

Pre-monsoon physico - chemical analysis of surface and ground water of Abhanpur block in district Raipur, (C.G.)

Pramisha Sharma¹, Amit Dubey² and S.K. Chatterjee^{3*}

¹Research Scholar, Department of Chemistry, C.V.Raman University Kota Bilaspur (C.G.), India.

²Senior Scientist, Chhattisgarh Council of Science and Technology, Raipur (C.G.) India.

³Principal, Govt.Arts, Commerce and Science College, Tilda, Distt. Raipur (C.G.), India.

Abstract

A segment of this investigation was carried out for pre-monsoon study of ground water as well as surface water physicochemical characteristics of Abhanpur block, district Raipur of Chhattisgarh. The geographical area at study is situated between 21°03'N to 21°35'4"N altitude and 81°43' E to 49.64'5" E longitude. The present work has been conducted by monitoring of ground and surface water i.e. well water and bore well water of 8 wards of Abhanpur Block as well as pond and tap water of the Abhanpur. Attempts were made to study and analyze the physico-chemical characteristics of water i.e. Temperature, pH, total dissolved solids, alkalinity, hardness and chloride.

Keywords: Surface Water, Ground Water, physicochemical characteristics, Abhanpur Block

INTRODUCTION

Only a small fraction about 2.5% of earth's water is fresh and suitable for human consumption. Approximately 13% of this fraction is ground water and important source of drinking water for many people worldwide. There is an extensive literature available that underscores deterioration of water quality²⁻⁵. The addition of various kinds of pollutants and nutrients through urban sewage, industrial effluents, agricultural runoff etc. into the water bodies brings about a series of changes in the physicochemical quality and its characteristics of water. This has been subject of several investigations⁶⁻¹⁰.

Fresh water resource is becoming day by day at the foster rate of deterioration of the water quality is now a global problem¹¹. Discharge of toxic chemicals, over pumping of qualifier and contamination of water bodies with substance that promote algal growth are some of the today's major cause for water quality degradation. Organic manure, municipal waste and some fungicides often contain fairly high concentration of heavy metals. Soils receiving repeated applications of organic manures, fungicides and pesticides have exhibited high concentration of extractable heavy metals and that thereby increase their concentration in runoff, while falling as rain, water picks up small amounts of gases, ions, dust and particulate matter from the atmosphere¹²⁻¹³. These added substances may be arbitrarily classified as biological, chemical, physical and radiological impurities¹⁴.

These impurities may give water a bad taste, color, odor, turbidity and cause hardness, corrosiveness, staining or frothing¹⁵. The composition of surface and ground water depend on natural

factors (geological, topographical, metrological, hydrological and biological) in the drainage basin and varies with seasonal difference in run off volume, weather conditions and water levels.¹⁶

Groundwater is one is the important resource all over the world. The term groundwater is usually reserved for the subsurface water that occurs beneath the water table in soils and geologic formation that are fully saturated¹⁷. It supports drinking water supply; livestock needs irrigation industrial and many commercial activities¹⁸. Groundwater is generally less susceptible to contamination and pollution when compared to surface water bodies¹⁹. Also the natural impurities in rainwater, which replenishes groundwater systems, get removed while infiltrating through soil strata. But, in India, where groundwater is used intensively for irrigation and industrial purposes, a variety of land and water based human activities are causing pollution of this precious resource²⁰. Importantly, groundwater can also be contained by naturally occurring sources. Soil and geologic formation containing high levels of heavy metals can leach those metals into groundwater. This can be aggravated by over-pumping wells, particularly for agriculture. Pollution caused by fertilizers and pesticides used in agriculture, often dispersed over large areas, is a great threat to fresh groundwater ecosystems.

Pollution of groundwater due to industrial effluents and municipal waste in water bodies is another major concern in many cities and industrial clusters in India. Groundwater is very difficult to remediate, except in small defined areas and therefore the emphasis has to be on prevention. Owing to the human activities, the ponds have become dumping ground of domestic wastes and other refuse of the society²¹. So, the knowledge of extent of pollution and the status of water become essential in order to preserve the valuable sources of water for future generation. Water quality guidelines provide basic scientific information about water quality parameter and ecologically relevant toxicological threshold values to protect specific water uses. Important physical and chemical parameters influencing the aquatic environment are temperature, pH, alkalinity, hardness, chloride, and total dissolved solid.

The main objective of this work has to analyze various

*Corresponding Author

S.K. Chatterjee

Principal, Govt.Arts, Commerce and Science College, Tilda, Distt. Raipur (C.G.), India

Email: somkumar.chatterjee@gmail.com

physico-chemical parameters of the surface and ground water of (Abhanpur Block) Raipur District C.G.

MATERIAL AND METHODS

Sampling and Preservation

The water samples were drawn during pre-monsoon (April-June). The ground and surface water were collected from different wards of Abhanpur Block in Raipur district C.G. Water samples from different location were collected in the plastic bottles of 250 ml from well, Bore well, pond and tap water. Samples collected were analyzed within 2 days in order to avoid special preservation required. However sample in the bottles were kept in the refrigerator. Standard testing methods are used to evaluate different parameter²².

The pH of the ground water was estimated by pH meter. The alkalinity of water is generally due to present of carbonate and hydroxide ion. Alkalinity provides an idea of the nature of salts present in the water. The total alkalinity of ground water was calculated by standard titration method. The total solid (TS) present in 100 ml of sample water was at 103^o to 105^o c to dryness in drying oven. Cooling is done desiccators and then weight. The TS in mg/l. = (A-B) × 100/sample volume in litre. Where A = weight of (dried residue + dish) & B = weight of dish. The total suspended solid (TSS) was calculated by the following formula: Total suspended solid (mg)/liter = (A-B) × 100/sample vol. in liter, where, A = weight of filter + dried residue. B = weight of filter paper. The total dissolved solids (TDS) term is used to describe the inorganic salts and small amount of organic matter present in solution. It was calculated by adding calcium and magnesium hardness derived by EDTA titration method. The chloride was estimated by silver nitrate titration method. Temperature of the samples was measure by thermometer.

RESULT AND DISCUSSION

Temperature

The temperature of tap water ranged from a minimum of 26°C ± 0.5°C to a maximum of 27.2°C in ward no 4, 6, 8, 5, 2 and 1 respectively (Table-1). Similarly the variation in temperature of a bore well water ranged from a minimum 26°C ± .5°C to a maximum 27°C in ward no. 5, 6, 3, 1, and 2 respectively (Table-2). The temperature of well water ranged minimum of 26°C ± .5 °C and maximum 26.9°C in ward no. 5, 6, 4, 3 and 1 respectively (Table-3). The temperature of pond water ranged minimum of 26°C ± .6 °C and maximum 27°C in ward no. 8, 7, 5, 4,3 and 2 respectively (Table-4). During the present investigation, there was no major difference between the temperature of the tap water, bore well, well and pond water.

pH

The pH of tap water from a minimum of 6.99 and maximum of 7.66 of ward no. 3,8,4,5,7 and 1 respectively (Table-1). Similarly the variation of pH of bore- well water ranged from a minimum 6.9 and maximum 7.5 of ward no. 2, 3, 1and 6,7 and 8 (Table-2). Similarly the variation of pH of well water ranged from a minimum 7.2 and maximum 7.54 of ward no. 3,5 and 1(Table-3). The pH of pond water ranged from a minimum 7.13and maximum 7.77 of ward no. 2 and 1, 3,6, 5 and 7(Table-4). The results show that water quality of Abhanpur block shows no remarkable variation from the BIS recommended value of pH.

Alkalinity

Table-1 represents the variation in total alkalinity of tap water ranged from a minimum of 40 mg/l. and maximum of 200 mg/l. in ward no. 3and 4. Similarly the variation in total alkalinity of bore well water ranged from minimum 50mg/l. and maximum 250 mg/l. in a ward no. 5 and 7 respectively (Table-2). The alkalinity of well water ranged from minimum of 60 mg/l. and maximum 240 mg/l. in a ward no. 1 and 2 (Table-3). Similarly the alkalinity ranged from pond water was minimum 60 mg/l. and maximum 150 in a ward no. 1 and 3 respectively (Table-4). The alkalinity of some places was above and some places were below the BIS desirable level 200 mg/l. in all the samples of ground and surface water but was less than the maximum permissible limit.

Hardness

The Hardness of tap water ranged from a minimum 200 mg/l. and maximum of 350 mg/l. in ward no. 4,5,7,1 and 6 respectively (Table-1). Similarly the variation in hardness of bore well water ranged from a minimum 140 mg/l. and maximum of 350 mg/l. in ward no. 3and 2 respectively (Table-2). The hardness of well water ranged from a minimum 150 mg/l. and maximum of 350 mg/l. in ward no. 1 and 8 respectively (Table-3). Similarly the hardness ranged of pond water from a minimum 60 mg/l. and maximum 220 in ward no. 4 and 5, respectively (Table-4). The hardness of some places was above and some places were below the BIS desirable level 300 mg/l . in all the samples of ground and surface water but was less than the maximum permissible limit .

Total Dissolved Solid (TDS)

The total dissolved solid of tap water ranged from a minimum 434 mg/l. and maximum 710mg/l. in ward no. 5 and 6 respectively (Table-1). Similarly the variation of total dissolved solid of bore well water ranged from a minimum 448 mg/l. and maximum 836 mg/l. in ward no 1 and 2 respectively (Table-2). The total dissolved solid of well water ranged from a minimum 366 mg/l. and maximum 656 mg/l. in ward no. 1 and 2 respectively (Table-3). Similarly the total dissolved solid of pond water ranged from a minimum 302 mg/l. and maximum 558 mg/l. in ward no. 4 and 5 respectively (Table-4). The water samples of all the wards contain higher amounts of TDS than the desirable limits. The maximum TDS was detected in Gatapar836 mg/l in Abhanpur block.

Chloride

Table-1represent the variation in total chloride of tap water ranged from a minimum of 40 mg/l. and maximum of 280 mg/l. in ward no. 1 and 3. Similarly the chloride of bore well water ranged from minimum 150 mg/l. and maximum 330 mg/l. in a ward no. 8 and 5 respectively (Table-2). The chloride of well water ranged from minimum of 40 mg/l. and maximum 180 mg/l. in a ward no. 5 and 2 (Table-3). Similarly the variation of chloride ranged from pond water ranged from minimum 70 mg/l. and maximum 240 in a ward no. 2 and 5 respectively (Table-4). In present investigation the chloride content of ward no. 6 (280 mg/l.) (Tap water sample) and 330 mg/l.(well water) shows above the BIS desirable level 250 mg/l.

Table 1. Pre-monsoon physico-chemical characteristics of Tap water samples in (Abhanpur Block) of District Raipur

Parameter	BIS- standars	Abbhannpur	Gatapapar	Manikchauri	Bajrangpur	Kurra	Gobranawapara	Tarri	Paragan
	mg/l	TW1	TW2	TW3	TW4	TW5	TW6	TW7	TW8
pH	65.9.2	7.66	7.1	6.99	7.44	7.53	7.11	7.55	6.91
Alkalinity	Desireable 200mg/l permissible 600mg/l	120	150	40	200	80	120	70	50
Hardness	Desireable 300mg/l permissible 600mg/l	300	210	330	200	210	350	290	340
TDS	Desireable 500mg/l permissible 2000mg/l	468	624	706	520	434	710	660	594
Chloride	Desireable 250mg/l permissible 1000mg/l	40	220	280	100	120	200	250	170
Temperature-URE		27.2	26.8	26.8	26.7	26.7	26.6	26.6	26.5

Table 2. Pre-monsoon physico-chemical characteristics of Bore-well water samples in (Abhanpur Block) of District Raipur.

Parameter	BIS- standars	Abbhannpur	Gatapapar	Manikchauri	Bajrangpur	Kurra	Gobranawapara	Tarri	Paragan
	mg/l	BW1	BW2	BW3	BW4	BW5	BW6	BW7	BW8
pH	65.9.2	7.03	6.87	6.9	7.06	7.44	7.44	7.5	7.32
Alkalinity	Desireable 200mg/l permissible 600mg/l	80	150	110	190	50	190	250	220
Hardness	Desireable 300mg/l permissible 600mg/l	140	350	140	140	200	190	240	250
TDS	Desireable 500mg/l permissible 2000mg/l	448	836	550	570	646	632	730	650
Chloride	Desireable 250mg/l permissible 1000mg/l	190	280	250	200	330	210	200	150
Temperature -URE		27	27	26.8	26.8	26.5	26.4	26.5	26.4

Table: 3 Pre-monsoon physico-chemical characteristics of Well water samples in (Abhanpur Block) of District Raipur.

Parameter	BIS- standars	Abbhannpur	Gatapapar	Manikchauri	Bajrangpur	Kurra	Gobranawapara	Tarri	Paragan
	mg/l	WW1	WW2	WW3	WW4	WW5	WW6	WW7	WW8
pH	65.9.2	7.54	7.18	7.2	7.2	7.52	7.65	7.57	7.21
Alkalinity	Desireable 200mg/l permissible 600mg/l	60	240	170	200	180	100	120	150
Hardness	Desireable 300mg/l permissible 600mg/l	150	200	180	240	300	280	170	350
TDS	Desireable 500mg/l permissible 2000mg/l	366	656	458	572	528	476	434	620
Chloride	Desireable 250mg/l permissible 1000mg/l	130	180	90	110	40	80	120	100
Temperature -URE		26.9	26.9	26.8	26.7	26.4	26.5	26.5	26.5

Table 4. Pre-monsoon physico-chemical characteristics of Pond water samples in (Abhanpur Block) of District Raipur.

Parameter	BIS- standards	Abhanpur	Gatapur	Manikchauri	Bajrangpur	Kurra	Gobrana wapara	Tarri	Paragan
	mg/l	PW1	PW2	PW3	PW4	PW5	PW6	PW7	PW8
pH	65.9.2	7.33	7.13	7.45	7.69	7.58	7.44	7.77	7.54
Alkalinity	Desireable 200mg/l permissible 600mg/l	60	110	150	110	50	140	110	100
Hardness	Desireable 300mg/l permissible 600mg/l	150	120	110	60	220	110	140	190
TDS	Desireable 500mg/l permissible 2000mg/l	318	314	380	302	558	478	418	494
Chloride	Desireable 250mg/l permissible 1000mg/l	90	70	100	110	240	190	140	170
Temperature - URE		26.7	27	26.9	26.8	26.7	26.6	26.6	26.4

CONCLUSION

The study assessed the evolution of water quality in ground water and surface water of Abhanpur Block in Raipur District. A comparative study of both type of ground water and surface water was carried out by taking certain important parameters like temperature, PH, total dissolved solid, alkalinity, hardness and chloride.

The water samples of the entire Abhanpur block contain higher amount of TDS than the desirable limits. No sample crossed the maximum permissible limit for TDS Alkalinity, hardness chloride and PH.

In this present investigation it was found that the maximum parameters were not at the level of pollution. So both type of ground water and surface water satisfy the requirement for the use in various purposes.

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REFERENCES

- [1] Batchmat Y. 1994. "Ground water" containmation and control", Marcel Dekker, Inc, New York.
- [2] T.N. Tiwari, and M. Mishra, 1986. "Pollution in the river Ganga at Varanashi". Life Science Advances 5, pp. 130-137.
- [3] T.N. Tiwari, and M. Ali, 1987. "River pollution in Katmandu valley variation of water quality index", JEP 1, pp.347-351.
- [4] P.M Reddy, and V. Venkateswar, 1987. "Assessment of water quality in the river Tungabhadra near Kurnel", A.P.J. Environ. Biol. 8, pp. 109-199.
- [5] R.D.khulab, 1989."Prospective in aquatic biology". Papyrus Pub. House, New Delhi. Eds.
- [6] R.A. Vollenweidre, 1986. "Scientific fundamental of the eutrophication of lakes and flowing waters with special reference to nitrogen and phosphorus as factoring eutrophication". O.E.C.D. Paris.
- [7] National Academy of science. Eutrophication causes consequences and correctives. Nat.Acad.Sci. Washington,D.C.
- [8] C.P.Milway,1969."Educational in large lakes and impoundments". Proc. Upplasale Symp. DECD Paris.
- [9] T. Olimax, and U. Sikorska, 1975."Field experiment on the effect of municipal sewage on macrophytes and epifauna in the lake littoral". Bull. Acad. Pol. Sc. clii 23, pp.445-447.
- [10] E. Piecznska, Usikorna and T. Olimak, 1975."The influence of domestic sewage on the littoral of lakes". Pol.Arch. Hydrobiol. 22, pp.141-156.
- [11] H.B.Mahanand, M.R. Mahanand, and B.P. Mohanty, 2005. "Studies on the Physico-chemical and Biological Parameters of a Fresh Water Pond Ecosystem as an Indicator of Water Pollution". Ecol. Env & Cons 11(3-4), pp537-541.
- [12] P.D.Moore, Jr. T. C. Daniel, J. T. Gilmour, B. R. Shereve, D. R. Edward, and B.H.Wood, 1998. "Decreasing Metal Runoff from Poultry Litter with Aluminum Sulfate". J.Env. Qual.27, pp. 92-99.
- [13] Kumar A., 1995. Periodicity and Abundance of Plankton in Relation to physico-chemical Characteristics of Tropical Wetlands of South Bihar. Ecol. Env. And Cons. Vol., pp.47-54.
- [14] Gay and Proop, 1993."Aspects of Rive pollution, Butterworth's Scientific Publication", London.
- [15] R.A. Vollenwider, 1998. "water Management research. Scientific fundamentals of the eutrophication of lakes and flowing waters

- with particular reference to nitrogen and phosphorus as factor in eutrophication," pp.45-72.
- [16] B.A. Muller. 2001. Residential Water Source and the Risk of Childhood Brain Tumors. *Env. Health. Perspt.* Vol.109 (6)
- [17] P. G." 2003. Parivesh Groundwater", Ed Dilip Biswas, p.3.
- [18] P. J. Veslind, 1993. "National Geographic Senior Writer", national Geographic, Vol. 183, No.5.
- [19] C.L. Zaman, 2002. "A Nested Case Control Study of methemoglobinemia Risk Factors in Children of Transylvania, Romania". *Env. Health Perspt.* Vol. 110 (B).
- [20] R.K. Trivedy, 1990. "Physico-Chemical Characteristics and Phytoplankton of the River Panchganaga near Kolhapur, Maharastra". *River Pollution in India* (Ed. R.K. Trivedy) Ashish Publishing House, Delhi, pp.159-178.
- [21] Welch Limnology 2nd Edn. 1952. McGraw Hill Book Co., New York.
- [22] APHA, 1989. "Standard method for examination of water and waste and waste water", American Public Health Association, Washington, D.C.