

## Seasonal Variability and Physico-Chemical Characteristics of Ground Water at Azamgarh

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**ABSTRACT:** The ground water is the chief source of fresh water in this small city of Eastern Uttar Pradesh. The samples were collected from fifteen sites covering the entire city of Azamgarh from the hand pumps and bore wells twice, once in the pre-monsoon season in the months of March-April 2011 and other in post-monsoon season, during the month of November-December 2011. Physico-chemical parameters viz., colour, odour, turbidity, transparency, total dissolved solid (TDS), hardness, calcium, pH and chloride were analyzed.

In most of the pre-monsoon samples, water is colourless and does not impart turbidity but in post-monsoon samples colour and turbidity develop. Only few samples of pre-monsoon sampling had odour, whereas most of the post-monsoon samples had offensive odour. TDS was also very high in both pre and post-monsoon samples. The water is moderately hard, the hardness increased in post-monsoon samples. The concentration of calcium was within acceptable limits however, concentration is found higher in post-monsoon samples. The pH is nearly neutral in both samples and hence shows low alkalinity. Chloride concentration was very high, ranged from 140 mg/l to 490 mg/l in pre-monsoon and 460 mg/l to 660 mg/l in post-monsoon samples.

**Keywords**— Physico-chemical parameters, total dissolved solid (TDS)

### I. INTRODUCTION

Water is one of the most important natural resources after air for human survival. The ground water (particularly from upper strata) is chief source of fresh water in Eastern Uttar Pradesh. The rain water which infiltrates through soil dissolves more salt than corresponding surface water due to higher partial pressure of CO<sub>2</sub> in percolating water than surface water. Human beings have designed various methods to withdraw underground water for his daily needs. Dug wells, tube wells, hand pumps etc. are some of the methods of ground water extraction.

After monsoon and floods, and the seepage from sewer lines and septic tanks ground water gets polluted. Agitation also occurs in the underground water making the water colloidal and turbid. All these factors make water impotable. The physico-chemical character of ground water also has seasonal variability by two factors, firstly the seepage of pollutants by percolating water during rain and secondly by the dilution of groundwater during monsoon.

### II. MATERIALS AND METHODS

The present investigation deals with the qualitative analysis of variations in parameters of groundwater due to monsoon. For this purpose water samples were collected from 15 sites chosen randomly covering the entire city of Azamgarh, the detail of sampling site is given in table-1. The samples were collected twice, once in pre-monsoon season in the month of March-April 2011, and other in post-monsoon season in the month of November-December 2011. The samples were collected in washed polypropylene bottles of 250 ml 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 sniffing the samples and identifying the smell. Turbidity and transparency were determined by viewing the sample against white card board after passing light through it. Rests of the parameters were analyzed by standard methods prescribed in APHA (1985).

**Table-1**  
**Details of Sampling Stations**

S.No.	LOCALITY	SAMPLING STATION
1	Chowk	SS <sup>1</sup>
2	Near S.N.C.	SS <sup>2</sup>
3	Musepur	SS <sup>3</sup>
4	Raidopur, near SBI	SS <sup>4</sup>
5	Ailwal Kali Chaura	SS <sup>5</sup>
6	Katra Tiraha	SS <sup>6</sup>
7	Jafarpur	SS <sup>7</sup>
8	Pandey Bazar	SS <sup>8</sup>
9	Near Roadways	SS <sup>9</sup>
10	Heera Patti Tiraha	SS <sup>10</sup>
11	Old Tons Bridge	SS <sup>11</sup>
12	Baz Bahadur	SS <sup>12</sup>
13	Hydel Colony	SS <sup>13</sup>
14	Sidhari	SS <sup>14</sup>
15	Jama Masjid	SS <sup>15</sup>

### III. RESULTS AND DISCUSSION

The result of the present study is summarized in the following tables, the pre-monsoon sample is given in table 2 whereas post-monsoon is in the table 3.

**Table-2**

S. No.	Sampling Station	Colour	Odour	Turbidity	Transparency	TDS(in mg l <sup>-1</sup> )	Hardness (in mg l <sup>-1</sup> )	Calcium (in ppm)	pH	Chloride (in ppm)
1	SS <sup>1</sup>	Colourless	Odourless	Clear	Transparent	660	54	45	7.0	240
2	SS <sup>2</sup>	Colourless	Odourless	Clear	Transparent	780	76	64	7.1	330
3	SS <sup>3</sup>	Colourless	Odourless	Clear	Transparent	550	39	29	7.0	310
4	SS <sup>4</sup>	Colourless	Fishy	Clear	Transparent	1010	73	60	7.2	380
5	SS <sup>5</sup>	Colourless	Odourless	Slightly turbid	Transparent	720	80	66	6.9	280
6	SS <sup>6</sup>	Colourless	Odourless	Clear	Transparent	580	32	29	7.0	340
7	SS <sup>7</sup>	Colourless	Odourless	Clear	Transparent	120	21	20	7.0	220
8	SS <sup>8</sup>	Colourless	Odourless	Clear	Transparent	670	43	37	7.0	370
9	SS <sup>9</sup>	Colourless	Odourless	Clear	Transparent	810	102	83	6.4	410
10	SS <sup>10</sup>	Colourless	Odourless	Clear	Transparent	660	83	68	7.1	360
11	SS <sup>11</sup>	Colourless	Odourless	Clear	Transparent	120	12	11	7.0	140
12	SS <sup>12</sup>	Colourless	Odourless	Clear	Transparent	710	97	82	7.2	380
13	SS <sup>13</sup>	Colourless	Mouldy	Slightly turbid	Transparent	760	76	57	6.8	490

14	SS <sup>14</sup>	Colourless	Odourless	Clear	Transparent	720	69	57	7.0	350
15	SS <sup>15</sup>	Colourless	Odourless	Clear	Transparent	830	37	34	7.0	360

**Table-3**  
**Post-Monsoon Data**

S. No.	Sampling Station	Colour	Odour	Turbidity	Transparency	TDS (in mg l <sup>-1</sup> )	Hardness (in mg l <sup>-1</sup> )	Calcium (in ppm)	pH	Chloride (in ppm)
1	SS <sup>1</sup>	Light yellow	Earthy	Turbid	Translucent	620	79	66	7.0	510
2	SS <sup>2</sup>	Dirty yellow	Deep earthy	Highly turbid	Translucent	1350	107	91	7.1	640
3	SS <sup>3</sup>	Light yellow	Earthy	Turbid	Slightly translucent	1330	60	49	7.0	540
4	SS <sup>4</sup>	Light yellow	Deep fishy	Turbid	Translucent	1210	98	83	7.2	580
5	SS <sup>5</sup>	Blackish	Pungent	Turbid	More translucent	1780	112	93	6.9	490
6	SS <sup>6</sup>	Orange yellow	Earthy	Turbid	More translucent	1510	61	50	7.0	520
7	SS <sup>7</sup>	Colourless	Earthy	Slightly turbid	Slightly translucent	510	30	25	7.0	460
8	SS <sup>8</sup>	Brownish	Deep fishy	Turbid	Translucent	1590	77	63	7.0	560
9	SS <sup>9</sup>	Dirty reddish	Pungent	Turbid	More translucent	1980	168	141	6.4	620
10	SS <sup>10</sup>	Yellowish	Deep fishy	Turbid	Translucent	1280	125	107	7.1	580
11	SS <sup>11</sup>	Colourless	Pungent	Turbid	Slightly translucent	510	18	14	7.0	560
12	SS <sup>12</sup>	Yellowish	Earthy	Turbid	Translucent	1790	137	111	7.2	540
13	SS <sup>13</sup>	Light yellow	Earthy	Highly turbid	More translucent	1810	95	84	6.8	660
14	SS <sup>14</sup>	Brownish	Deep fishy	Turbid	Translucent	1680	103	84	7.0	570
15	SS <sup>15</sup>	Light yellow	Earthy	Turbid	Translucent	1720	78	64	7.0	540

Most of the pre-monsoon samples did not show colour hence it is colourless and transparent; however, colour and turbidity develop in post-monsoon samples probably due to seepage and percolation of organic pollutants during ground water recharge. This finding is evident by the presence of odour in most of the post-monsoon samples, as most of the pre-monsoon samples are odourless. The odour is the first indication of organic matter pollution in ground water (Jain *et al.*, 1996). TDS were high in both pre and post-monsoon samples; it varied from 120 mg l<sup>-1</sup> to 1010 mg l<sup>-1</sup> in pre-monsoon sample and from 510 mg l<sup>-1</sup> to 1980 mg l<sup>-1</sup> post-monsoon samples. Thus the water is moderately hard, the hardness increased in post-monsoon samples. The concentration of calcium was within acceptable limits prescribed by ICMR (1985) and WHO (2005). The range of concentration in pre-monsoon samples is having lesser variability (11 mg l<sup>-1</sup> to 83 mg l<sup>-1</sup>) than post-monsoon samples (14 mg l<sup>-1</sup> to 141 mg l<sup>-1</sup>). The pH is nearly neutral in both samples and hence shows low alkalinity. Chloride concentration was very high ranged between 140 mg l<sup>-1</sup> and 490 mg l<sup>-1</sup> in pre-monsoon and 460 mg l<sup>-1</sup> and 660 mg l<sup>-1</sup> in post-monsoon samples.

#### **IV. CONCLUSION**

On the basis of results of present study, the water of the Azamgarh, particularly upper strata ground water which is taken out from ordinary hand pumps and dug wells are not good for its potability. Most of the parameters are beyond the acceptable limits prescribed by WHO (2005) and ICMR (1985). However, the parameters were not so high to cause acute toxicity and serious health hazard, but long term effects cannot be ruled out.

#### **REFERENCES**

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