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Research Article

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Assessment of diverse resources of ground water quality in Bareilly district (U.P.)

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ABSTRACT

Ground water is one of most important source of the domestic water use in our country the water supply bodies' i.e. municipal corporation Jal nigam, or Nagar nigam are mainly depends on the ground water resources of the area. In the light of all these facts the work was demonstrate in the Bareilly city to access the current ground water quality of the city. By taking some parameters like. pH, TDS, Calcium Hardness, Magnesium Hardness and Total Hardness, Alkalinity and the conclusion of the results state that the minimum value was observed in the hand pump water 7.16 at Nagar nigam site were as maximum 7.84 was observed in Tap water sample at Kila. In the term of TDS maximum was found in bore well water sample 120.8 mg/l at Cant site and minimum 92.5 mg/l in Tap water sample of Cant site. In term of hardness maximum hardness 218.1 mg/l was observed at Satellite region in Hand pump water sample and minimum was observed at Cant area in Tap water sample i.e. 92 mg/l Calcium hardness was found between 70.03 to 191.1 mg/l. Of Satellite and Kutubkhana in hand pump sample Mg hardness was maximum analysis in the sample of hand pump of Nagar nigam area i.e. 45.4 mg /l and 19.98 mg/l. In Tap water sample Nagar nigam area. Alkalinity was found maximum 29.02 mg/l in bore well sample of Kutubkhana and minimum was found in Tap water sample 11.08 mg/l Nagar nigam. The result comes out of study shows that all the water are Fit for consumption and Tape water supply is good it due to the treatment of water before supply.

INTRODUCTION

Water quality and monitoring and its suitable management need our attention because of far reaching impact on human health by transmitted disease in associated area [1, 2]. Water pollution means contamination of water by foreign matter such as micro-organism, chemicals industrial or other wastes, or sewage [3, 4]. Hence for safe drinking water a regular assessment and monitoring of water resources is required. Underground water has become matter of great concern not only to the scientist and researcher working on the related aspect in India but throughout the globe. Disposal of sewage water and effluent from various industries into fresh water aquifers is the main cause of ground water pollution [5]. Ground water is the major source or municipal supply because ground water has become an important water resource throughout the ages [6]. As like other natural resources, ground water supplies are not unlimited and hence must be wisely managed and protected against under exploitation and contamination by pollutants. Degradation of ground water quality can take place in large areas from diffuses source, like deep percolation from intensively cultivated field, or it can be caused by point sources such as open dumps, sewage disposal, surface impoundment and septic tanks [7, 8]. The quality of groundwater at any point reflects several major influences including lithology of the area, atmospheric inputs, climatic conditions and anthropogenic inputs. Municipal and industrial waste water discharge constitutes a constant polluting source, whereas surface runoff is a seasonal phenomenon, largely affected by climate within the basin [9].

EXPERIMENTAL SECTION

Study Area: Bareilly is located in north western segment of Uttar Pradesh between latitudes 28°1′ to 28°54′ North and longitude 78°58′ to 78°58′ East, and lies in northern India. It borders Pilibhit and Shahjahanpur on East and Rampur on west, Udham Singh Nagar (Uttarakhand) in North and Badaun in South. It is a level terrain, watered by many streams, the general slope being towards the south. The soil is fertile and highly cultivated, groves of noble trees abound, and the villages have a neat, prosperous look. A tract of forest jungle, called the tarai, stretches along the extreme north of the district, and teems with large game, such as tigers, bears, deer, wild pigs, &c. The river Sarda or Gogra forms the eastern boundary of the district and is the principal stream. Next in importance is the Ramganga, which receives as its tributaries most of the hill torrents of the Kumaon mountains. The Deoha is another great drainage artery and receives many minor streams. The Gomati or Gumti also passes through the district.

The experimental area having the ground water potential, net ground water availability is 139714.95 hectare meter (Ham), minus all uses of ground water is around 95524.76 hectare meter and divided by net ground water availability and multiply by 100, this represent the level of development of ground water is 68.37%. The rate of decrease in ground water table is around 0.10 m/year in most part of the study area**,** Water samples are collected from municipality taps, bore well and ground water of different areas. Samples are collected in plastic bottles from the sampling sites and brought to the laboratory for analysis. Samples were collected from ten different sites of Bareilly city namely Kutubkhana, Nagar nigam, Cant, Satellite and Kila.

Parameters: pH, TDS, Total Hardness, Total Alkalinity.

1. **pH:** pH is the measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. It was measured by using the pH meter.
2. **TDS:** Total dissolved solid or simply solids are mainly the inorganic mineral and some organic matter. There are large unity of state such as Cl^-, CO_3^- HCO_3^-, NO_3^-, PO_4^{-3} and SO_4^{-2} of Ca, Mg, Na, K, & Fe etc which import certain taste to water measurement [10].
3. **Total Hardness:** The total hardness in water is defined as the summary concentration of calcium and magnesium cations expressed in milligram equivalent ions present in water and the standard formula id used for the Calcium hardness, magnesium hardness and total hardness [10].

Hardness as mg/l $CaCO_3$ = $\frac{TV \times 1000}{ml\ of\ sample}$

Where TV = *Volume of EDTA used*

4. **Calcium hardness:** Many indicators such as ammonium purpurate, calson form a complex with only calcium but not with magnesium at higher pH [10]

$$\text{Calcium or } CaCO_3\,(\text{mg/l}) = \frac{volume\ of\ EDTA\ used \times 1000}{volume\ of\ sample\ used}$$

5. **Magnesium Hardness :** Magnesium hardness can be calculated by applying following formula

$$\text{Magnesium (mg/l)} = \text{total hardness - calcium hardness}$$

6. **Total Alkalinity:** Alkalinity of water is its capacity to neutralize a strong acid and it is characterized by the presence of all hydroxyl ions capable of combining with hydrogen ions. Alkalinity in natural water is due to free hydroxyl ion and hydrolysis of salts formed by weak acid and strong bases measurement process use as given by Maiti [10].

RESULTS AND DISCUSSION

pH: pH is one of the most important water quality parameters The high and the low pH indicates that the equilibrium of carbon dioxide, carbonate and bicarbonate equilibrium is affected [2, 11]. The pH of hand pumps water from fig.1 ranged minimum of 7.16 to a maximum of 7.59 of Nagar nigam and Kila respectively. Similarly, the variation of pH of bore well water ranged from a minimum of 7.25 to a maximum of 7.62 of Nagar nigam and Kila respectively. In case of tap water pH ranged from 7.54 to 7.84 of Nagar nigam and Satellite respectively. pH is within the permissible limits as prescribed by IS [12] for Indian drinking water standard which is 6.5 – 8.5.

TDS: TDS are composed mainly of carbonates, bicarbonates, chlorides, phosphate and nitrates of calcium, magnesium, sodium, potassium and manganese, organic matter, salts and other particles.[13] Their minimum value is recorded in Cant area for all types of ground water analyzed (fig.2). The TDS of hand pump water ranged from minimum of 101.2 to maximum of 116.4 of Cant and Satellite respectively. In case of bore well water, TDS range from 93.2 to a maximum of 120.8 of Cant and Satellite respectively. Similarly the TDS ranged from minimum of 92.5 to a maximum of 118.6 respectively the given result states that the water of selected sites are good for daily consumption the range of sites are within the permissible limit given by IS [12] i.e. is 500 mg/l.

Total Hardness: The total Hardness is an important parameter of quality of water whether it is to be used for domestic and industrial purpose. The hardness is defined as the sum total of the polyvalent cations present in water and the most common divalent cations are Ca^{++} and Mg^{++}. IS [12] prescribed its permissible limit 300 mg/l for drinking purpose. Total Hardness of study area (fig.3) ranges from 92-218.1 mg/l in Cant and Satellite region respectively, in case of hand pump water of Kutubkhana region is found to be most hard with 218.1 mg/lit water and Satellite region is having minimum value of 141.03 mg/l. Total Hardness of tap water ranged from a minimum of 92 mg/lit to a maximum of 102.6 mg/l of Satellite and Kila respectively. Total Hardness of water of Kutubkhana is high in all forms of water (fig.3). The high Hardness of Satellite region may be due to different geological condition of this area. Salts of calcium and magnesium are more in the water of this area. Hardness does not have any adverse effect on human health [11, 14]. Water above hardness of 200 mg/l may cause scale deposition in the water distribution system and more soap consumption in case of total hardness it is resulted that all site are under controlled and fine for use.

Calcium Hardness: Calcium occurs in water mainly due to the presence of limestone, Gypsum, dolomite and gypsiferrous materials, the difference in the calcium hardness concentration may be due to the difference between their geological conditions for drinking and other domestic use its permissible value 75 mg/l [12].The calcium hardness of hand pump water ranged from a minimum of 70.03 mg/l to a maximum of 191.1 mg/l of Satellite and Kutubkhana respectively (fig.4). Similarly the calcium hardness of bore well water ranged from a minimum of 86.21 mg/l to a maximum of 144.9 mg/l of Nagar nigam and Kutubkhana respectively (fig.4). The maximum value of calcium harness of tap water was found to be 75.5 mg/l in N. Nigam area and the minimum value of calcium was found to be 73.05 mg/l (fig.4). All the samples have calcium concentration within the maximum permissible limit.

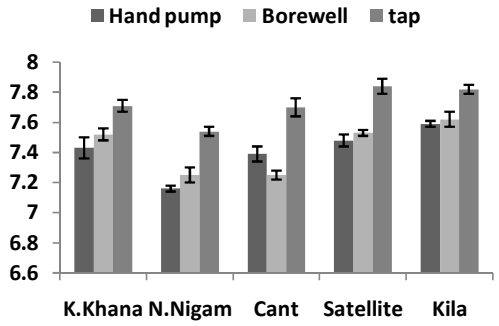

Fig.1 Average pH

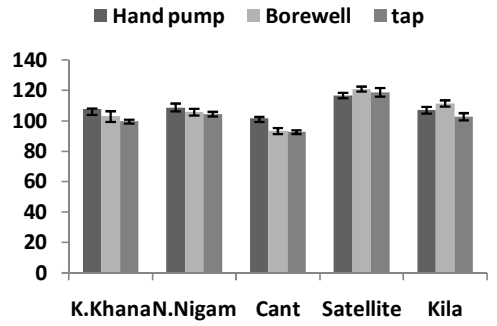

Fig. 2 Average TDS mg/l

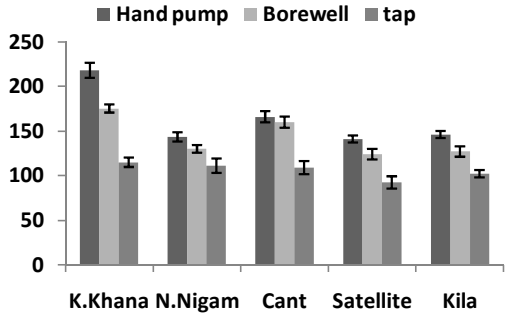

Fig. 3 Average Total hardness

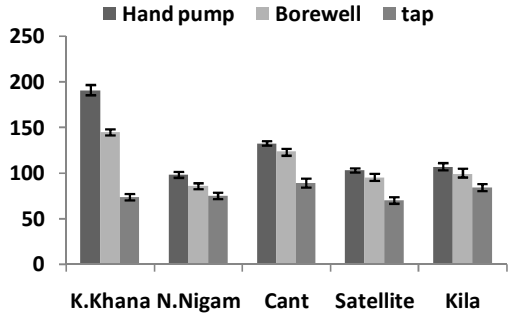

Fig.4 Average $CaCO_3$Hardness

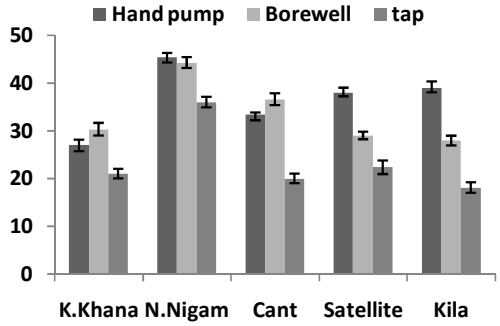

Fig.5 Average Mg Hardness

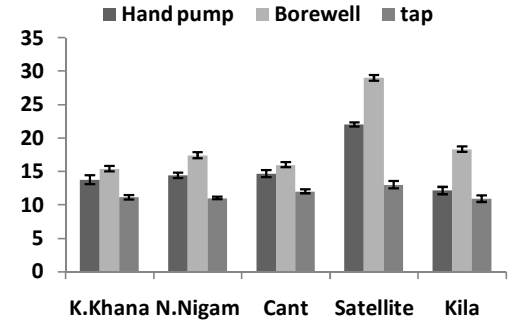

Fig.6 Average Alkanity mg/l

*(K. Khana= Kutub khana; N.Nigam= Nagar Nigam)

Magnesium Hardness: The magnesium hardness of hand pump water is minimum of 27.9±0.88 mg/l of Kutubkhana and maximum of 45.4 mg/l of Nagar nigam (fig. 5). The magnesium hardness of bore well water rang from minimum of 27.7 mg/lit to a maximum of 44.3 mg/l of Kila and Nagar nigam respectively (fig.5). Similarly in

case of tap water magnesium value ranged from a minimum of 19.98 mg/l to a maximum of 36.01 mg/l of Nagar nigam and Satellite respectively (fig.5) in case of magnesium hardness the alarming richness was observed in sample of Hand pump of Nagar nigam 45.4mg/l to 44.3 mg/l. In bore well at Kila and slightly high at tape water of Nagar nigam are i.e. 36.01 mg/l as limit given by [12].

Alkalinity: Variation in total alkalinity of hand pump water ranged from minimum of 12.11 mg/l to a maximum of 22.01 mg/l of Kila and Satellite respectively (fig.6). Similarly the variation in total alkalinity of bore well water ranged from a minimum of 15.4 mg/lit to a maximum of 29.02 mg/l Kutubkhana and Satellite (fig.6). The minimum value of alkalinity of tap water is found to be 11.08 mg /l of Nagar nigam and maximum value is 13.03 mg/l of Satellite (fig.6). The alkalinity of water is caused mainly due to OH, CO_3, HCO_3 ions. Alkalinity is an estimate of the ability of water to resist change in pH upon addition of acid. The alkalinity of hand pump water was minimum in Kila, alkalinity of bore well water is minimum in Cant and minimum value of alkalinity of tap water is found in Nagar nigam. The maximum alkalinity for hand pump, bore well and tap water was recorded in Satellite (fig.6). This may be due to low water table and low temperature bringing down the rate of decomposition of salts to a minimum thereby increasing the alkalinity or may be due to leaching of soil during natural filtration in case of alkalinity water is good for consumption its under permissible limit as given by IS [12] i.e. 200 mg/l.

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REFERENCES

[1] B Simpi; SM Hiremath; KNS Murthy; KN Chandrashekarappa; AN Patel; ET Puttiah. *Global J. Sci. Frontier Res.*, **2011,** 11(3), 31-34.
[2] S Chandra; SK Rawat; RP Singh; SK Garg. *Advance Biomedical Res*., **2012**, 3[4],76-83
[3] PJ Puri; MKN Yenkie; SP Sangal; NV Gandhare; GB Sarote; DB Dhanorkar. *Rasayan J. Chem.,* **2011**, 4(1), 43-48.
[4] MR Sinha; A Dev; A Prasad; M Ghosh; RN Tagore. *J. Chem. Pharm. Res.*, **2011**, 3(3):701-705.
[5] MR Mahananda; BP Mohanty; NR Behera. *International J. Res. Reviews App. Sci.,* **2010**, 2(3), 284-295.
[6] Nandababu Singh Laishram. *J. Chem. Pharm. Res.*, **2013**, 5(2), 181-183.
[7] RK Kushwah; A Bajpai; S Malik. *International J. Res. in Chem. Environ.* **2012,** 2(1), 112-115.
[8] MM Bhat; T Yazdani; K Narain; M Yunus; RN Shukla. *J. Wetlands Ecology*, **2009,** 2, 67-73.
[9] P Tyagi; B Dharm; R Chaudhary; RL Sawhney. *Poll. Res*., **2000**, 19(3), 443-445.
[10] SK Maiti. Handbook of methods in environmental studies: water and waste water analysis. (1). ABD, publishers, Jaipur. (India), **2001.**
[11] RK Gangwar; J Singh; AP Singh; DP Singh. *International J. Sci. & Engineer. Res.*, **2013,** 4(9), 2325-2329.
[12] Indian standard drinking water - specification (BIS 10500:**1991**).
[13] RK Gangwar; P Khare; J Singh; AP Singh. *J. Chem. Pharm. Res.*, **2012**, 4(9), 4231-4234.
[14] T Bhattacharya; S Chakraborty; N Tuck. *I Res. J. Environment Sci.,* **2012,** 1(1), 28-33.