



Ground Water Quality At Ghazipur City Of Eastern Uttar Pradesh, India

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Abstract:

The ground water is the main source of fresh water in this small city of Eastern Uttar Pradesh. The water samples were collected from eight sites twice, once in month of November 2010 and other in February 2011. Physico-chemical parameters viz., colour, odour, electrical conductivity (E.C.) total dissolved solid (TDS), hardness, chloride, calcium, total alkalinity and phosphate were analyzed. In some of the samples water impart colour and odour. The TDS value ranged from 240 to 1690 mg l⁻¹ in November sample and from 280 to 1420 mg l⁻¹ in February sample. Total hardness was higher than prescribed by various standards, this show that water in entire city is moderately hard to hard. The chloride contents were higher and ranged from 116 to 303 mg l⁻¹ in November sample and from 202 to 484 mg l⁻¹ in February sample. E.C. ranged from 0.34 to 2.65 μ siemens cm⁻¹ in November sample and from 0.24 to 1.62 μ siemens cm⁻¹ in February sample. The phosphate contents were below the detectable limit. In most of the cases the average value of parameters were lower in November sample than February samples, except TDS and E.C., probably due to the dilution of underground water during rain.

keywords: Physico-chemical parameters, TDS, Ground water potability, hardness

1.Introduction

Ghazipur is an ill developed city of Eastern Uttar Pradesh lying at the bank of River Ganges about 75 km downstream to Varanasi. It is situated at 25° 34' longitude and 83° 35' latitude. The main source fresh water for domestic use in this city is ground water. However, river water is also used for irrigation and washing. The ground water generally extracted from ground water aquifers by dug wells, hand pumps and tube wells.

During monsoon the flooding of catchment area of river and subsequent percolation of polluted water makes ground water contaminated. The extent of pollution gets aggravated by seepage of wastes from sewer lines and septic tanks. All these factors make ground water impotable. It is also getting contaminated from leachates of solid wastes generated from open dumping, as in Ghazipur there is no safe disposal of solid wastes.

The physico-chemical character of ground water also has seasonal variability largely due to seepage of surface load by infiltration which makes a way for pollutants to enter into ground water aquifers and rainy season recharge causes the dilution of pollutants. For the present study of ground water quality of Ghazipur, eight sampling sites were chosen which represent the entire city, and sampling were done twice once in post-monsoon season in the month of November 2010 and other in pre-monsoon season of next year in the month of February 2011. The parameters viz., colour, odour, electrical conductivity (E.C.) total dissolved solid (TDS), hardness, chloride, calcium, total alkalinity and phosphate were analyzed.

2.Materials And Methods

The water samples were collected from 8 sites chosen randomly covering the entire city of Ghazipur. The sampling was done twice as stated above. The samples were collected in washed polypropylene bottles of 250 ml size. Colour of the samples were determined by visual comparison with the standard solution of known concentration using Platinum-Cobalt comparator. Odour of the samples was determined by sniffing the samples and identifying the smell. Electrical conductivity was measured by digital conductivity meter (RI 215R). Rests of the parameters were analyzed by standard methods prescribed in APHA (1995).

3.Result And Discussion

The result of the present study is summarized in the following table. The post-monsoon sample is given in table 1 where as pre-monsoon sample is in the table 2.

S.N.	Sampling Sites	Parameters								
		Colour	Odour	Total Dissolved Solid (mg ^l ⁻¹)	Total Hardness (mg ^l ⁻¹)	Chloride (mg ^l ⁻¹)	Calcium (mg ^l ⁻¹)	Electrical Conductivity (μ siemens cm ⁻¹)	Total Alkalinity (mg ^l ⁻¹)	Phosphate (mg ^l ⁻¹)
1	Gora Bazar	CL ¹	OL ³	1010	496	234	31	2.24	242	BD ⁵
2	Peer Nagar	CL	OL	920	690	303	38	2.65	202	BD
3	Mishra Bazar	CL	OL	240	522	116	112	1.17	84	BD
4	Bara Pura	CL	OL	1690	460	263	19	1.68	164	BD
5	Miyan Pura	CL	OL	820	324	272	21	0.67	150	BD
6	Aam Ghat Colony	CL	OL	1030	480	157	14	1.91	126	BD
7	Sayedwada	CL	OL	1620	444	191	84	0.34	116	BD
8	GangaVihar colony	C ²	O ⁴	1590	546	205	83	1.04	320	BD
--	-----	Average		1115	495	218	50.3	1.46	176	----
--	-----	Standard Deviation		496	103	63	37.2	0.79	76.7	----

Table 1: November (Post-monsoon) Sample

S.N	Sampling Sites	Parameters								
		Colour	Odour	Total Dissolved Solid (mg ^l ⁻¹)	Total Hardness (mg ^l ⁻¹)	Chloride (mg ^l ⁻¹)	Calcium (mg ^l ⁻¹)	Electrical Conductivity (μ siemens cm ⁻¹)	Total Alkalinity (mg ^l ⁻¹)	Phosphate (mg ^l ⁻¹)
1	Gora Bazar	CL	OL	790	764	359	26	0.38	301	BD
2	Peer Nagar	CL	OL	610	488	302	21	0.34	402	BD
3	Mishra Bazar	CL	OL	280	606	484	115	0.71	264	BD
4	Bara Pura	CL	OL	1420	642	470	20	0.91	202	BD
5	Miyan Pura	CL	OL	410	448	300	25	0.43	306	BD
6	Aam Ghat Colony	CL	OL	320	706	215	18	1.62	248	BD
7	Sayedwada	CL	OL	1230	566	202	93	0.24	208	BD
8	Ganga Vihar colony	C	O	1360	364	203	99	0.91	360	BD
--	----	Average		803	573	317	52.1	0.69	286	----
--	----	Standard Deviation		474	134	114	42.1	0.46	70.3	----

Table 2: February (Pre-monsoon) Sample

¹CL is colourless²C is coloured³OL is odourless⁴O is having offensive odour⁵BD is Below Detectable Level

In most of the samples water is colorless and odourless in both post-monsoon and pre-monsoon samples which indicate that organic content is low (Jain et al., 1996) probably due to low water table, which gives sufficient time and space for its decomposition. Since there is no industrialization in city area therefore, organic matter is having domestic origin and mostly biodegradable in nature. The total dissolved solid (TDS) values were high in both post-monsoon and pre-monsoon samples ranging from 240 to 1690 mg^l⁻¹ in November sample (average 1115 mg^l⁻¹ and S.D. 496 mg^l⁻¹) and from 280

to 1420 mgL⁻¹ in February samples (average 803 mgL⁻¹ and S.D. 474 mgL⁻¹). The TDS values were higher November samples probably due to dissolution of minerals during water percolation in rainy season (Jha and Verma, 2000). This finding is supported by higher electrical conductivity and chloride concentration in the sample (Hem, 1970). This indicates that water is moderately hard to hard.

Total hardness is lower in November sample ranging from 324 to 690 mgL⁻¹ (average 495 mgL⁻¹ and S.D. 103 mgL⁻¹) than February sample ranging from 364 to 764 mgL⁻¹ (average 573 mgL⁻¹ and S.D. 134 mgL⁻¹). The higher value of hardness in February sample is probably due to the dissolution of carbonate minerals in anaerobic condition found underground.

The chloride content is also very high in comparison to various standards (WHO, 2004 and ICMR, 1985). The chloride content in November sample ranged from 116 to 303 mgL⁻¹ (average 218 mgL⁻¹ and S.D. 63 mgL⁻¹) and in February samples from 202 to 484 mgL⁻¹ (average 317 mgL⁻¹ and S.D. 114 mgL⁻¹). This indicates that chloride minerals are getting dissolved in greater concentration in underground environment.

Calcium content ranged from 14 to 112 mgL⁻¹ (average 50.3 and S.D. 37.2 mgL⁻¹) in November samples and from 14 to 114 mgL⁻¹ (average 52.1 and S.D. 42.1) in February samples. Calcium shows greater degree of stability in concentration and seasonal change, indicating that it is least influenced by rain. The dilution and dissolution, balancing each other resulting into stable concentration.

The electrical conductivity is having greater variability ranging from 0.34 to 2.65 μ siemens cm⁻¹ (Average 1.46 μ siemens cm⁻¹ and S.D. 0.46) in November sample and from 0.24 to 1.62 μ siemens cm⁻¹ (average 0.69 and S.D. 0.46) in February sample. Electrical conductivity is lower in November sample than February sample.

Total alkalinity is very high in both November and February samples, however February samples show much higher value than November sample. This indicates that water is highly buffered. The phosphate concentrations were very low in all the samples and were below detectable limit.

It is concluded that water of the Ghazipur city is not good for its potability, because most of the parameters were beyond the acceptable limits as prescribed by WHO (2004) and ICMR (1985). However, the parameters were not too high to pose any serious health hazard. But long term effects cannot be ruled out.

4.Reference

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