



## Original Research Article

### Study on Assessment of Underground Water Quality

Ahmad Ashfaq<sup>1\*</sup> and Faizan Ahmad<sup>2</sup>

<sup>1</sup>Civil Engineering, Faculty of Engineering & Technology, A.M.U., Aligarh, India

<sup>2</sup>Department of Biochemistry, Faculty of Science, A.M.U., Aligarh, India

\*Corresponding author

#### A B S T R A C T

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The present study was aimed at assessing the ground water quality characteristics of Agra city. A comprehensive physico-chemical analysis was conducted after the groundwater samples were collected from different sampling locations. The physico-chemical parameters such as pH, TDS, Total hardness, Chlorides, turbidity and alkalinity were analyzed to observe the current status of the groundwater quality.

## Introduction

Water resources have played critical and vital role throughout history in the growth and continue to be a factor of importance in the economic growth of all the contemporary societies. In societies like our India with developing economics, the optimum development, efficient utilization and effective management of their water resources should be the dominant strategy for economic growth, but in recent year's unscientific management and use of this resources for various purpose almost invariably has created undesirable problems in its wake, water logging and salinity in the case of agriculture use and environment pollution of various limits as a result of mining, industries and municipal use (Kumar and Kumar, 2013). Despite the large volume of water that covers the surface of the earth, only 1% is inland fresh and easily available for human use. The qualities groundwater resources vary naturally and

widely depending on climate, season, geology of bedrock as well as anthropogenic activities (Ramesh and Soorya, 2012). Groundwater is ultimate, most suitable fresh water, resource with nearly balanced concentration of the salt for human consumption (Tewari et al., 2010). In India, most of the population is dependent on groundwater as the only source of drinking water supply. The groundwater is believed to be comparatively much clean and free from pollution than surface water (Patil and Patil, 2010). But prolonged discharge of industrial effluents, domestic sewage and solid waste dump causes the groundwater to become polluted and created health problems (Raja et al., 2002).

Groundwater pollution has become a major subject of public concern the world over. There are several ways as groundwater is contaminated in urban and rural areas such

as municipal sewage disposal to nearby water bodies, disposal or seepage of effluent from industries and use of inorganic fertilizers in agricultural farming. Most of the industries discharge the effluent without proper treatment into nearby open land or pass them through unlined channels, resulting in a deterioration of the groundwater resources. The groundwater pollution is highest in urban areas than rural areas where large volumes of waste concentrated and discharged near to the urban lakes. The increasing demand of water from fast growth of industries has put pressure on limited water resources (Ramesh and Soorya, 2012).

Considering the above aspects of groundwater contamination, the present study was undertaken to investigate the impact of the groundwater quality water samples at Agra district, U.P., India. To communicate information on the quality of water to the concerned citizens and policy makers, analysis of water is utmost important. It thus, becomes an important factor for the assessment and management of ground water. Thus, in this research work an attempt has been made to assess the physical and chemical parameters of ground water like pH, Total hardness, Total dissolved solids, Alkalinity, Chloride and turbidity. The analyzed data were compared with standard values recommended by BIS.

### **Study Area**

Agra district is bounded by Mathura District on the north, Dholpur District of Rajasthan state on the south, Firozabad District on the east and Bharatpur District of Rajasthan State on the west. Area of the district is 4027 km<sup>2</sup>. Agra, the former capital of Hindustan, is a city on the banks of the river Yamuna in the northern state of Uttar Pradesh, India. It is 363 kilometres (226 mi) west of the state

capital, Lucknow, 200 kilometres (124 mi) south of the national capital New Delhi and 125 kilometres (78 mi) north of Gwalior (MSME, Govt. of India). 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.

### **Materials and Methods**

During the study, sampling was carried out at District Jail, Mental Hospital, Lajpat Kunj, St. Peter's College, Madhu Nagar, Raja Ki Mandi, Lady Lyall Hospital, FET Agra College, Agra Med. College, Jeoni Mandi, Etmad-ud-daula, Jama Masjid, Agra Fort, Ramleela Maidan, Moti Mahal.

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 analysis all the chemicals used were A R grade. Double distilled water was used for the preparation of reagent and solution. pH and TDS were measured by universal water analysis kit and manual method. Total hardness of water was estimated by complexometric titration with EDTA. Chlorides content were determined volumetrically by AgNO<sub>3</sub> titrimetric method.

### **Results and Discussion**

#### **pH**

pH is the measure of acidity or alkalinity of water. pH is considered as an important

ecological factor and provides an important piece factor and piece of information in many type of geochemical equilibrium or solubility calculation (Shyamala et al., 2008). The pH values of the study area are within the permissible limits of WHO standards (6.5– 8.5). The value of pH is found to lie between 6.4– 8.1. This may be

attributed to different types of buffers normally present in the ground water (Weber and Stun, 1963). The mild alkalinity indicates the presence of weak basic salts in the soil (Kumar and Kumar, 2013). The mild alkaline nature suggests that approximately 95% of CO<sub>2</sub> in water is present as bicarbonate (Azeez et al., 2000).

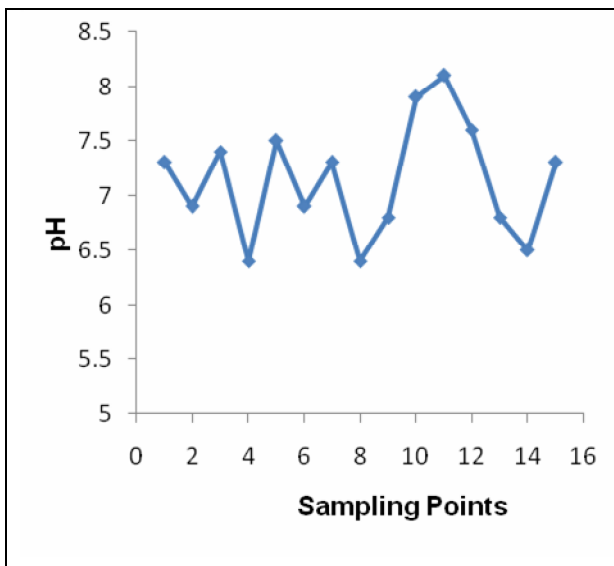


Fig 1: Variation of pH

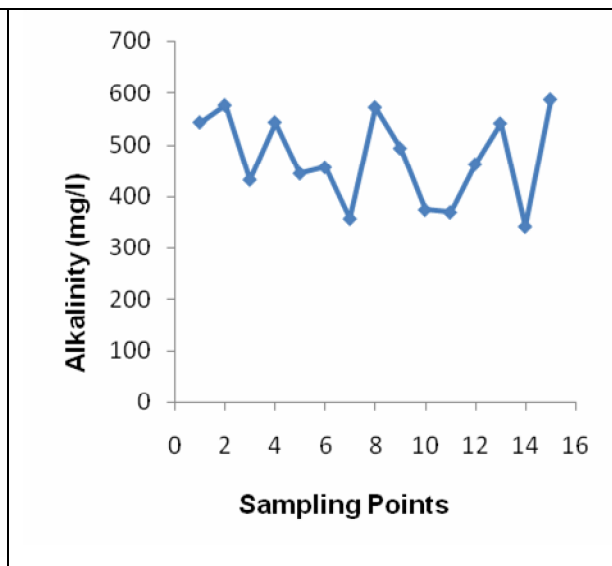


Fig 2: Variation of Alkalinity

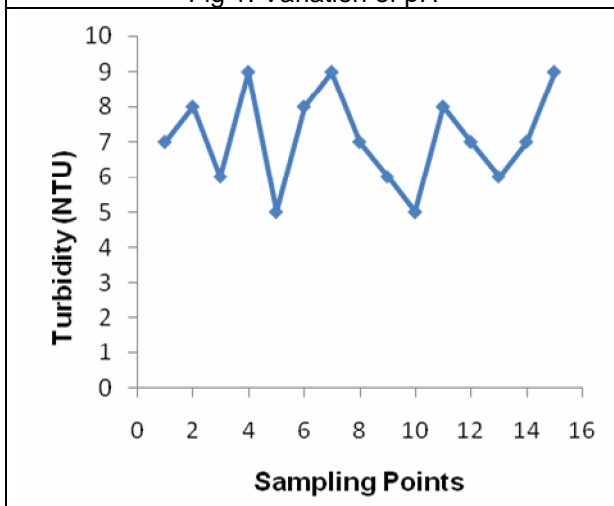


Fig 3: Variation of Turbidity

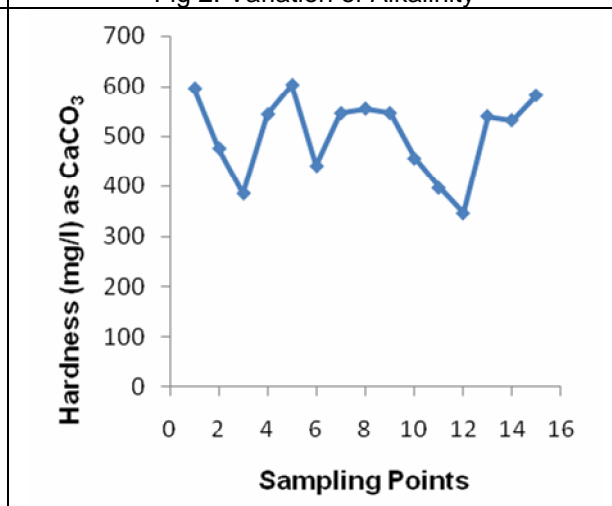


Fig 4: Variation of Hardness as CaCO<sub>3</sub>

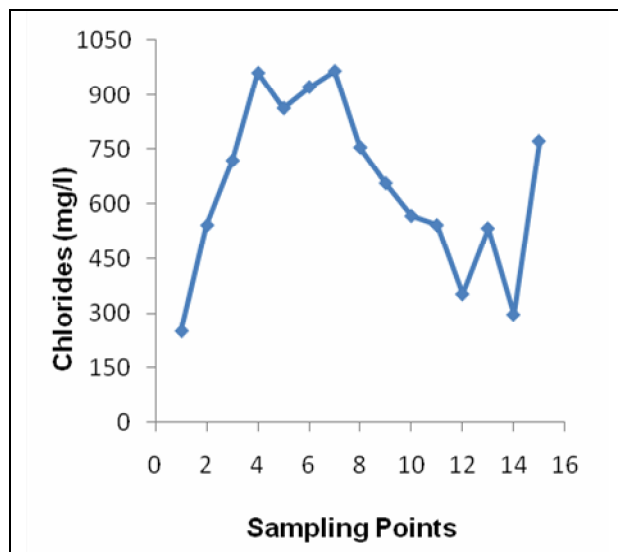


Fig 5: Variation of Chlorides

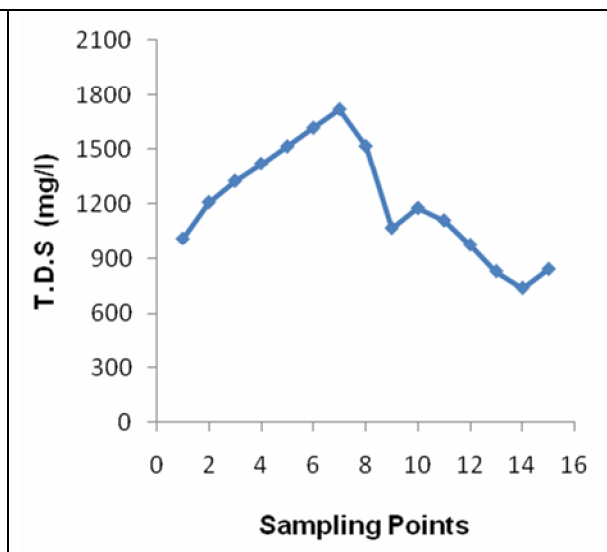


Fig 6: Variation of T.D.S

### TDS

The TDS of all the samples obtained from the study area were in the range of 739-1720 mg/L. According to the WHO the maximum permissible limiting value of TDS for potable water is 500- 2000 mg/L. High level of TDS in water used for drinking purposes leads to many diseases which are not water-borne but due to excess salts (Sabata and Nayar, 1995; Parihar et al., 2012).

### Turbidity

The standard values for turbidity are 5- 10 NTU. The turbidity of all the samples obtained from the present area of study are found to be between 5- 9 NTU. Therefore all lie within the prescribed limits.

### Total Hardness

The total hardness is the indicator of the capacity of water to precipitate soap. The minimum and maximum values recorded were 347 and 603 mg/L respectively. The increase in the maximum level of total hardness is due to presence of carbonate

and non carbonate compounds (Ramesh et al., 2013).

### Alkalinity

The ranges of alkalinity have been found to lie in between 342- 587 mg/L. The standard values as prescribed by the WHO are between 200- 600 mg/L. Therefore the total alkalinity is found to lie in between the prescribed limits.

### Chloride

Chloride is a widely distributed element in all types of rocks present in different forms. Therefore, in groundwater of the places where the temperature is high and rainfall is less, its concentration is high. The main form in which chloride is found in the groundwater is sodium chloride. Soil porosity and permeability plays a major role in building up of the chloride concentration. The higher consumption can cause significant increase in the development of hypertension, risk for stroke, left ventricular hypertension, osteoporosis, renal stones and asthma in human beings (McCarthy, 2004; Ramesh and Soorya, 2012). The chloride

concentration varied from 347- 603 mg/L in the samples taken from the study area. It is found to be within the standard prescribed limits of 300- 600 mg/L.

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