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Physico-chemical analysis of drinking water in some rural areas of Kanpur

Atul Kumar Misra[a]*
[a]*Deptt. of Zoology, D.A.V. P.G. College,Kanpur (U.P.) India.

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Abstract : The present study is focused on the Physico-chemical analysis of the underground water samples which were collected from different sites of the some rural areas of Kanpur region of Uttar Pradesh. The samples were collected in the month of August, 2011. For experimental purpose three samples of water were collected from the some selected areas of the city. These samples have been physico-chemically analysed and tested their suitability for drinking purpose. Just after collection these samples were analysed for various physico-chemical parameters. These parameters are odour, colour, pH value, total hardness, calcium, total alkalinity, electrical conductivity, chloride, fluoride, magnesium, sulphate, Potassium, nitrate and total dissoved solids (T.D.S.). There are so many inorganic and organic impurities suspended in water. Thus water is not suitable for drinking purpose.

The result clearly indicates that most of the physico-chemical parameters are within permissible limits except sample-3.

Key words : Underground water, Physico-chemical parameters, Permissible limit, Total Dissolved Solids (T.D.S.), Physico-chemical analysis, Total hardness and pH value.

INTRODUCTION

Kanpur is well known thickly populated industrial city of North India. The holy river, "Ganga" is situated in the North-South region of the city. It is rich source of irrigation for agricultural purpose but now water has been polluted due to many anthropogenic activities of human beings.

Water plays an important role in completion of almost all the vital activity of life process in living organisms. Ground water is a very common and chief source for drinking purpose, but the ground water is not totally safe for drinking because there are so many impurities suspended in the water. However, the advancement of human civilization arid agriculture has put many serious question to the safe use of ground water for drinking due to release of diverse wastes into the environment, which can contaminate ground waters (Abdul, 2002; Sinha *et al.*, 2004)[1,2].

*Corresponding author :
Phone: 09935815839
E-mail : atulkumarmisra03@gmail.com

Drinking water which comes directly from natural resources, contains fluoride, it is a very common and harmful element because it is absorbed completely by human beings. In another study the ground water which is collected from rural areas of Rajasthan not is suitable for drinking purpose due to presence of fluoride. (Sinha, 2000[3]; Sinha *et al.*, 2004[2]; Gupta & Singh, 2005[4]; Chandra *et al.*, 2009[5]).

In India, most of the population is totally dependent for their survival on ground water because it is a chief source for drinking and domestic purpose. It is well known fact that gound water is comparatively much clean, safe and better compared to surface water. But due to city discharge of industrial effluents, solid waste dump and sewage has caused the ground water to get polluted. There are so many inorganic and organic elements suspended in the water. Due to presence of these impurities, water is not suitable and safe for drinking purpose and caused in past so many serious health problems in living organisms (Raja *et.al.* 2002[6]; Canter and Sobatini, 1995[7]; Forstner

and Wittman, 1981[8]; Tiwari and Dhar, 1995[9]; Todd, 1980[10]).

On the basis of survey, in India, there are over 20 million wells in addition to tube well (Dutta, 2005)[11], which are over burdened due to exploration and dumping of polluted water without proper treatment having harmful effects among human beings (Pandey and Tiwari, 2000)[12]. There are many hydrogeochemical parameters which indicate impurities and significant variations in the quality of ground water (Mahanta *et al.,* 2004)[13].

The objective of present work is to focus and analyze the quality of ground water in some selected rural areas of Kanpur. The investigation encompases the study the physico chemical analysis of drinking water on the basis of their qualitative analysis.

MATERIALS AND METHODS

Water samples were collected from three sites of rural areas of Kanpur city. These sites are Bithoor, Rooma Village and Sarsaul. All the drinking water samples were brought to the laboratory and were put to physico-chemical analysis.

The physico-chemical parameters of water samples are colour, odour, turbidity, pH, total hardness, total alkalinity, electrical conductivity, chloride (Cl), Fluoride (F), Calcium (Ca), Magnesium (Mg), Sulphate (SO_4), Potassium (K), Nitrate (NO_3) and Total dissolved solids (T.D.S.).

Physico-Chemical analysis of the drinking water samples were carried out by using standard methods as described by A.P.H.A. (1995 and 1998)[14,15]; Trivedi and Goel (1986)[16].

RESULTS AND DISCUSSION

The physico-chemical parameters studied are presented in Table-1.

Colour : All the samples, which are taken from different localities from the city are colourless.

Odour : All the collected water samples were odourless.

Turbidity : All the samples are clear and transparent because these samples are under natural condition of pure water except sample no. 3. In sample No. 3 many suspended particles of clay and soil were observed.

Hydrogen Ion Concentration (pH) : The hydrogen ion concentration (pH) is very important chemical parameter because it is always used in chemical analysis of water. The pH of the various sampling area varied from 6.5 to 7.6 which shows slight alkalinity of water.

Total Hardness : The total hardness of water varies from place to place depending upon metalic contents dissolved in water samples. In the present study, total hardness of water observed was 365 to 420mg/L.

Calcium : It is the most important content of water. The presence of calcium in natural water depends on the types of rocks. Because in natural condition, calcium is leached and contaminates water. The value of calcium recorded in the different samples ranging from 95 to 136 mg/L.

Total alkalinity : The Values of total alkalinity of water samples recorded were 1500to 2210mg/L. The maximum permissible limit of total alkalinity is 600 mg/L. In normal way alkalinity is itself is not harmful for human being. In general, large quantity of alkalinity has bitter taste of water.

Electrical conductivity : Electrical conductivity in the study area were recorded between 1500 to 2210. In the water, electrical conductivity is a measure of the current carrying capacity. With the increase of concentration of dissolved salts, the conductivity increases and pollution level also increases.

The results clearly indicates that the water quality is good in sample-1, 2 and totally safe for drinking but the result of the water sample no.3 is not suitable for drinking due to excess amount of sulphate. Water can be utilized for drinking purpose after improving the water quality.

Chloride : The chloride value in the water samples from the different places are recorded 45 to 210 mg/L. The taste of water is normal because the higher concentration of chloride above the 250 mg/L makes the water salty in taste.

Fluoride : The excessive amount of fluoride causes disfigurement of teeth (Thakare *et al.,* 2005)[17]. The fluoride is commonly found in ground water in the form of rough and weathering of primary silicates and other associated accessory minerals. In a standard drinking water (Kulshreshtrha *et al.* 2002)[18] the value of fluoride should be 15mg/L. In the study area the flouride value of the water sample observed are 0.3 to 4.8 mg/L.

Magnesium : Magnesium is another important chemical component. The maximum permissible limit is prescribed 150 mg/L (WHO, 1971)[19]. The results of all the samples showed the ideal range of magnesium.

Sulphate : In the sample 1 and 2, the range of sulphate range between 55 to 78. In the last sample i.e. sample no. 3 the maximum limit was recorded 395 mg/L., but higher range sulphate does not affect the taste of water.

Potassium : The potassium is very important component for living beings. The ground water should contain less than 10 mg/L potassium. In the present study the amount of potassium dissolved in water between 38 to 46 mg/L.

Nitrate : In the ground water, the presence of nitrate is very common because the presence of nitrate is mainly due to aerobic decompsition of nitrogen from the organic matter as pollutants. The chief sources of nitrate are industrial effluent. The present study shows the desirable range of nitrate in water.

Total Dissolved solids (T.D.S.) : Total dissolved solids in water are very important and very essential factor for the survival of living organisms. Many gastrointestinal irritation is caused due to presence of higher concentration of (T.D.S.). The maximum permissible limit of T.D.S. is 2000 mg/L. The total dissolved solids (T.D.S.) values recorded from different sites are varied 450 to 675 mg/L. due to water pollution of study area.

CONCLUSION

Sample C is comparatively better.

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Table-1: Showing the Physico-Chemical analysis of water sample A, B & C from different localities of Kanpur City (Mg/Lit)

Parameters	Standard values		Sample A	Sample B	Sample C
	X	Y			
Colour	-	-	Colourless	Colourless	Colourless
Odour	-	-	Odourless	Odourless	Odourless
Turbidity	2.5	10	2.0	1.5	1.0
pH Value	7.0-8.5	6.5-9.0	6.5	7.0	7.6
Total Hardness	200	600	380	365	425
Total Alkalinity	-	-	1500	1650	2210
Chloride	200	1000	45	75	210
Fluoride	1.0	1.5	0.3	3.5	4.8
Calcium	75	200	95	105	136
Magnesium	30	150	42	48	51
Sulphate	200	400	55	78	65
Potassium	-	-	38	46	45
Nitrate	45	100	48	56	52
Total Dissolved Solids (T.D.S.)	500	2000	450	530	675

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