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Assessment of underground water quality around Atarra region district Banda (U.P.)

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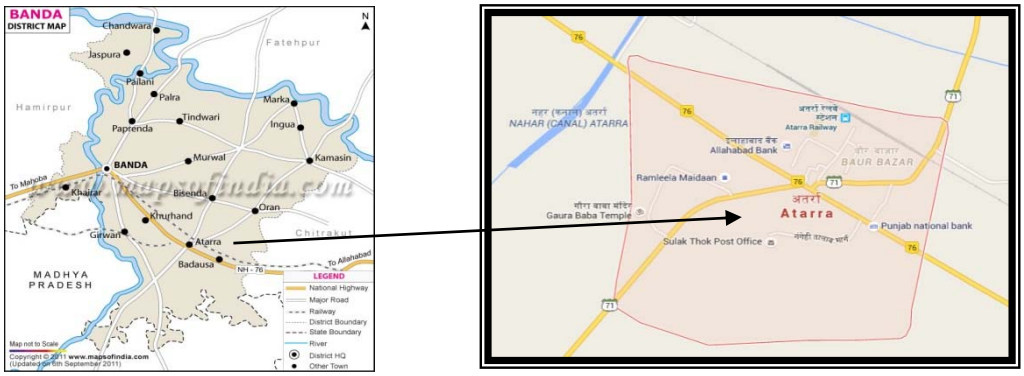
Abstract
Present paper deals assessment of ground water in Atarra region. In current work sample from 9 Open wells from study area were Selected and tested for various parameters. The hydro chemical analysis has been done by using piper diagram for both the seasons, i.e. pre and post monsoon. The groundwater quality is tested based on Sodium percent, Sodium Absorption Ratio and Residual Sodium Carbonate & suitability of water for irrigation purpose is examined and found out it is suitable for irrigation purpose. From the result it has shown the sampling points having hardness, TDS, conductivity and chlorides exceed the permissible limit as per APHA standards. So that it is not safe for drinking purpose. Thus from the overall analysis some suggestions & remedial measures are provided in the paper for the same.

Keywords: Ground water pollution, Atarra, hydro chemical analysis.

1. Introduction
The chemistry of water is very vibrant, mostly controlled by its medium of contact. In view of the fact that the chemistry of water directly hints the quality of water for various purposes, its monitoring and evaluation gained considerable importance in the present century. A terrific raise in the population increased the stress on surface water and the groundwater (Butt and Ghaffar, 2012; Ghorabaand Khan, 2013; Kashyap, 2015 and Niloufer, *et al.* 2013) [1-5]. From the ancient times the ground water is used mostly for drinking because of the filtering effect of aquifers. Though, in at present one cannot drink the water directly from the source without treatment. Various chemical, physical and biological processes alter the original quality of water when it moves through the hydrological cycle; the reactions of soil, rock, organic matter, Natural processes and human activities are causes behind changes in groundwater quality. So this study examines the quality of ground water throughout the hadapsar region & It is seen that the ground water quality at some places is not fulfilling the desired parameters (Patil, *et al.* 2013; Sadashivaial, *et al.* 2008; Sarla and Ravi, 2012 and Tank and Candel, 2010) [6-10].
The ground water quality may affect due to human activities, unlimited use of chemical fertilizers etc. such factors lead to decrease in water qualities in wells & bores in the area. Water from such wells & bores is currently used by the people in the area for drinking, domestic & agricultural purpose which might affect the health of people.
Therefore it is necessary to assess the ground water quality status of the areas around Atarra region during the pre-monsoon and post monsoon period to frame the policy and management plan for the protecting it from the contamination and further detoriation of water quality.

2. Material and Methods
Atarra is a medium-size town and Tehsil located at 25.28°N 80.57°E in Dist. Banda (Uttar Pradesh). It has an average elevation of 124 metres (406 feet). Atarra is situated in Jhansi-Allahabad rail link and nearly 11kms from city Badausa. It has a big rice belt area having different kinds of flavored rice. Rice, Wheat, Pulses and Sugarcane are its major crops. It is believed that its name is derived based on Ramayan era great sage Maharshi Atri. Ramayan era great epic place Chitrakoot area is hardly 30 K.M. from Atarra.



Map 1: Location map of Atarra Region District Banda (U.P.).

Groundwater samples are randomly collected from rural areas like Badousa, Khurhand and Naraini. All the three areas are surrounded by agricultural land and residential area. The 4 open well samples from Badousa, 4 open well samples from Khurhand and 2 open well samples from Naraini were collected. All the samples were collected by grab sampling method in plastic bottle from all the sampling stations.

The collected samples were analyzed for various parameters like pH, Total Dissolved Solids, Hardness, Conductivity, Turbidity, Alkalinity, Chlorides, Sulphates, Calcium, Magnesium, Na, K Bicarbonates and Temperature. All the samples were tested as per APHA [11] standards.

3. Result and Discussion

The parameters are selected on the basis of two steps. First one is the cations and anions that required for Pie diagram which indicates the concentration of ions in water. Second one is to check the suitability of water for irrigation purpose on the basis of Residual sodium carbonate (RSC), Sodium Hazard and Sodium adsorption ratio (SAR). The Ground water quality parameters analyzed for open wells around Atarra region. These samples were analyzed during post monsoon (Nov. 2014) and pre monsoon (Apr. 2015) period for below mentioned water quality Parameters. The results are as shown in tables 1-2.

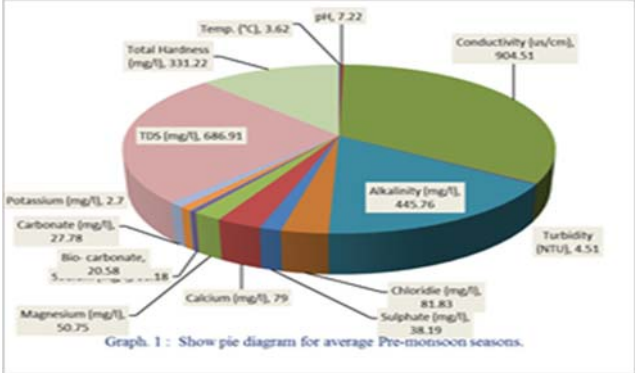
Table 1: Analysis of Pre Monsoon Season.

S. No.	Parameters	OW1	OW2	OW3	OW4	OW5	OW6	OW7	OW8	OW9	Avg.
1.	Temp. (°C)	6.3	5.2	2.3	4.2	2.3	2.5	1.2	2.3	6.3	3.62
2.	pH	7.1	7.16	7.22	7.3	7.28	7.14	7.19	7.10	7.5	7.22
3.	Conductivity (us/cm)	789.23	944	742	652.3	1576	789	896	900	852.1	904.51
4.	Turbidity (NTU)	4.2	0.4	2.1	3.2	9.1	7.5	4.5	6.5	3.1	4.51
5.	Alkalinity (mg/l)	426.12	327.6	264.74	250.21	681.38	751	303.14	551.46	456.2	445.76
6.	Chloridie (mg/l)	75.26	66.53	50.88	62.33	111.54	100.23	74.38	95.12	100.2	81.83
7.	Sulphate (mg/l)	52.3	31.1	24.3	35.6	48.63	35.13	29.35	42.13	45.2	38.19
8.	Calcium (mg/l)	76.13	87.49	70.33	71.23	96.06	86.15	69.2	72.13	82.3	79.00
9.	Magnesium (mg/l)	36.98	45.12	55.28	48.13	56.3	62.3	65.06	45.3	42.3	50.75
10.	Sodium (mg/l)	10.37	9.15	10.37	8.26	11.3	15.2	10.37	10.37	15.23	11.18
11.	Potassium (mg/l)	2.0	3.5	2.0	4.6	3.1	2.5	2.0	2.0	2.6	2.70
12.	Bio- carbonate	12.56	10.52	8.58	9.12	32.1	29.1	27.64	23.2	32.4	20.58
13.	Carbonate (mg/l)	28	28	28	27.8	28	27.2	28	28	27	27.78
14.	TDS (mg/l)	526.23	622	486	450	1082	1012	597	895	512	686.91
15.	TH (mg/l)	375.20	451.2	355.2	258.8	248.3	248.2	352.3	316.7	375.1	331.22

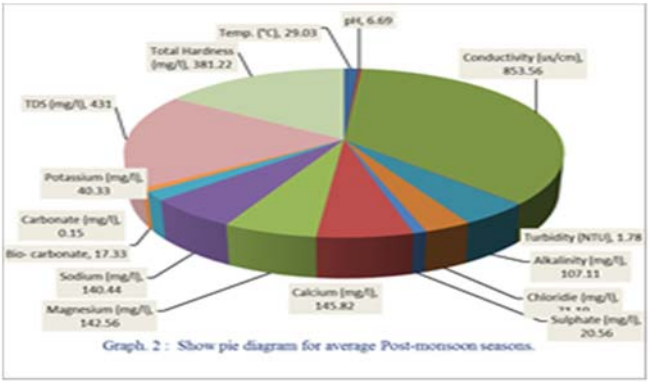
Table 2: Analysis for post monsoon season

S. No.	Parameters	OW1	OW2	OW3	OW4	OW5	OW6	OW7	OW8	OW9	Avg.
1.	Temp. (°C)	29	28.9	29.1	29	29	29.30	29	29	29	29.03
2.	pH	6.83	6.73	6.74	6.78	6.82	6.48	6.76	6.46	6.64	6.69
3.	Conductivity (us/cm)	779	795	801	561	572	963	1028	1144	1039	853.56
4.	Turbidity (NTU)	1	1	1	1	1	8	1	1	1	1.78
5.	Alkalinity (mg/l)	101	110	108	80	75	160	120	100	110	107.11
6.	Chloridie (mg/l)	60.30	62.3	70.2	41.4	46	56.3	88.20	108	108	71.19
7.	Sulphate (mg/l)	18	21	22	11	13	19	32	28	21	20.56
8.	Calcium (mg/l)	152	155	153	78	81	110.4	180	235	168	145.82
9.	Magnesium (mg/l)	171	178	180	95	98	105	125	180	151	142.56
10.	Sodium (mg/l)	151	155	152	156	162	110	131	121	126	140.44
11.	Potassium (mg/l)	31	36	35	36	42	48	41	49	45	40.33
12.	Bio- carbonate	12	14	16	14	19	20	22	18	21	17.33
13.	Carbonate (mg/l)	0.20	0.10	0.20	0.11	0.20	0.10	0.10	0.10	0.20	0.15
14.	TDS (mg/l)	393	405	410	283	295	490	515	569	519	431.00
15.	TH (mg/l)	380	398	401	250	262	316	470	554	400	381.22

From the above result it can be seen that the pH was within the range. The TDS was ranging from 450-1082 mg/lit. It can be seen that many of the samples were above desirable limits i.e.500 mg/l, The total hardness was ranging from 248.2-554 mg/lit. Thus it can be seen that the open well water for all sampling points is hard. Alkalinity was ranging from 250.21-681.38Mg/lit and was above the desirable range. Chlorides, Sulphates, Sodium, Potassium, Bicarbonates were within the range. Calcium, Magnesium were above the desirable limits. Conductivity and Turbidity were almost above the range.



Graph. 1 : Show pie diagram for average Pre-monsoon seasons.



Graph. 2 : Show pie diagram for average Post-monsoon seasons.

The pie diagram shows the result in rounded form. On the basis of Pie diagram an obtained the following results which are tabulated in table.

Sodium Hazards

Table 3: shows Classification of groundwater based on Sodium percent

S. No.	Sodium (%)	Water class	Pre-monsoon samples	Post-monsoon samples
1.	< 20	Excellent	4.41-8.53 (9samples)	19.97 (1 samples)
2.	20-40	Good	-	21.91-34.95 (8 samples)
3.	40-60	Permissible	-	-
4.	60-80	Doubtful	-	-
5.	>80	Unsuitable	-	-

From the above table it is observed that 9 samples and 1 sample are excellent in pre and post monsoon season respectively and 8 samples are good for post monsoon season.

Residual Sodium Carbonate (RSC)

Table 4: shows Classification of groundwater based on Residual Sodium Carbonate

S. No.	RSC	Remark on quality	Pre-monsoon samples	Post-monsoon samples
1.	< 0	None	9 samples	9 samples
2.	0-1.25	Good	-	-
3.	1.25-2.5	Doubtful	-	-
4.	>2.5	Unsuitable	-	-

All the values for RSC were found to be negative i.e. <0. A negative RSC indicates that more Ca and Mg are in water than Carbonates, where the excess Ca and Mg have been precipitated and excess Ca and Mg can act as counter ions to displace Na

Sodium Absorption Ratio

Table 5: Classification of groundwater based on Sodium Absorption Ratio

S. No.	Sodium Hazard class	SAR in Equivalents permole	Remark on quality	Pre-monsoon samples	Post-monsoon samples
1.	S1	10	Excellent	0.18-0.35 (9 samples)	1.44-2.86 (9 samples)
2.	S2	10-18	Good	-	-
3.	S3	18-26	Doubtful	-	-
4.	S4 and S5	>26	Unsuitable	-	-

Table 6: shows Characterization of 9 samples groundwater of Atarra, district Banda (U.P.)

Sub-division of the diamond	Characteristics of corresponding subdivisions of diamond-shaped ields	Percentage of samples in this category	
		Pre monsoon	post monsoon
1.	Alkaline earth (Ca+Mg) exceed alkalies (Na+K)	100	100
2.	Alkalies exceeds alkaline earths	0	0
3.	Weakacids (CO_3 + HCO_3) exceed strng acids (SO_4+Cl)	0	0
4.	Strong acids exceeds weak acids	100	100
5.	Magnesium bicarbonate type	0	0
6.	Calcium-chloride type	100	100
7.	Sodium-chloride type	0	0
8.	Sodium-bicarbonate type	0	0
9.	Mixed type (No cation-anion exceed 50%)	0	0

Based on the classification diagram from figure for anion and cation facies in the form of major-ion percentages, water types are designed according to the domain in which they occur on the diagram segments. It is clearly depicted that water type is predominantly of Cl type for post-monsoon seasons and Mg-Cl Type for Pre Monsoon. There was no significant change in hydro-chemical facies for both the seasons.

4. Conclusion

From the above observation, it may concluded that almost all the parameters like pH, sodium, potassium, carbonate, bicarbonate, chloride are within the permissible limits prescribed by APHA but calcium, magnesium and nitrate values were exceeding the limits. The pie diagram shows that alkaline earth(Ca^{2+} + Mg^{2+}) exceed over alkaline (Na^{+} + K^{+}) where in anion strong acids (SO_4^{2-} + Cl^{-}) were predominated. On the other hand most of the sampling station considered suitable for irrigation uses according to EC, SAR, %Na & RSC values

5. Acknowledgement

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6. References

1. Butt, Ibtisam and Ghaffar, Abdul. Ground water quality assessment near Mehmood Botilandfill, Lahore, Pakistan, Asian Journal of Social Sciences & Humanities. 2012; 1(2):13-24.
2. Ghoraba Sema, Khan AD. Hydrochemistry and groundwater quality assessment in balochistan province, Pakistan, IJRRAS, 2013; 17(2):185-199.
3. Kashyap, Vinita R. Hydro Biological Studies on Nebuha Dam of Sidhi District (M.P.). International Education & Research Journal [IERJ]. 2015; 1(3):24-25.
4. Kashyap Vinita R. Physicochemical Analysis of Ground Water near Municipal Solid Waste Dumping Sites in Rewa (M.P.) India, International Journal for Research in Applied Science & Engineering Technology (IJRASET), 2015, 466-471.
5. Niloufer Shaheda N, Swamy AVVS. Devi Syamala MK. Impact of Municipal Solid Waste on the Ground Water Quality in Vijayawada City, Andhra Pradesh, Indian Journal of Applied research. 2013; 3:62-642.
6. Patil Chidanand, Narayanakar, Shreekant, Virupakshi Arjun. Assessment of Groundwater Quality around Solid Waste Landfill Area - A Case Study, International Journal of Innovative Research in Science, Engineering and Technology. 2013; 2(7):3131-3136.
7. Patil Chidanand, Narayanakar, Shreekant. Virupakshi Arjun. Assessment of Groundwater Quality around Solid Waste Landfill Area - A Case Study, International Journal of Innovative Research in Science, Engineering and Technology. 2013; 2(7):3131-3136.
8. Sadashivaia1 C, Ramakrishnaiah CR, Ranganna G. Hydrochemical Analysis and Evaluation of Groundwater Quality in Tumkur Taluk, Karnataka State, India, International Journal of Environmental Research and Public Health. 2008; 5(3):15.
9. Sarala C, Ravi Babu P. Assessment of Groundwater Quality Parameters in and around Jawaharnagar, Hyderabad, International Journal of Scientific and Research Publications, 2012; 2(10):1-6.
10. Tank Dinesh, Kumar Candel, Singh CP. Analysis of the major ion constituents in groundwater of Jaipur city, Nature and Science, 2010; 8(10):1-7.
11. APHA Standard Methods for the Examination of Water and Waste Water, 21th edition, American Public Health Association, Washington DC, 2005.