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SOME STUDIES OF UNDERGROUND WATER QUALITY AT DISTRICT JAUNPUR, U.P.

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ABSTRACT

Underground water quality at six tahsils (Badalapur, Shahganj, Jaunpur (Sadar), Kerakat, Mariahu and Machhalisahar) of Jaunpur district with reference to different physic chemical parameters are analysed using standard method of sampling and estimation. Calculated underground water quality index indicates that ground water is good in quality at five sites and is some polluted at one site of the study. Calculated results are similar to the estimated values. Present study is one step ahead in the field of environmental studies. People exposed to polluted water are prone to health hazards and underground water quality management is urgently needed.

KEYWORDS: Water quality index, Ground water quality, Quality rating and Unit weight

District Jaunpur is situated at 25.41ºN, 81.87ºE in the southern part of Uttar Pradesh at an elevation of 96 meter and stands at confinence of five rivers Sai, Gomati, Veruna, Basuhi and Pili. Life and water have an inseparable relationship and are taken as two sides of a single coin. Water quality plays an important role in the growth of aquatic men, animals and their distribution and abundance. Fluctuations in optimum level of water quality may provide to abrupt changes in the aquatic life. Life on earth would be non-existent in the absence of water and it is essential for everything on our planet to grow and prosper. Although, we as human beings recognize this fact, we disregard it by polluting our water resources. In fact, the problems associated with water pollution have the capabilities to disrupt life on our planet to a great extent. Several laws have been formulated to combat water pollution but the government alone may not solve the entire problem. (Agarwal et al., 1976 a, b; Singh 2014 and Das and Pandey 1978.).

Water is one of the most common resources used on earth. Barely only of it is fresh 96% of earth's water is too salty or polluted, 3% is too far underground to reach that leaves only 1% for clean drinking water. Since, we have a very low supply of fresh water, we need to conserve it and its quality as well.

Water quality index (W. Q. I.) has been taken as used to monitor water quality changes in a particular water supply over time or it may be used to compare a water supply quality with other water supplies in the different regions. The results may also be used to determine if a particular stretch of water is taken to be healthy. (Wolf et al., 2015).

EXPERIMENTAL

We have taken thirteen physico-chemical parameters namely pH value, conductivity, alkalinity, total dissolved solids, dissolved oxygen, biological oxygen demand, chemical oxygen demand, evaluated magnesium, fluoride, chloride and iron to estimate following standard methods of sampling and estimation.

The statistical data obtained from quantitative analysis of underground water and water quality standards of World Health Organization are used for evaluating water quality standards. Water quality indices of underground drinking water collected at different sites at different tahsils of Jaunpur were calculated using the methods. According the role of various parameters, on the basis of importance and incidence of ideal value of different physic-chemical parameters. Even, if they are present, they might not be the ruling factor. Hence, they were assigned zero values. On the basis of evaluated values of water quality indices quality status is assigned to include the collective role of various physic-chemical parameters on the overall quality of

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drinking water. On the basis of a number of water pollution studies, following assumptions were made with reference to assess the extent of contamination or the quality of drinking water. The assumptions are:

WQI < 50 : Fit for human consumption
WQI < 80 : Moderately polluted
WQI > 80 : More polluted
WQI > 100 : Severely polluted

Table 1: Description of Sampling Sites

S. No.	Name of Site (Tahsils)	Location	Types of Source	Usage	Water quality
1	Jaunpur Sadar	500m South Tehsil	Indian Mark II	Drinking & irrigation	Colourless, good in taste
2	Mariahu	500m North Tehsil	Indian Mark II	Drinking & irrigation	Colourless, good in taste
3	Machhalisahar	500m East Tehsil	Indian Mark II	Drinking & irrigation	Colourless and odourless
4	Badalapur	500m West Tehsil	Indian Mark II	Drinking & irrigation	Colourless, good in taste
5	Shahganj	500m North Tehsil	Indian Mark II	Drinking & irrigation	Colourless, good in taste
6	Kerakat	500m South Tehsil	Indian Mark II	Drinking & irrigation	Colourless, good in taste

Table 2 : Physico-chemical parameters, their WHO standards and assigned unit weight (Wn)

S. No.	Parameters (units)	Recommended WHO standard	Assigned unit weight (Wn)
1	pH	8.0	0.017865
2	Conductivity (μ/cm)	0.30	0.475556
3	Dissolved solids (mg/L)	500	0.000236
4	Alkalinity (mg/L)	100	0.001340
5	Dissolved oxygen (mg/L)	5.00	0.026800
6	BOD (mg/L)	6.00	0.23533
7	COD (mg/L)	10.00	0.014220
8	Hardness (mg/L)	100.00	0.001340
9	Calcium (mg/L)	100.00	0.001340
10	Magnesium (mg/L)	30.00	0.004676
11	Fluoride (mg/L)	1.00	0.143300
12	Chloride (mg/L)	200.00	0.000517
13	Iron (mg/L)	0.50	0.268000

Table 3: Site-wise estimated actual value (V_n), calculated rating (Q_n) and calculated value of Wn $\log_{10}Q_n$ of different parameters

S. No.	Parameters	Site-I			Site-II			Site-III		
		V_n	Q_n	Wn $\log_{10}Q_n$	V_n	Q_n	Wn $\log_{10}Q_n$	V_n	Q_n	Wn $\log_{10}Q_n$
1	pH	7.4	32	0.026	7.3	2	0.003	7.22	10	026
2	Conductivity (μ/cm)	0.56	180	1.076	1.95	650	1.430	1.62	540	1.076
3	Dissolved solids (mg/L)	370	70	0.002	1280	250	0.001	1070	210	0.002
4	Alkalinity (mg/L)	310	310	0.003	470	470	0.003	380	380	0.003
5	Dissolved oxygen (mg/L)	0.80	140	0.052	1.60	130	0.052	0.62	130	0.052
6	BOD (mg/L)	9	160	0.051	60	1040	0.062	30	480	0.051
7	COD (mg/L)	6	70	0.045	80	980	0.052	40	500	0.045
8	Hardness (mg/L)	180	180	0.002	490	490	0.002	500	500	0.002
9	Calcium (mg/L)	150	150	0.002	368	368	0.002	360	360	0.002
10	Magnesium (mg/L)	80	200	0.001	370	300	0.012	250	400	0.001
11	Fluoride (mg/L)	0.20	18	0.002	0.12	12	0.049	0.12	10	0.002
12	Chloride (mg/L)	28.04	16	0.001	250	140	0.001	140	60	0.001
13	Iron (mg/L)	0.50	100	0.502	0.60	130	0.520	0.28	40	0.502

S. No.	Parameters	Site-IV			Site-V			Site-VI		
		V_n	Q_n	Wn $\log_{10}Q_n$	V_n	Q_n	Wn $\log_{10}Q_n$	V_n	Q_n	Wn $\log_{10}Q_n$
1	pH	7.2	16	0.033	7.02	18	0.003	7.08	20	0.016
2	Conductivity (μ/cm)	1.06	360	0.219	1.08	250	1.430	0.25	100	0.982
3	Dissolved solids (mg/L)	710	140	1360.00	400	100	0.001	100	30	0.002
4	Alkalinity (mg/L)	1.20	130	0.004	200	200	0.003	200	200	0.001
5	Dissolved oxygen (mg/L)	1.20	130	0.052	1.00	130	0.052	0.40	130	0.002
6	BOD (mg/L)	18	310	0.052	10	200	0.062	30	200	0.052
7	COD (mg/L)	20	210	0.042	20	180	0.052	20	200	0.032
8	Hardness (mg/L)	300	300	0.002	200	200	0.002	140	140	0.002
9	Calcium (mg/L)	200	200	0.002	200	200	0.002	100	100	0.003
10	Magnesium (mg/L)	120	250	0.012	150	100	0.012	40	80	0.010
11	Fluoride (mg/L)	0.30	28	0.120	0.03	6	0.049	0.06	4	0.024
12	Chloride (mg/L)	80	40	0.001	90	10	0.001	10	6	0.001
13	Iron (mg/L)	0.22	60	0.440	0.02	40	0.520	0.6	2	0.06

Table 4 : Site-wise calculated WQI values

S. No.	Site No.	Calculated WQI value
1	Jaunpur Sadar	45
2	Mariahu	46
3	Machhalisahar	122
4	Badalapur	48
5	Shahganj	50
6	Kerakat	45

The calculated water quality index ranges from 45 to 122. Highest pollution is seen at site no. 3 and lowest at site no. 2. The ground water is obtained to be polluted at nearly almost sites of study. It is observed that it is less polluted at 5 sites i.e. no. I, II, IV, V, VII of study.

RESULTS AND DISCUSSION

Critical analysis of data and its comparison with WHO standards and assumptions for WQI reveal following facts regarding the underground water quality at public places of six tahsils of Jaunpur during the period of study.

Number, names and description of different sites are given in Table 1. Physico-chemical parameters, their W.H.O stands and assigned unit weight (Wn) are presented in Table 2, site (Tahsil-wise) wise calculated actual value (Vn), calculated quality rating (Qn) and calculated value of Wn log Qn of different parameters are given in Table 3. Calculated WQI are shown in Table 4.

Estimated values of different parameters show very clearly that at most of the sites their values are much higher than prescribed WHO drinking water standards and water is polluted and not fit for human consumption and other domestic uses.

CONCLUDING REMARKS

In view of calculated values of water quality index, it is observed that ground water is polluted at Machhalisahar tahsil of study and good at other Jaunpur sadar, Mariahu, Badalapur, Shahganj and Kerakat.

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