International Journal of Basic and Applied Chemical Sciences ISSN: 2277-2073 (Online)
An Open Access, Online International Journal Available at http://www.cibtech.org/jcs.htm
2014 Vol. 4 (3) July-September, pp.1-4/Ashfaq and Ahmed
Review Article

DRINKING WATER QUALITY ASSESSMENT: A CASE OF STUDY

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ABSTRACT
A water quality analysis was carried out to evaluate the physico–chemical characteristics of ground water samples of Moradabad city. The city was divided into different zones and water samples were collected from different locations in these zones. An analysis of parameters such as pH, total hardness, total alkalinity, chlorides, turbidity and total dissolved solids was conducted. The study indicates that there is a need for regular monitoring of ground water in the study area.

INTRODUCTION
Ground water is ultimate, most suitable fresh water resource with nearly balanced concentration of the salts for human consumption. Over burden of the population pressure, unplanned urbanization, unrestricted exploration policies and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the ground water (Pandey and Tewari, 2008). As groundwater is used in high extent, some troubles are created such as water logging, land subsidence, lowering of water table, sea water intrusion in coastal aquifers and deterioration in water quality **(**Mehta, 2011). Groundwater is a very sensitive topic which has significance not only at local level, but at global level also (Konstantopoulou *et al.*, 2011). Similar to other countries, issue of groundwater has become an issue of importance for the progress of India (Meena and Bhargava, 2012). Waste materials from the factories percolate with rain water and reach aquifer resulting in erosion of ground water quality. The addition of various kinds of pollutants and nutrients through the agency sewage, industrial effluents, agricultural runoff etc. in to the water bodies brings about a series of changes in the physicochemical characteristics of water, which have been the subject of several investigations (Mahananda *et al.*, 2010; Rao *et al.*, 2013). The present study deals with the physico-chemical characteristics of water which taken from different locations in Moradabad district. The quality of water was checked by the determination of physico-chemical parameters such as pH, TDS, Total Hardness, Cl^-, turbidity and alkalinity.

Study Area

Moradabad district forms a part of Gangetic alluvial plain and lies between $28^0$20’ and $29^0$16’ North latitudes and $78^0$24’ and $79^0$0’ East longitude covering an area of 3759.79 sq.km. It is bound by Bijnor and Nainital district in East, by Rampur district in South, by Budaun district in North and in West by Jyotiba Phule Nagar district. The district is administratively divided into 6 tehsils and is further divided into 12 development blocks. The district of Moradabad lies east of the Ganges and west of the native state of Rampur.

The district Moradabad is drained by river Ramganga and its tributaries namely Dhela Nadi, Koshi Nadi, Gangan Nadi, Aril Nadi and Sot Nadi. It lies within the great Gangetic plain and is demarcated into three subdivisions by the rivers Ramganga and Sot. The eastern tract consists of a submontane country, with an elevation slightly greater than the plain below, and is traversed by numerous streams descending from the Himalayas. The central portion consists of a level central plain descending at each end into the valleys of the Ramganga and Sot. The western section has a gentle slope towards the Ganges, with a rapid dip into the lowlands a few miles from the bank of the great river. (MSME, Govt. of India) The average annual rainfall is 967.3 mm.

The climate is sub-humid and it is characterized by hot summer, a bracing cold season and general dryness except in the south-west monsoon season. About 86% of rainfall takes place from June to September. During monsoon surplus water is available for deep percolation to ground water.

MATERIALS AND METHODS

In order to study the ground water quality of the study area a total number of fifteen samples of ground water were collected and analyzed for physico-chemical parameters including pH, turbidity, alkalinity, TDS, total hardness and chlorides. The samples were obtained from Ashiyana Colony, Himgiri Colony, Ramganga Vihar, Naveen Nagar, Jigar Colony, Adarsh Colony, Kashiram Nagar, Civil Lines, Faiz Ganj, Mansarovar Colony, Faiz Ganj, Lajpat Nagar, Shivpuri, Tilokpur, Harthala. All physico-chemical parameters were analyzed according to the standard methods for water and waste water examination provided by BIS.

RESULTS AND DISCUSSION

pH

The pH indicates the acidity or alkalinity of the water. The pH of groundwater samples in the area under observation ranges from 6.1- 8.5. The groundwater of this area is generally alkaline in nature because carbonate and bicarbonate ions are present in it. The standard values for the pH as per the WHO is 6.5- 8.5. Hence the observed pH falls within the standard range.

TDS

High TDS value indicates the highly mineralized form of water. Desirable limit for TDS is 500 mg/L and maximum limit is 2000 mg/L that has been prescribed for drinking purposes. The concentration of TDS in present study is observed in the range of 920 mg/L to 1970 mg/L.

Turbidity

The values of turbidity in the present study are found to lie in between 5- 9 NTU. The standard values are between 5- 10 NTU, therefore the values of the present study are found to lie within the permissible limits.

Total Alkalinity

The total Alkalinity was found to be in the range of 295-640 mg/L in ground water samples that are shown in table. They are found to be within the standard values of 200- 600 mg/L on comparison.

Total Hardness

In this study, total hardness of all samples was found to be within the permissible limit of 300- 600 mg/L. From the graphs it is seen that the minimum and maximum values recorded were 320 and 546 mg/L.

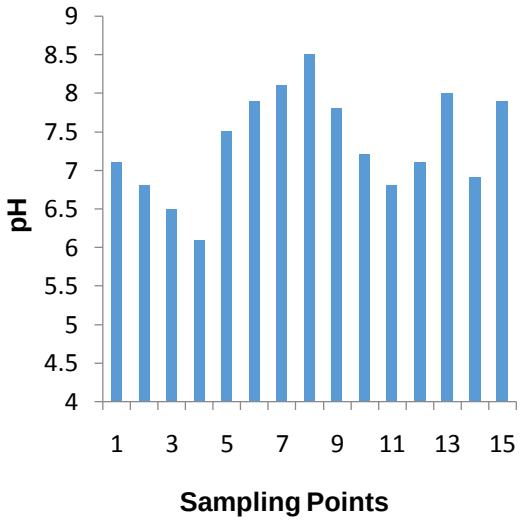

Figure 1: Variation of pH

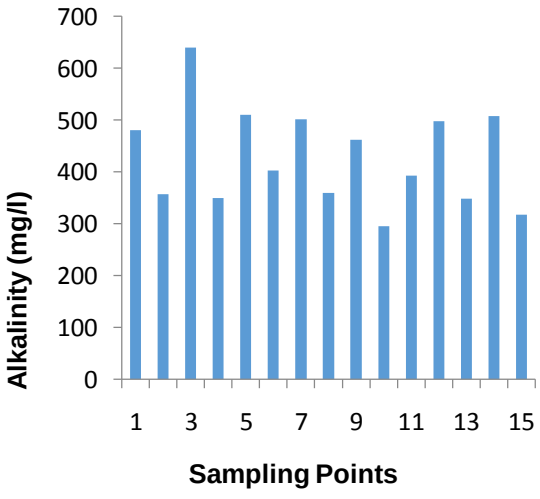

Figure 2: Variation of Alkalinity

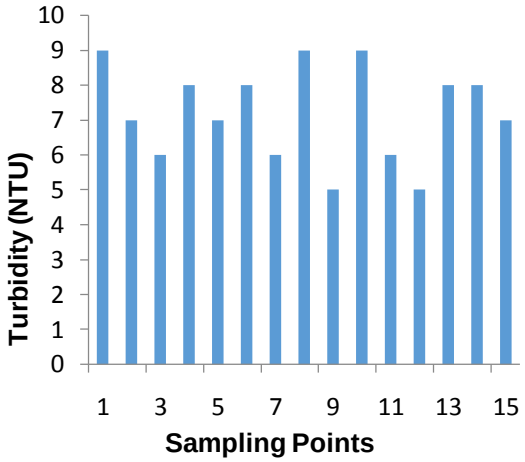

Figure 3: Variation of Turbidity

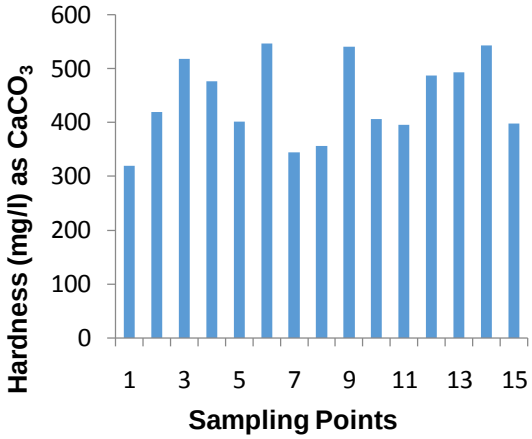

Figure 4: Variation of Hardness

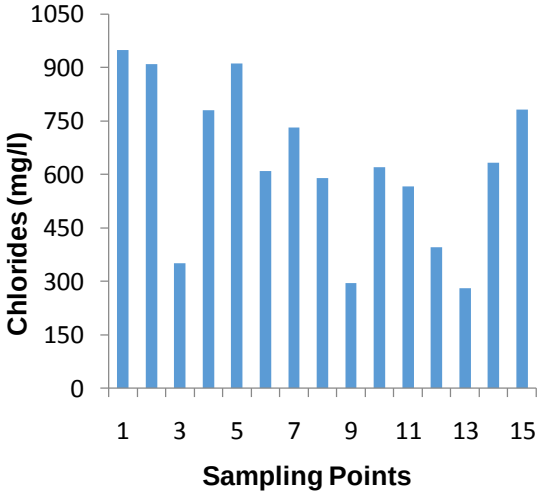

Figure 5: Variation of Chlorides

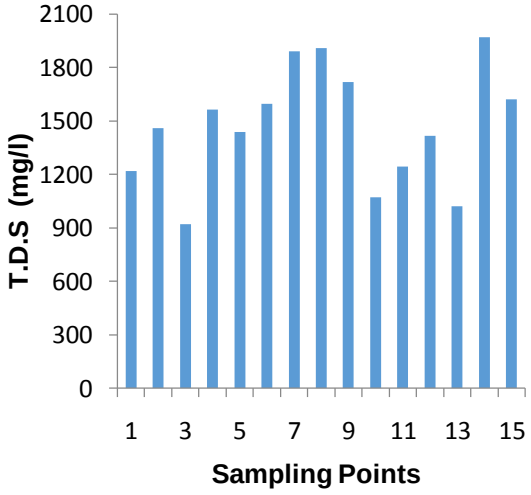

Figure 6: Variation of T.D.S

Chloride

In the present study area the chloride level is within the permissible limit of WHO (250- 1000 ppm) that indicates less contamination by chloride. The range of chloride was found to be in between 280-950 mg/L for the area under study.

Conclusion

The groundwater samples of Moradabad city were collected from the defined locations and were analyzed for various physico-chemical parameters. The results of the above study show that most of the physico-chemical parameters are well within the acceptable limits. The observed results confirm that the ground water quality is almost in the normal range. Even though the present condition is not very bad but if the contamination continues in future, the ground water source will be seriously polluted and will become completely unfit for portability and other purposes.

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