

Seasonal Variation in Physico Chemical Parameters of Ground Water of Merta City, Nagaur

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Abstract: The influence of seasonal changes on the properties of the water in Merta City, Nagaur, Rajasthan was investigated. Composites samples from different sites of Merta City were collected and assessed for both pre-monsoon and post-monsoon seasons. The values of the various parameters were as follows: pH 7.3 to 8.1 for Pre-monsoon season and 7.0 to 7.7 for Post-monsoon season; conductivity 874 to 9138 mhos/cm for Pre-monsoon season and 786 - 8225 mhos/cm for wet season; total dissolved solids (TDS) 568 to 5940 mg/L for dry season and 511 to 5346 mg/L for Post-monsoon season; Fluoride 0.892 to 2.56 mg/L for Pre-monsoon season and 0.83 to 2.38 mg/L for Post-monsoon season. The values for other parameters were exceeding the BIS permissible limit for drinking water. Therefore, the water is highly contaminated & non potable.

Keywords: Groundwater, seasonal variation, Merta City, conductivity, TDS, pre-monsoon

I. Introduction

Groundwater is water located beneath the ground surface in soil pore spaces and in the fractures of lithologic formation¹. This is the water that percolated downward from the surface through the soil pore. Ground water is naturally replenished by surface water from precipitation, streams and rivers. Groundwater is not as susceptible to pollution as surface water but once polluted restoration is difficult and long term². Groundwater contamination occurs when man made products such as gasoline, oil, road salts and chemicals get into the groundwater and cause it to become unsafe and unfit for human use³. Generally rural dwellers rely on groundwater as drinking water and for other domestic chores since it does not generally require treatment. The problems of water in the Merta City are not that of availability but of portability⁴. The water quality of well is generally neglected based on the general belief that it is pure through the natural purification process. There is inadequate information or knowledge of the quantity, quality and pattern of distribution of Merta's water resources⁵. Due to the absence of municipal water supply, many of the inhabitants of Merta depend on natural water sources for their need. This work examines the influence of seasonal variation on the physicochemical qualities of water from different water bodies in this area.

II. Materials And Methods

2.1 Details of study area

Merta City is a city town and a municipality located in Nagaur district in the Indian state of Rajasthan.

Merta City is a holy city for Hindus as it is the birthplace of Meera bai the famous Devotee of Lord Krishna.

Nagaur District is one of the 33 districts of the state of Rajasthan in western India. Panchayati Raj was introduced here. Area of the district is 17,718 km². The city of Nagaur is the district headquarters.

Nagaur is located at 27.2°N 73.73°E. It has an average elevation of 302 metres (990 feet). Nagaur is situated amidst seven districts namely Bikaner, Churu, Sikar, Jaipur, Ajmer, Pali, Jodhpur. Nagaur is the fifth largest district in Rajasthan with a vast terrain spreading over 17,718 km². Its geographical spread is a good combine of plain, hills, sand mounds & as such it is a part of the great Indian Thar Desert.

The district consist 12 Main tehsils. These are Nagaur, Kheenvsar, Jayal, **Merta City**, Degana, Didwana, Ladnun, Parbatsar, Makrana, Kuchaman City, Nawa, Mundwa. All of these are Sub-divisions also. There are 11 blocks and 1607 villages in the district.

2.2 Collection of water samples

Water samples were collected from 20 area of the Tehsil representing the various quarters. One litres of each of the water samples from the Different sources (tube well, well & hand pump) was taken to give a composite sample. One litres of this was the sample used for analysis. Samples were taken in the Pre-monsoon and Post-monsoon season. The containers used for collection and storage had been previously washed and rinsed with 5% nitric acid and then thoroughly rinsed with deionised water. The samples were put in plastic bottles and were preserved in a freezer at 4°C pending analysis.

2.3 Analysis Techniques

Non conservable parameters such as pH, temperature and electrical conductivity were determined at the time of sampling. Water chemical analysis was done using standard analytical procedures (APHA, 1995). The pH of water sample was measured with a pH meter previously calibrated with buffer solutions. Conductivity was measured with a conductivity meter calibrated with potassium chloride solution. Alkalinity was determined by titrating a known volume of water sample with H₂SO₄. Total hardness was determined by titration with EDTA using Eriochrome black T as indicator. Each sample was analysed in duplicate and the average of results reported. General laboratory quality assurance measures were maintained.

Sample No.	pH	EC	TDS	Alk	TH	CaH	MgH	Ca	Mg	SO ₄ ⁻	Cl	F	NO ₃
		mhos/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	7.5	7708	5010	400	1120	520	600	208	168	451	2460	1.56	6
2	7.6	4785	3110	600	480	230	250	92	70	280	1220	2.54	16
3	7.6	4600	2990	600	460	220	240	88	67	269	1220	2.56	14
4	7.6	4646	3020	600	460	220	240	88	67	272	1240	2.49	14
5	7.3	3003	1952	180	500	200	300	80	84	176	820	1.3	21
6	7.8	1163	756	390	120	70	50	28	14	68	170	1.96	7
7	7.7	1865	1212	500	260	160	100	64	28	109	350	2.04	23
8	7.7	1877	1220	500	280	180	100	72	28	110	440	2.11	26
9	7.9	1997	1298	240	340	150	190	60	53	117	400	0.905	85
10	7.8	3538	2300	140	760	360	400	144	112	207	740	1.95	12
11	8.0	1018	662	160	260	110	150	44	42	60	140	0.848	33
12	7.6	9138	5940	160	1240	60	1180	24	331	535	264	2.27	8
13	7.6	3492	2270	200	500	220	280	88	78	204	960	1.46	26
14	7.7	3215	2090	320	400	160	240	64	67	188	700	1.72	37
15	8.1	874	568	240	200	80	120	32	34	51	160	0.892	30
16	7.8	3215	2090	320	420	160	260	64	73	188	820	1.2	23
17	7.8	3600	2340	360	340	120	220	48	62	211	900	2.05	31
18	7.9	1911	1242	320	220	90	130	36	36	112	380	1.8	65
19	7.8	3154	2050	300	380	160	220	64	62	185	900	1.74	37
20	8.0	1757	1142	360	240	100	140	40	39	103	320	1.85	21

Table 1: Physicochemical characteristics of water during the Pre-monsoon season

Sample No.	pH	EC	TDS	Alk	TH	CaH	MgH	Ca	Mg	SO ₄ ⁻	Cl	F	NO ₃
		mhos/cm	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
1	7.2	6937	4509	376	1042	484	558	193	156	410	2263	1.45	6
2	7.3	4306	2799	564	446	214	233	86	65	266	1122	2.36	15
3	7.3	4140	2691	564	428	205	223	82	63	256	1122	2.38	13
4	7.3	4182	2718	564	428	205	223	82	63	258	1141	2.32	13
5	7.0	2703	1757	169	465	186	279	74	78	167	754	1.21	20
6	7.5	1047	680	367	112	65	47	26	13	65	156	1.82	7
7	7.3	1678	1091	470	242	149	93	60	26	104	322	1.90	22
8	7.4	1689	1098	470	260	167	93	67	26	104	405	1.96	25
9	7.6	1797	1168	226	316	140	177	56	49	111	368	0.84	82
10	7.5	3185	2070	132	707	335	372	134	104	197	681	1.81	12
11	7.7	917	596	150	242	102	140	41	39	57	129	0.79	32
12	7.3	8225	5346	150	1153	56	1097	22	307	508	243	2.11	8
13	7.3	3143	2043	188	465	205	260	82	73	194	883	1.36	25
14	7.4	2894	1881	301	372	149	223	60	63	179	644	1.60	36
15	7.7	786	511	226	186	74	112	30	31	49	147	0.83	29
16	7.4	2894	1881	301	391	149	242	60	68	179	754	1.12	22
17	7.4	3240	2106	338	316	112	205	45	57	200	828	1.91	30
18	7.6	1720	1118	301	205	84	121	33	34	106	350	1.67	62
19	7.5	2838	1845	282	353	149	205	60	57	175	828	1.62	36
20	7.7	1581	1028	338	223	93	130	37	36	98	294	1.72	20

Table 2: Physicochemical characteristics of water during the Post-monsoon season

* 1. Akelia 2. Kurdaya 3. Badgaon 4. Katayasani 5. Oladan 6. Deshwal 7. Chapari kalkan 8. Lamba jatan 9. Nokha chandawata 10. Mundelon ki dhani 11. Tukliya 12. Bola ki dhani 13. Harsor 14. Radon ki dhani 15. Dhabhiyon ki dhani 16. Harsolao 17. Sipaiyon ki dhani 18. Dharma ki dhani 19. Tada ki dhani 20. Bhatiyon ki dhani

S.N.	Parameters	P	E
1.	pH	6.5	8.5
2.	TDS	500	2000
3.	Alkalinity	200	600
4.	TH	300	600
5.	FLUORIDE	0.5	1.5
6.	CHLORIDE	250	1000
7.	NITRATE	45	100
8.	CALCIUM	75	200
9.	MAGNESIUM	30	150

Here P-Permissible limit, E-Excessive limit [BIS-Bureau of Indian standard]

Table 3: Permissible limits of various parameters by BIS

III. Results And Discussion

The quality of water resources depends on the management of the water sources. This would include anthropogenic discharges as well as the natural physico-chemical properties of the area. The results of the seasonal variation of some physico-chemical parameters are presented in **Table 1 and 2**. The pH for the pre-monsoon season ranges from 7.3 - 8.1 while that of the post-monsoon season ranges from 7.0-7.7. This water result would be regard as neutral in both seasons. These values are within the permissible level of BIS drinking water standards. Such pH that is near to neutral is indicative of unpolluted water. The total dissolved solids (TDS) are an indication of the degree of dissolved substances such as metal ions in the water. Pre-monsoon season range between 568 - 5940 mg/L while the post-monsoon season range between 511 - 5346 mg/L. The values for both seasons are far above the BIS permissible value (**Table 3**).

IV. Conclusion

From the following study of seasonal variation in groundwater of Merta City region, it can be observed that the pH of water is within the permissible limit while most of the parameters like TDS, Ca hardness, Mg hardness, Chloride and Fluoride have the values more than the permissible limit. It was also observed that the pre-monsoon season values are a bit higher than that of the post-monsoon season. The water studied is all hard due to high value of hardness in both seasons. So it is concluded that groundwater of Merta City region is highly contaminated and thus a regular and periodical monitoring of water is suggested.

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