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Case Report

STUDY OF WATER QUALITY PARAMETERS IN THE UNDERGROUND WATER OF BILARIYAGANJ NAGAR PANCHAYAT AREA OF AZAMGARH, U.P

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ABSTRACT

Ground water is the main source of fresh water in this nagar panchayat area of Azamgarh district. The water samples are collected twice from the eleven sites selecting at least one from each ward of the nagar panchayat area, first sampling is done in the month of November 2016 and the other in February 2017. The physico-chemical parameters viz., colour, odour, turbidity, electrical conductivity (EC), total dissolved solid (TDS), hardness, chloride, calcium, pH and biochemical oxygen demand (BOD) were analysed. In the most of the samples, water is colourless and does not impart turbidity. Only few samples have odour. TDS was very high in almost all the samples. The water is moderately hard. The concentration of calcium was within acceptable limit. The pH is above neutral in all the samples hence shows alkalinity. Chloride concentration was very high in the collected samples. The values of BOD were reported to be also high in the samples collected from the different sampling stations.

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INTRODUCTION

Bilariaganj is a town and a nagar panchayat in Azamgarh district in the state of Uttar Pradesh, India. Bilariaganj is located at 26.2°N 83.23°E coordinates. It has an average elevation of 66 metres (216 feet). It has total population as per 2011 census is 11,891. Ground water is the main source of fresh water in this nagar panchayat area Azamgarh district. The ground water is generally extracted from ground water aquifers by bore well, dug well, 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 leakages of solid wastes generated from open dumping. The physico-chemical characters 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 water quality of Bilariaganj nagar panchayat, eleven sampling station were earmarked selecting one sampling station from each ward, and sampling has been done twice once in post monsoon

season in the month of November 2016 and other in pre-monsoon season of impending year in the month of February 2017. The physico-chemical parameters viz., colour, odour, turbidity, electrical conductivity(EC), total dissolved solid(TDS), hardness, chloride, calcium, pH and biochemical oxygen demand(BOD) were analysed.

MATERIALS AND METHODS

The ground water samples collected from various sampling stations of the Bilariaganj panchayat covering the entire nagar panchayat area. It has eleven wards, one sampling station has been selected from each ward for the purpose of study, the details of sampling station are given in the table-1

Table 1 Details of Sampling Stations

S.No.	WARD	Sampling station	Owner of the hand Pump
1	Bilariaganj Ward No. 1	SS ¹	Mr M M Khan
2	Bilariaganj Ward No. 2	SS ²	Mrs Rabiya Khatoon
3	Bilariaganj Ward No. 3	SS ³	Mrs Israwati Devi
4	Bilariaganj Ward No. 4	SS ⁴	Mrs Sameena Khan
5	Bilariaganj Ward No. 5	SS ⁵	Mr Alok Prajapati
6	Bilariaganj Ward No. 6	SS ⁶	Mr Zubair Alam
7	Bilariaganj Ward No. 7	SS ⁷	Mr Mohd Irshad

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8	Bilariyaganj Ward No. 8	SS ⁸	Mr Mohd Parvez
9	Bilariyaganj Ward No. 9	SS ⁹	Mr Imran Ali
10	Bilariyaganj Ward No. 10	SS ¹⁰	Mr Noorul Huda
11	Bilariyaganj Ward No. 11	SS ¹¹	Mrs Sitara Devi

Electrical conductivity was measured by digital conductivity meter (RI 215R). Rests of the parameters were analysed by Standard Methods as prescribed in APHA (1995).

The samples were collected from the different stations in prewashed polypropylene bottles of 250ml size. The colour of the samples was 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. Turbidity and transparency were determined by viewing the samples against the white card board after passing light through it.

Table 2 Physico-chemical parameters in November 2014 (Post Mansoon Samples)

#	Sampling Station	Colour	Odour	Turbidity	EC (μ siemens cm-1)	TDS (mg/l ⁻¹)	Total Hardness (mg/l ⁻¹)	Chloride (mg/l ⁻¹)	Calcium (mg/l ⁻¹)	pH	BOD
1	SS ¹	Colourless	Odourless	Clear	2.07	1040	496	283	89	8.1	6.3
2	SS ²	Colourless	Offensive Odour	Clear	2.65	1850	780	315	114	8.3	9.9
3	SS ³	Colourless	Odourless	Clear	1.18	520	324	145	27	7.3	4.4
4	SS ⁴	Colourless	Odourless	Clear	1.24	680	460	248	32	7.6	4.4
5	SS ⁵	Colourless	Odourless	Clear	1.98	930	510	264	41	8.0	5.9
6	SS ⁶	Colourless	Odourless	Clear	1.65	840	410	240	39	7.9	5.3
7	SS ⁷	Colourless	Odourless	Clear	1.69	875	455	245	34	7.9	5.4
8	SS ⁸	Colourless	Odourless	Clear	1.46	740	355	185	30	7.8	4.5
9	SS ⁹	Colourless	Odourless	Clear	1.54	790	390	189	31	7.8	4.4
10	SS ¹⁰	Colourless	Odourless	Clear	0.78	400	285	110	19	7.0	4.1
11	SS ¹¹	Colourless	Odourless	Clear	1.17	500	310	137	21	7.2	4.2
	Mean (\bar{x})	-	-	-	1.58	833.18	434.09	214.63	43.36	7.72	5.34
	Standard Deviation(s)	-	-	-	0.52	389.69	137.43	65.74	30.01	0.40	1.68

Table 3 Physico-chemical parameters in November 2014 (Pre Mansoon Samples)

#	Sampling Station	Colour	Odour	Turbidity	EC (μ siemens cm-1)	TDS (mg/l ⁻¹)	Total Hardness (mg/l ⁻¹)	Chloride (mg/l ⁻¹)	Calcium (mg/l ⁻¹)	pH	BOD
1	SS ¹	Colourless	Odourless	Clear	0.94	840	566	381	92	7.9	6.0
2	SS ²	Colourless	Offensive Odour	Clear	0.98	1410	800	398	121	8.0	9.4
3	SS ³	Colourless	Odourless	Clear	0.70	340	345	205	33	7.2	4.2
4	SS ⁴	Colourless	Odourless	Clear	0.74	390	490	280	39	7.3	4.3
5	SS ⁵	Colourless	Odourless	Clear	0.84	710	540	290	47	8.0	5.2
6	SS ⁶	Colourless	Odourless	Clear	0.81	680	470	265	43	7.8	5.1
7	SS ⁷	Colourless	Odourless	Clear	0.79	690	465	275	39	7.9	5.4
8	SS ⁸	Colourless	Odourless	Clear	0.73	640	360	201	33	7.7	4.3
9	SS ⁹	Colourless	Odourless	Clear	0.75	660	424	202	34	7.6	4.2
10	SS ¹⁰	Colourless	Odourless	Clear	0.24	300	315	190	21	6.8	4.0
11	SS ¹¹	Colourless	Odourless	Clear	0.69	330	345	200	24	6.9	4.1
	Mean (\bar{x})	-	-	-	0.75	635.45	465.45	262.45	47.82	7.55	5.11
	Standard Deviation(s)	-	-	-	0.19	317.21	138.82	73.17	30.66	0.44	1.56

RESULTS AND DISCUSSION

The results of present study is summarized in the above tables. The post monsoon samples is given in table-2 whereas pre monsoon samples were given in table -3. In almost all the samples water is colourless, odourless and without turbidity in both post monsoon and pre monsoon samples which indicates 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 the studied area therefore, organic matter is having domestic origin and mostly biodegradable in nature. The electrical conductivity is high in post monsoon as compared to the pre monsoon samples with the mean of 1.58(SD 0.52) and 0.75 (SD 0.19) μ siemens cm^{-1} respectively. The total dissolved solids(TDS) values are high in both post monsoon and pre monsoon samples ranging from 400 to 1850 mg l^{-1} in November sample (mean 833.18 mg l^{-1} and SD 389.69 mg l^{-1}) and from 300 to 1410 mg l^{-1} in February sample (mean 635.45 mg l^{-1} and SD 317.21 mg l^{-1}). The TDS values were higher in November samples probably due to dissolution of minerals during water percolation in rainy season (Jha & Verma,2000). This finding is also supported by the higher electrical conductivity and chloride concentration in the sample(Hem, 1970). These facts indicates that water is moderately hard to hard. Total hardness is lower in post monsoon sample ranging from 285 to 780 mg l^{-1} (mean 434.09 mg l^{-1} and SD 137.43 mg l^{-1}) than pre monsoon sample ranging from 315 to 800 mg l^{-1} (mean 465.45 mg l^{-1} and SD 138.82 mg l^{-1}) The higher values of hardness in pre monsoon sample is probably due to the dissolution of carbonate minerals in found in underground anaerobic conditions. The chloride content is also very high in comparison to various standards (WHO, 2004 & ICMR,1985). The chloride content in November sample ranged from 110 to 315 mg l^{-1} (mean 214.63 mg l^{-1} and SD 65.74 mg l^{-1}) and in February sample ranged from 190 to 398 mg l^{-1} (mean 262.45 mg l^{-1} and SD 73.17 mg l^{-1}). These data indicates that chloride minerals are getting dissolved in greater concentration in underground conditions. Calcium content ranged from 19 to 114 mg l^{-1} (mean 43.36 mg l^{-1} and SD 30.01 mg l^{-1}) in November samples and from 21 to 121 mg l^{-1} (mean 47.82 mg l^{-1} and SD 30.66 mg l^{-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 balanced each other results in stable concentration.

The value of pH was recorded in the range 7.0 to 8.3 in November samples while it range from 7.3 to 8.0 in February samples, as pH is a term used universally to express the intensity of the acid or alkaline condition of a solution. Most of the samples are slightly alkaline due to the presence of carbonates and bicarbonates (Manivaskam, 1996). The value of Biochemical Oxygen Demand (BOD) in November sample ranging from 4.1 to 9.9 (mean 5.34 and SD 1.68) and in February sample from 4.0 to 9.4 (mean 5.11 and SD 1.56).

CONCLUSION

It is concluded that the underground water of Bilariyaganj nagar panchayat 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 limits of physico-chemical parameters were not too high to pose any serious health issue, but one cannot ruled out its long term effects.

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