Journal of Advanced Scientific Research

ISSN

Available online through http://www.sciensage.info/jasr

ASSESMENT OF HYDRO-GEOCHEMICAL PARAMETER AND CORRELATION MATRIX OF GROUND WATER AT PIRBAWDA, AURANGABAD (M.S.)

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ABSTRACT

The ground water samples were collected from Pirbawda station at Aurangabad district was evaluated during 2009-10for its hydrogeochemical parameters regularly in every month. A systematic study of correlations among the water quality parameters has been carried out. The parameters studied were pH, Conductivity, TDS, Turbidity, Hardness, Ca, Mg, Na, K, Fe, Alkalinity, CO₃, HCO₃, Cl, F, NO₃ and SO₄. Monthly variation in the parameters was discussed here. All parameters were found to be within permissible limit.

Keywords: Ground water quality, Hydro-geochemical parameters, Correlation matrix, Pirbawda.

1. INTRODUCTION

Water is one of the most important commodities which man has exploited than any other resources for the sustenance of his life. Most of our demands for water are fulfilled by rainwater which gets deposited in surface and ground water resources. Though, water is continuously purified by evaporation and precipitation, pollution of water has emerged as one of the most significant environmental problems of recent times. The cause of such a situation is many but the quality of water is deteriorated day by day to rapid increase in urbanization and industrialization [1-3]. Some of the major adverse effects have arised from construction of reservoirs, surface water irrigation, deforestation, industrial and urban waste disposal. Water quality deterioration has made potable water resource scarcer and endangered for plant and animal life [4].

Correlation analysis measures the closeness of the relationship between chosen independent and dependant variables. Correlation between different parameters in specific environmental condition has been shown to be useful when such correlation exists and determination of few parameters would sufficient to give some idea about the quality of ground water in that area.

Generally ground water is clear and colorless as it percolates from various levels. During percolation, it dissolves inorganic salts. Secondly, it was also observed that generally ground water does not have certain bacteria until contamination because they are filtered out while percolating through subsoil. In order to monitor the pollution status at Pirbawda station and as part of ongoing research in the relevant field [5-6] we decided to study the assessment of ground water quality of this area. In the present work, various water samples of tube wells of Pirbawda station have been analysed and correlation matrix carried out. Many authors [7-9] have studied the physiochemical characterization of ground water of different parts of the worlds. The objective of present study was to determine the quality of water supplied to the rural community in order to estimate the health implications.

2. EXPERIMENTAL

Water samples were collected in polythene bags of tube wells from Pirbawda stations during Jan-2009 to Dec-2010. The temperature was recorded at the Spot. The chemicals used for analysis were A.R. Grade and the solutions were prepared in double distilled water. The solutions were standardised as per methods given in literature. Analyses for Physico-chemical parameters were done by following method described in the literature [10, 11]. Hardness is determined by EDTAtitrimetric method and chloride by Mohr's methods. A computer programme was used to calculate Correlation coefficient.

2.1. Method

To find the relationship between two parameters x and y, the karl Pearson's correlation coefficient r is used and it is determined as follows-



Short Communication

Where, r: correlation coefficient, n: number of data points, x: values of x-variable, y: values of y-variable.

3. RESULTS AND DISCUSSION

The samples from Pirbawda stations were collected in different seasons during the year 2009-2010. The samples were

analysed for their Physico-chemical parameters, data shown in Table-1 and the conductance of water was co-related with other parameters. The Correlation matrix is shown in Table-2 for Pirbawda station.

Table: 1. Physico-Chemical para	meters at station	Pirbawda
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Month pH	лH	E.C.	TDS	Tur	TH	Ca	Mg	Na	K	Fennm	TA	CO3	HCO3	C1	F	NO3	SO4
	r.,	μS/ cm	$_{\rm ppm}$	NTU	ppm	ppm	ppm	ppm	Ppm	r e pp	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Jan-09	8.3	908	581	0.6	300	93	40	60	1	0.7	192	0	192	102	0.7	151	33
Feb-09	8.3	1025	600	0.1	333	102	50	75	0.9	0.2	205	0	205	124	0.8	112	63
Mar-09	8	872	514	0.6	245	88	47	70	1	0.4	150	0	150	93	0.1	145	50
Apr-09	8.1	987	567	0.5	363	102	53	30	0.3	0.9	175	0	175	106	0.4	98	26
May-09	7.6	1062	550	0.4	345	109	55	29	0.6	0.1	195	0	195	111	0.7	77	34
Jun-09	8.4	999	650	0.1	313	103	43	40	1	0.6	113	0	113	88	0.9	102	29
Jul-09	7.6	1023	654.7	0.7	336	64	42.8	55	1	0.2	276	0	276	90	1.2	44.3	50
Aug-09	7	1047	619	0.2	378	90	39	26	0.1	0.1	236	0	236	98	0.2	63	53
Sep-09	7.8	896	514	0.6	289	45	34	26	0.5	0.8	98	0	98	102	0.4	98	64
Oct-09	7.3	870	478	0.4	277	63	23	33	0.7	0.4	100	0	100	74	0.8	45	30
Nov-09	8	915	602	0.2	305	88	46	49	0.1	0.2	124	0	124	92	0.4	110	46
Dec-09	8.1	824	428	0.7	264	72	35	23	0.6	0.6	133	0	133	114	0.4	96	20
Jan-10	7.4	1120	728	0.4	388	112	26.2	68.1	0.3	0.5	292	0	292	120	0.6	22.6	80
Feb-10	7.2	1047	0	0.1	0	0	0	63	0.9	0.3	234	0	234	98	0	18	75
Mar-10	7.3	960	0	0	0	0	0	57	1.4	0.5	176	0	176	76	0.09	49	23
Apr-10	7	1247	0	0.3	0	0	0	74	10	0.6	309	0	309	126	0.1	113	47
May-10	6.9	1369	0	0.4	0	0	0	85	1.9	0.1	323	0	323	133	0.2	179	90
Jun-10	7.1	1488	0	0.6	0	0	0	90	12	0.09	345	0	345	165	0.06	210	33
Jul-10	7.3	1600	0	0	0	0	0	97	0.67	0.3	310	0	310	200	0.4	155	18
Aug-10	7	1478	0	0.4	0	0	0	132	9	0.06	278	0	278	182	0.7	89	45
Sep-10	6.8	1643	0	0.7	0	0	0	99	6	0.021	289	0	289	231	0.05	105	18
Oct-10	7	1423	0	0.6	0	0	0	112	20	1	255	0	255	177	0.3	177	44
Nov-10	7.6	1556	1011	0.7	556	178	27	104	22	0.08	296	0	296	190	0.8	278	19
Dec-10	7.3	1327	928	0.2	0	138	0	76	12	1.03	190	0	190	129	0.6	104	70

pH: The pH value of drinking water is an important index of acidity, alkalinity and resulting value of acid base interaction of no. of its minerals and organic components. During the study period pH between 6.8 to 8.4 was noticed in tube wells.

Conductivity: Conductivity of water provides quick and convenient method for determination of total amount of ionisable salts present in it and expressed as mhos/cm. In the present finding conductivity varied from 870 to 1643 mhos/cm. There was no regular trend in the conductivity of water at Pirbawda, this might be due to difference in geometrical structure.

TDS: According to world health organization and Indian standard, total dissolved solids values should be lower than 500 mg/L for drinking water. In the present study total dissolved solids range from 514 to 1011 mg/L, all the samples have moderate values of TDS as prescribed by WHO and Indian standards.

Turbidity: Turbidity found in between 0.1 to 0.7 NTU.

Hardness: Total hardness is a measure of the capacity of precipitate soap. It is the sum of polyvalent cation present in water. It was found to have been varied from 245 to 556mg/L. Samples values are compared to IST and WHO.

Alkalinity: Alkalinity is due to the presence of carbonates, bicarbonates, hydroxides, phosphates and other ionic radicals. The alkalinity of water in our study area varies from 98 mg/L in the month of Sep-2009 and maximum 345 mg/L June-2010. **Ca:** Calcium is needed for the body in small quantities. Calcium hardness in mainly due to salts present in water and expressed as calcium carbonates. The limits of calcium have been prescribed in the range of 75 to 200 mg/L, The observed calcium values were within range i.e. 45 to 178 mg/L.

Mg: The limits of magnesium have been prescribed in the range of 50 to 100 mg/L, The observed calcium values were within range i.e. 23 to 55mg/L.

		E.C.	TDS	Tur	TH	Ca	Mg	Na	К	Fe	TA	CO3	HCO3	C1	F	NO3	SO4
	pН	μS/cm	ppm	NTU	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
pH E.C.	1																
µS/cm	-0.648	1															
TDSppm	0.586	-0.38	1														
Tur NTU	0.023	0.082	0.132	1													
TH ppm	0.632	-0.48	0.826	0.246	1												
Ca ppm	0.598	-0.32	0.968	0.105	0.822	1											
Mgppm	0.798	-0.67	0.694	0.157	0.86	0.693	1										
Na ppm	-0.492	0.83	0.416	0.078	-0.513	0.356	-0.65	1									
Kppm	-0.389	0.666	0.057	0.318	-0.212	0	-0.47	0.665	1								
Feppm	0.278	-0.3	0.174	0.013	-0.065	0.133	0.01	0.232	0.097	1							
TA ppm	-0.649	0.795	0.412	0.107	-0.374	0.366	-0.56	0.698	0.451	-0.42	1						
CO3 ppm	*	*	*	*	*	*	*	*	*	*	*	1					
нсозррт	-0.649	0.795	0.412	0.107	-0.374	0.366	-0.56	0.698	0.451	-0.42	1	*	1				
Cl ppm	-0.477	0.922	0.354	0.253	-0.367	0.278	-0.53	0.788	0.609	-0.26	0.667	*	0.667	1			
Fppm	0.454	-0.17	0.629	0.1	0.572	0.567	0.481	0.115	-0.04	0.006	-0.2	*	-0.2	0.17	1		
NO3 ppm	0.01	0.53	0.005	0.35	-0.01	0.088	-0.14	0.5	0.65	-0.08	0.349	*	0.349	0.55	-0.08	1	
SO4 ppm	-0.178	-0.11	0.063	-0.185	-0.108	0.017	-0.09	0.029	-0.14	0.052	0.128	*	0.128	0.25	0.072	0.25	1

Table 2 Correlation Matrix at Station Pirbawda

Na: The water having value of sodium can decreases the crop yield significantly and a long term use of such water can cause increasing damage of soil properties. The source of sodium in ground water may be chemical fertilizer etc. In the present work, the amount of sodium varies from 23 mg/L to 132 mg/L.

K: The potassium content of ground water was found in between 0.1 to 22 mg/L.

Fe: The Fe content of ground water found to be near about 1 mg/L.

CO₃: The carbonate content of ground water found to be zero mg/L in all the samples.

HCO₃: The HCO₃ content of ground water was found in between 98 to 345 mg/L.

Cl: Presence of chloride in high amount in water indicated that it is contaminated by sewage. But in the present study quantity of chloride is moderate i.e. 74-200 mg/L. The desirable limit of chlorides is 250 mg/L and permissible up to 600 mg/L.

F: The F content of ground water was found in between 0 to 1.2 mg/L.

 NO_3 : The main source of nitrate in water is oxidation of ammonia. The nitrate nitrogen of study area varies from 18 mg/L to 210 mg/L.

SO₄: The variation in sulphate content represents the pollution status. The decrease in sulphate indicates detoriation and increase in sulphate indicate improvement of water quality. The highest desirable value of sulphate, as prescribed by WHO is 200mg/L. The present investigation shows that sulphate is

under permissible limit. Correlation study reveals that the parameters (TDS & Ca, 0.968) and (E.C. & Cl, 0.922) are good related.

4. CONCLUSION

The ground water of Pirbawda station was analyzed for various Physico-chemical parameters. From the analysis data we conclude that the ground water of the selected site is suitable for drinking and agriculture purpose.

5. ACKNOWLEDGEMENTS

We are thankful to Dr. Mazhar Farooqui, Associate Professor & Head, Dept. of Chemistry, Dr. Rafiq Zakaria College for Women, Navkhanda, Aurangabad for his kind support and guidance. I am also thankful to Dr. Maqdoom Farooqui, Principal Maulana Azad College, Aurangabad, for providing the laboratory facilities in completing this work.

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