NTU. It was well within the prescribed standards of 5- 10 NTU.

5. Total Alkalinity

Alkalinity value in water indicates the presence of natural salts in water. The alkalinity is mainly due to the bicarbonates. In the present study the alkalinity ranged from 245 - 627 mg/L. The alkalinity values are under the reasonable limit of 200- 600 mg/L as per WHO standards (1993).

6. Chloride

All type of natural and raw water contains chlorides. It comes from activities carried out in agricultural area, Industrial activities and from chloride stones. Its concentration is high because of human activities. As per IS: 10500-2012 Desirable limit for chloride is 250 and 1000 mg/l in Permissible limit.

Chloride content of the ground water samples obtained from the study area was found to be in the range of 275- 986 mg/L.

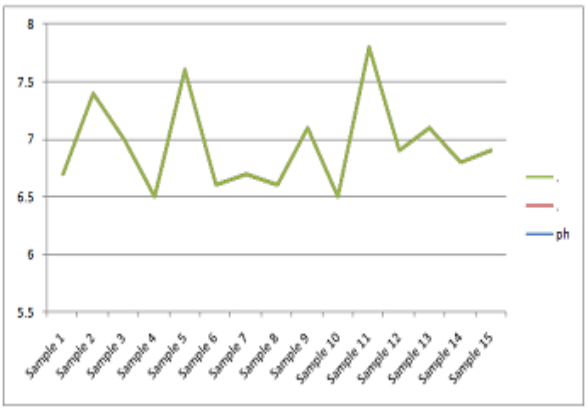

Figure 1: Variation of pH

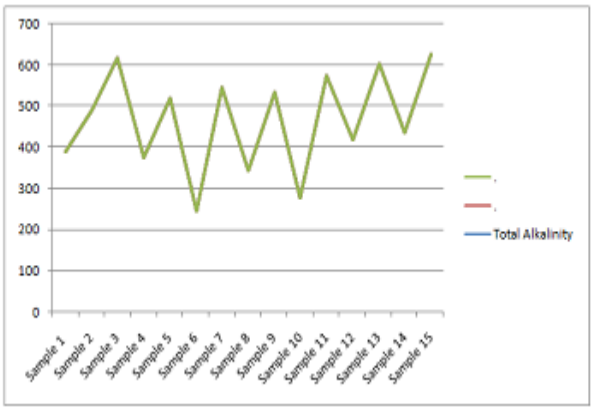

Figure 2: Variation of Total Alkalinity

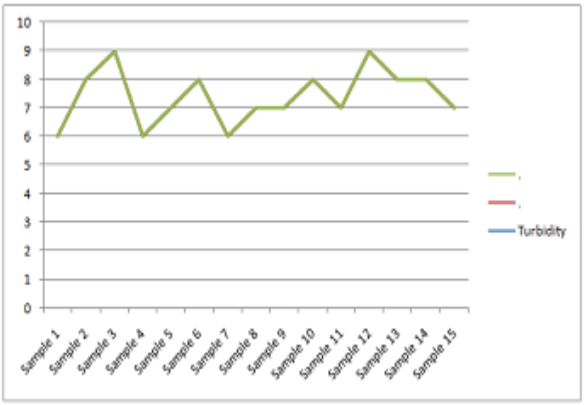

Figure 3: Variation of Turbidity

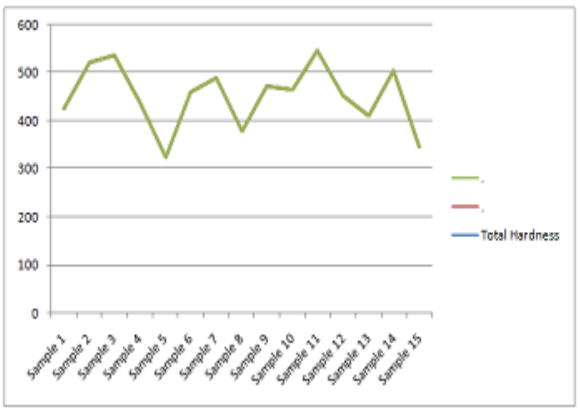

Figure 4: Variation of Total Hardness

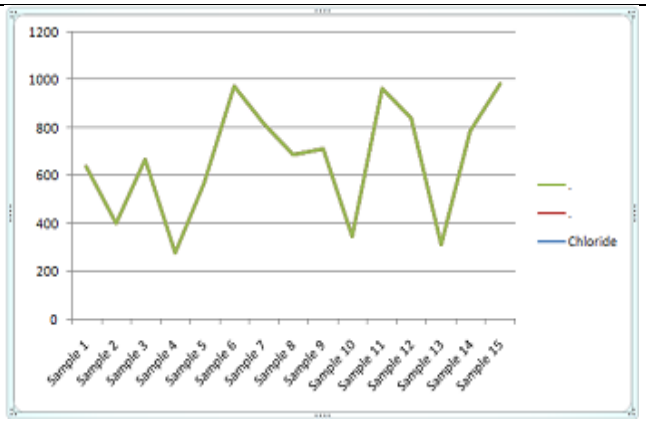

Figure 5: Variation of Chloride

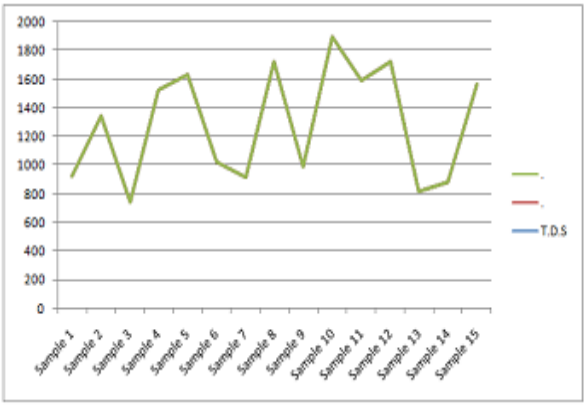

Figure 6: Variation of T.D.S.

V. CONCLUSIONS

The groundwater quality analysis of Agra city is found to be fit for drinking purposes. The different values of the parameters under consideration were found to be- 6.94 for pH, 466.86 mg/L for total alkalinity, 7.4 NTU for turbidity, 451mg/L for total hardness, 6658mg/L for chlorides and 1286 mg/L for total dissolved solids. All the parameters were found to lie well within the prescribed standard limits.

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