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Evaluation of Ground Water Quality of Aligarh city, India

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A B S T R A C T

The physico-chemical characteristics of the drinking water were determined in the present study for different locations in the Aligarh city, U.P., India. About 15 water samples were collected from different locations in and around Aligarh city. The parameters selected for the study were pH, total hardness, total dissolved solids, chlorides, turbidity and alkalinity.

Introduction

Water plays an essential role in human life. Although statistics, the WHO reports that approximately 36% of urban and 65% of rural Indian were without access to safe drinking water (Sexenal and Mishra, 2011). It is even more important for the human being as they depend upon it for food production, industrial and waste disposal, as well as cultural requirement (Kalra et al., 2012). According to WHO organization, about 80% of all the diseases in human beings are caused by water (Rao et al., 2013). Ground water is ultimate and most suitable fresh water resource for human consumption in both urban as well as rural areas. The importance of ground water for existence of human society cannot be overemphasized. There are several states in India where more than 90% population is

dependent on groundwater for drinking and other purposes (Ramachandraiah, 2004). Ground water is also frequently used as the alternative source for agricultural and industrial sector (Reza and Singh, 2009).

The groundwater chemistry is controlled by the composition of its recharge components as well as by geological and hydrological variations within the aquifer. Many a time ground water carries higher mineral contents than surface water, because there is slow circulation and longer period of contact with sediment materials in case of groundwater (Shahnawaz and Singh, 2009). The problems of groundwater quality are much more acute in the areas which are densely populated, thickly industrialized and have shallow groundwater tables (Patil and Patil,

2010). The rapid growth of urban areas has further affected groundwater quality due to overexploitation of resources and improper waste disposal practices. Hence, there is always a need for and concern over the protection and management of groundwater quality (Patil et al., 2001). Thus, in this paper an attempt has been made to assess the physical and chemical properties of groundwater.

Study Area

Aligarh district is a part of central Ganga plain of the state covering an area of 5498 square kilometer and lies between North latitudes 27°28' and 28°10' and East longitudes 77°29' and 78°36'. The district is bound by river Ganga in the west and the river Yamuna in the east. The entire district falling in Upper Ganga Doab represents flat topography. Aligarh experiences the tropical monsoon type of climate with marked North-East and South-West monsoons. The year can be broadly divided into: Winter season (December to January), Post-winter (February to March). Summer season (April to June), Monsoon season i.e. season of general rains (July to September), Post-monsoon season (October to November). (ShodhGanga)

By & large three tier aquifer system has been demarcated in the district occurring down to bed rock.

I Aquifer Group 00.00 - 130.00 mbgl – Quality fresh.

II Aquifer Group 100.00 - 150.00 mbgl – Quality Brackish to saline.

III Aquifer Group 130.00 – 300.00 mbgl – Quality Brackish to Saline.

Ground water occurs under water table conditions in the upper zones of first aquifer group while in deeper aquifers it is under

semi confined to confined conditions. Depth to water level in the area generally varies from 2.57 to 21.00 m.bgl during pre monsoon period & during post monsoon period it ranges between 0.13 m & 16.73 mbgl. Water level rests generally at shallow depth along the main canals and their distributaries. The range of water level fluctuation between pre and post monsoon period is between 0.32 and 7.24 metres. In general a seasonal fluctuation of 2 meters can be seen over the entire district. (CGWB). Average annual rainfall is 662 mm and the temperature ranges from 4°C to 47°C. The average relative humidity ranges from 32% to 82%.

Materials and methods

During the study, sampling was carried out at Upperfort, Rasalganj, Near katpula, Banna Devi, Baraula Bye Pass, Maruti Suzuki G.T. Road, Dubey ka Padao, Charra Adda, Sootmill, Masoodabad Bus Stand, Shri Varshney College, Tiger Farm, B. R. Ambedkar Hall (A.M.U. farm). For sampling plastic bottles were used. Before sampling, bottle were soaked in HCl and rinsed with double distilled water. Necks of the bottle were tightly sealed. For sampling, the bottles were rinsed 2 to 3 times for the sample to be examined then after samples were collected from different sites. All samples are collected from hand pump which are used for drinking water, situated in different sites of study area. The complete information was recorded about the source and the condition under which the samples were collected.

Results and discussion

pH

The pH indicates the acidic or alkaline content of water. The pH of groundwater

samples in our study area ranges from 5.2-7.22. It is well within the standard limits of 6.5- 8.5. The groundwater is usually alkaline in nature due to presence of carbonates and bicarbonates ions. If pH is not within the permissible limit, it causes damage to the mucous membrane present in nose, mouth, eye abdomen, anus in human beings (Ramesh and Soorya, 2012).

T.D.S

The total dissolved solids (TDS) values of sampling area are found to be within the permissible limits of WHO (500- 2000 mg/L). The graphical representation shows the TDS values of the studies were between 620- 1970 mg/L.

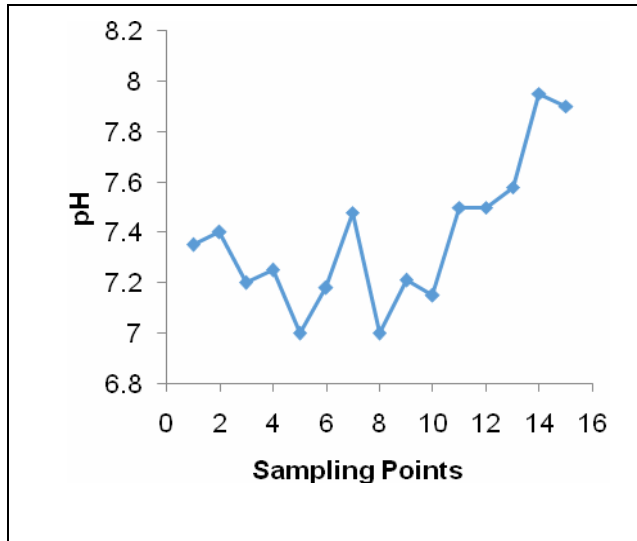


Fig 1: Variation of pH

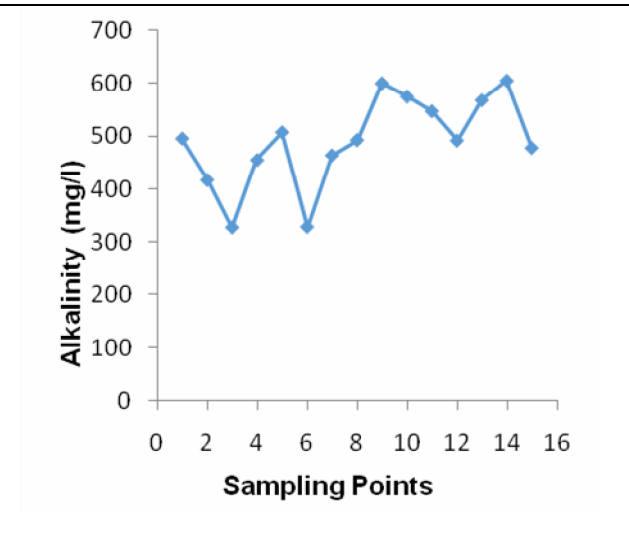


Fig 2: Variation of Alkalinity

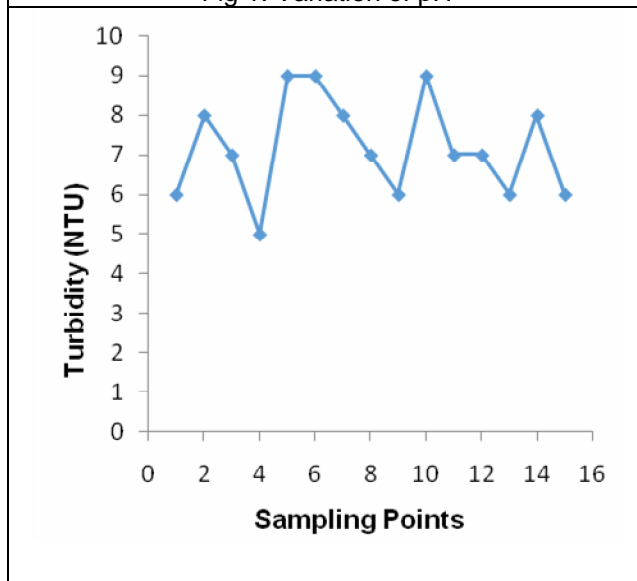


Fig 3: Variation of Turbidity

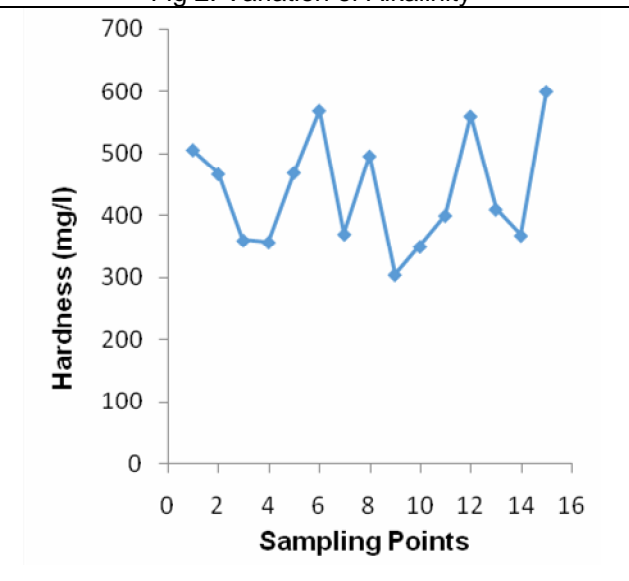


Fig 4: Variation of Hardness as CaCO₃

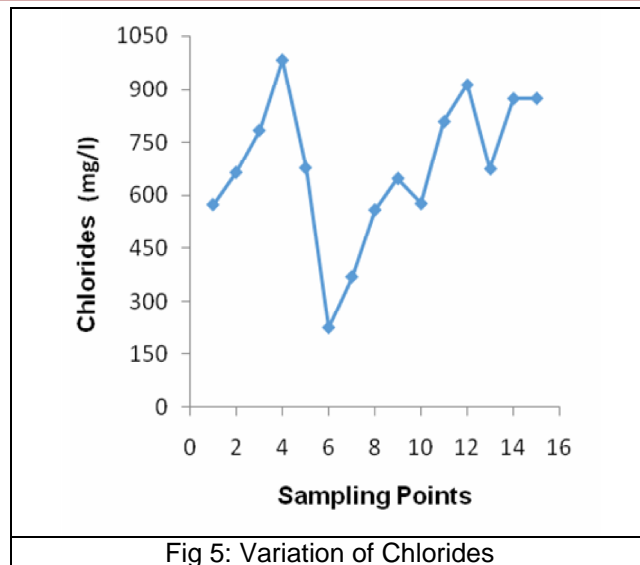


Fig 5: Variation of Chlorides

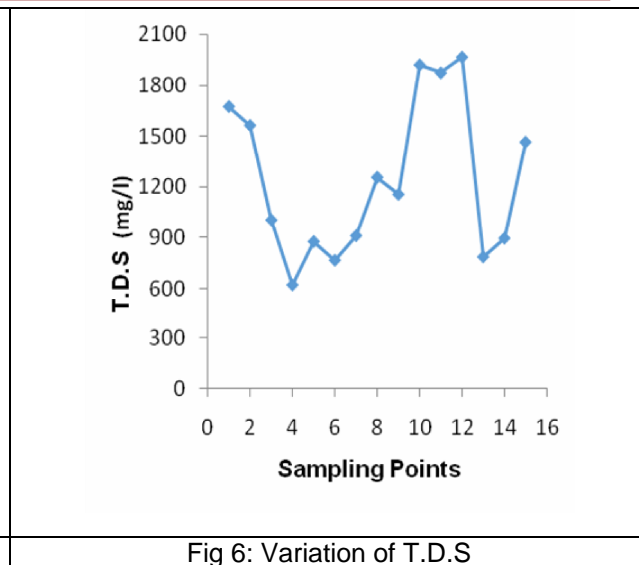


Fig 6: Variation of T.D.S

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 Hardness

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of water (Patil and Patil, 2010). Hardness does not have health effects but it can make the water unsuitable for domestic and industrial use. Total Hardness of groundwater under the present investigation ranged from 305 to 600 mg/L.

Total Alkalinity

The total Alkalinity was found to be in the range of 328-606 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.

Chloride

Chloride in the form of Cl^- is one of major inorganic anions in water. According to the

Indian standards for drinking water the recommended values have been set as 250 mg/L while 1000 mg/l has been set as the maximum permissible limit for chloride concentration.

The figure shows that the Cl^- concentration is between 225 mg/L to 985 mg/L. High concentration of Cl^- can produce hypertension, effect metabolism of body, and increase the electrical conductivity of water (Jain and Agarwal, 2012).

Conclusions

Water is a necessity for the existence of the mankind and also essential for the human development and healthy functioning of eco-system. The study of the physic-chemical parameters in the present investigation indicates that the groundwater quality is almost within the standard limits at all locations. Since the values are almost for all sampling locations therefore the groundwater can be deemed fit for drinking purposes.

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