RJC
http://www.rasayanjournal.com

RASĀYAN *J. Chem.*
Vol.3, No.3 (2010), 420-424
ISSN: 0974-1496
CODEN: RJCABP

MULTIVARIATE ANALYSIS OF GROUND WATER, AROUND SUGAR FACTORIES OF OSMANABAD DISTRICT (INDIA)

Shaukat Patel[1*], Mohd. Mohsin[2], Mazahar Farooqui[2] and S.H. Quadri[2]

[1]Adarsh College, Omerga, Dist. Osmanabad (M.S.) India

[2]Post Graduate & Research Centre, Maulana Azad College, Aurangabad.(M.S.) India

*E-mail:mazahar_64@rediffmail.com

ABSTRACT

Water quality parameter determination of ground and surface water of Osmanabad district around sugar factories is carried out. The parameters reported were, temperature, pH, conductivity, chloride, hardness, Na, K , SO^{2-}_4, NO^-_3, DO, COD, alkalinity etc. during the year 2007-09.

Keywords: Pollution status, ground water surface water, Osmanabad District.

INTRODUCTION

Water pollution is related with urbanization though rural pollution is also predominant due to modernization in agricultural practice. The agro based industries are also major cause for the pollution of surface and ground water. Today we need industries for economic and commercial development which leads ultimately for social development also, but it should not be at the cost of environment. Therefore sustainable development is necessary. We should keep our strict eyes on the environment. In order to do that, we decided to monitor the water quality parameters of Osmanabad district, we selected nine stations/places which are placed nearby sugar factory (within the diameter of 1km) surface and ground waters are the important sources of water supply throughout, the world but the ground water is the only source of drinking water in the most of the rural areas Polluted ground water is the cause for the spread of epidemics and chronic diseases in human. It causes typhoid, Jaundice, dysentery, diarrhea, tuberculosis and hepatitis.

EXPERIMENTAL

The wells, bore wells and surface water samples were collected from Murum (S1, bore well), Naldurg(S2, open well) Patoda(S3, open well), Terna(S4, open well), Wadegaon(S5, Bore well), Hewargoan(S6, Bore well). The temperature of water samples were recorded at sample site pH is measured by pH meter (model No. LI-120, Elico), conductance by conductivity bridge (model no. EQ-660, Equiptronic). The other parameters are determined by using standard methods available in the literature[1-2].

RESULTS AND DISCUSSION

The value of temperature depends on type of water (open well, bore well, surface water etc, temperature of air, season of winter, summer rainy). The temperature is responsible for different biological and physical processes such as growth of bacteria, dissolution of oxygen and other gases, decay process etc.

The general trend in the variation of pH shows that for S-1 to S-6 decrease in pH during Dec-06 and Jan-07and then increase in pH in Feb to May-07. This indicates that pH is comparatively high in rainy and summer season, but low in winter season. The pH value of well waters lies in the slight alkaline range. The reason might be due to more/rapid evaporation of water from pond. Since evaporation depend on surface area. The basic component present in water may get concentrated.

For our study the conductance of water during the year 2006-07 varies from 0.333 ms in the month of Dec-06 at S-3 to 0.896 ms for May-07 at S-6. The average value lies between 0.5502 ms (S2) to 0.6916 ms (S-5). The general trend of conductance shows that during winter season the values of conductance

are below average and during rainy and summer season the values are above average. During the year 2007-08, conductivity was observed to be minimum 0.299 at S-6 in the month of Jan-08 and maximum 1.764 ms at S-6 in the month of Aug-07. The average value of conductance varies from 0.8498 (S-3) to 1.0697 (S-1). During the year 2008-09 the variation in conductivity of water shows a general trend, in which rainy and summer season shows high values of conductance, whereas in winter the conductance is less. The minimum conductance 0.302 ms in Oct-08 at S-2 and maximum 1.442 ms in July-08 at S-6 the average lies in between 0.5662 ms (S-2) to 1.1582 (S-6) the trend in average conductivity for three consecutive year. The conductance is due to the electrolytic ions/salts present in the water samples. There are various sources of ions, such as content of soil, effluent from industry, there might be contamination or leaching of same salts/ions into the well water. The minimum conductance observed may be due to settlement of salt at the bottom. All water shows slight higher conductivity this is agreement of conductivity reported by earlier workers[3-4]. The conductivity of polluted water depend on distance of pollution source from the sample site, depth of water collected and time of collection of sample.

Alkalinity is due to the presence of carbonates, bicarbonates, hydroxides, phosphates nitrates and other ionic radicals. The alkalinity of water in our study area varies from 120 mg/L (at S-5) in the month of Sep-06 and maximum 298 mg/L at S-6 in the month of Jul-06. The average value of alkalinity varies from 151.42 (S1) to 217.17 mg/L at S-6. The general trend of alkalinity shows that in rainy season and summer season alkalinity is high. This may be attributed to leaching of alkalinity salt in rainy season and evaporation of water in summer season. During 2007-08 minimum alkalinity is observed in the month of Jan-08 at S5 (120 mg/L) and maximum at S-3, in the month of July-07 (466 mg/L). The average value of alkalinity varies from 259.17 mg/L (S5) to 328.33 mg/L (S-2). During the year 2008-09, the minimum alkalinity (138 mg/L) observed at S-2 in the month of Dec-08 and maximum 546.8 mg/L at S-1 in the month of July-08. The alkalinity values in the 2006-07 are low compared to 2007-08 and 2008-09 this may be attributed due to high rainfall in the region during last two years and excessive evaporation of water due to very high temperature during summer season.

Water content various dissolved gases, some of them are oxygen and CO_2. Oxygen is a regulator of metabolic process of plant and animal communities and indicative of water conditions. It is a well known fact that, in shallow and turbulent water bodies the concentration of these gases (O_2 & CO_2) is possibly controlled by the physical laws of diffusion of gases into liquids as well as by the rate of various metabolic activities of the biotic community. During 2006-07, the dissolved oxygen is found minimum 2.486 ppm at S-1 in the month of Aug-06 and maximum 7.998 ppm at S-1 in the month Dec-06. The average D.O. varies from 4.4363 ppm (S-3) to 5.2428 ppm (S-4). During 2007-08 D.O. is found minimum 1.073 ppm at S-2 in Sep-07 and maximum 4.009 ppm in Oct-07 at S-4 the average values varies from 1.7003 ppm (S-2) to 2.6866 ppm at S-4. In the year 2008-09 DO is found to be minimum in May-09 at S-1 (3.982 ppm) and maximum at S-4 in Aug-09 (9.002 ppm). The average D.O. value varies from 5.4974 ppm at S6 to 6.4033 ppm at S4. The general trend shows that in winter D.O. is high, whereas in rainy and summer season D.O. is low.

Chemical oxygen demand is used as a measure of the oxygen equivalent of the organic matter content of a sample that is susceptible to oxidation by a strong chemical oxidant. This is a satisfactory method for determining the organic load of a water body. The chemical oxygen demand during 2006-07, shows minimum value 29.12 ppm at S-2 in the month Feb-07 and maximum 73.14 ppm at S-4 in the month of march-07. The average minimum value varies from 38.181 ppm to 61.439 ppm. During the year 2007-08, minimum value of COD is observed at S-6 in the month of April-08 (12.98 ppm) and maximum in the month of Aug-07 at S-4 (77.8 ppm). The minimum average COD is 36.954 ppm for S-6, whereas maximum average 43.483 ppm for S-5. During the year 2008-09, minimum value is observed of 27.98 ppm in May-09 at S-6. The maximum value is observed 78.54 ppm at S-3 in Sep-08. The average varies from 40.941 ppm to 56.498 ppm the trend in COD is not fixed.

Hardness is due to the presence of calcium and magnesium content. Since the values of hardness are high, it comes under very hard category of water.

The chloride content of all samples falls well within the permissible limits. This indicates that inorganic salt present in the water sample is very low.
The high values of sulphate indicate that either leaching of solid waste or effluent affect the stagnant underground water quality of these areas.

Table-1: Average, Maximum, and Minimum Physico Chemical Parameter Osmanabad District for the year 2006-07

Station		Temp	pH	Conductivity	Alkalinity	DO	COD	Hardness	Chloride
S1	Max	30	8.38	0.889	180	7.998	61.92	248	61
	Min	23	7.24	0.369	121	2.486	38.91	109	40
	Avg	26.7	7.87	0.5906	151.42	5.13	51.85	180.67	51.667
	Std	2.6753	0.4258	0.2077	17.344	1.8458	8.0291	54.806	6.5966
S2	Max	30	8.91	0.889	188	7.134	62.7	255	64.94
	Min	24	7.29	0.358	131	3.346	29.12	102	42.98
	Avg	26.9	8.32	0.5502	154.67	4.9818	38.181	194.67	55.809
	Std	2.4011	0.5567	0.2058	16.244	1.2745	10.497	50.996	7.2588
S3	Max	30.5	8.49	0.891	208	7.635	44.21	230	90.28
	Min	23	7.18	0.333	135	3.102	36.38	127	44.72
	Avg	26.6	8.05	0.6283	165.58	4.4363	39.474	178.17	65.09
	Std	2.6657	0.439	0.2147	19.318	1.4936	2.3384	37.148	15.142
S4	Max	30	8.57	0.809	212	7.882	73.14	231	77.08
	Min	23	7.19	0.438	138	3.639	49.46	161	44.08
	Avg	26.5	8.04	0.5911	181.75	5.2425	61.439	191.83	63.743
	Std	2.6529	0.4844	0.1293	23.231	1.2324	7.1935	22.942	12.406
S5	Max	39	8.96	0.883	212	7.398	48.78	238	61.92
	Min	24	7.12	0.566	120	3.776	32.12	131	45.72
	Avg	27.4	8.0	0.6916	171.83	4.9972	39.568	187.42	55.51
	Std	4.2578	0.6352	0.1127	31.185	1.1502	5.6693	42.909	5.7215
S6	Max	30	8.75	0.896	298	7.183	52.8	252	72.82
	Min	24	7.17	0.381	175	3.082	38.18	130	30.89
	Avg	26.5	8.0	0.6138	217.17	5.0037	46.013	185.75	55.45
	Std	2.2909	0.4589	0.2164	43.203	1.4052	5.275	40.297	11.769

Table-2: Average, Maximum, and Minimum Physico Chemical Parameter Osmanabad District for the year 2007-08

Station		Temp	pH	Conductivity	Alkalinity	DO	COD	Hardness	Chloride
S1	Max	31	8.55	1.651	364	4.001	66.23	245	156
	Min	24	8.02	0.329	140	1.126	20.98	108	56
	Avg	26.7	8.25	1.0697	260.5	2.4425	38.398	175.67	95.218
	Std	2.169	0.1747	0.4091	91.468	1.081	14.243	45.398	29.905
S2	Max	29	8.76	1.667	451	3.643	76.45	242	132
	Min	23	8.12	0.358	138	1.073	19.23	119	59
	Avg	25.6	8.46	1.0241	328.33	1.7003	38.973	160.58	102.25
	Std	2.2293	0.216	0.512	106.97	0.7045	16.762	42.395	27.592
S3	Max	30	8.98	1.342	466	3.554	59.74	192	138
	Min	26	7.55	0.32	160	1.221	21.09	120	89
	Avg	28.3	8.43	0.8498	289.25	2.2051	38.363	141.83	108.08
	Std	1.6697	0.4924	0.3258	102.38	0.8031	11.366	23.241	12.566
S4	Max	30.5	8.88	1.657	396	4.009	77.8	210	220
	Min	24	8.06	0.476	160	1.82	21.91	117	98

	Avg	26.5	8.45	0.8838	280.17	2.6866	42.996	160.25	154.67
	Std	2.3061	0.2537	0.4102	88.677	0.7847	16.19	28.898	44.512
S5	Max	31	8.99	1.561	411	3.841	63.2	246	217
	Min	23	7.99	0.548	120	1.56	22.1	121	69
	Avg	25.9	8.42	0.9904	259.17	2.4723	43.483	177.75	145.08
	Std	2.6582	0.3264	0.3466	92.52	0.7005	16.286	42.915	51.803
S6	Max	30	8.89	1.764	398	3.211	65.88	266	225
	Min	24	7.98	0.299	138	1.229	12.98	67	43
	Avg	26.6	8.33	0.8962	266.5	2.1067	36.954	135.9	141
	Std	2.2395	0.3016	0.4641	97.792	0.7215	15.218	67.938	61.477

Table-3: Average, Maximum, and Minimum Physico Chemical Parameter Osmanabad District for the year 2008-09

Station		Temp	pH	Conductivity	Alkalinity	DO	COD	Hardness	Chloride
S1	Max	31	8.45	0.924	546.8	8.935	69.38	332	265
	Min	23	7.19	0.314	139.32	3.982	34.83	122.86	48.89
	Avg	26.3	8.18	0.5888	280.9	5.8248	51.197	230.18	151.1
	Std	3.0085	0.3237	0.2564	140.32	2.0542	12.334	79.267	77.319
S2	Max	30.5	8.6	0.98	543	8.993	64.92	327	329
	Min	24	7.1	0.302	138	3.998	31.22	149.89	49.62
	Avg	26.8	8.18	0.5662	270.58	6.3496	45.8	217.8	118.3
	Std	2.5147	0.384	0.257	130.11	1.5529	12.373	68.311	89.656
S3	Max	31	8.55	0.971	501	8.62	78.54	329	312
	Min	23	7.08	0.364	219	4.102	29.87	125.3	60.42
	Avg	26.4	8.05	0.5702	330.75	6.3763	55.148	199.98	150.15
	Std	2.9142	0.3481	0.23	92.738	1.6914	16.399	68.862	84.058
S4	Max	30	8.69	0.926	410	9.002	72.91	366	432
	Min	24	7.42	0.436	200	3.987	37.29	109	70.82
	Avg	27.1	8.26	0.6533	288.08	6.4033	56.498	215.63	143.62
	Std	2.2088	0.3244	0.1912	83.193	1.8175	11.209	67.803	105.05
S5	Max	31	8.04	1.008	510	7.876	71.89	330	345
	Min	23	7.08	0.643	189	4.056	33.6	122	55.98
	Avg	26.4	7.61	0.7828	349.25	6.0903	42.69	226.77	129.3
	Std	2.8431	0.301	0.1285	107.24	1.0911	12.227	52.72	101.57
S6	Max	30.5	8.56	1.442	523	7.213	73.67	322	348
	Min	23	7.3	0.882	188	3.987	27.98	119	88.8
	Avg	26.7	8.08	1.1582	285.58	5.4974	40.941	267.49	198.43
	Std	2.6152	0.2915	0.1907	115.68	1.1932	17.043	59.342	104.39

CONCLUSION

The ground water of Osmanabad districts was analyzed for various physio-chemical parameters. From the analysis of data, we conclude that the ground water of these sites surprisingly is not much polluted, even though the sampling sites are within one to one and half km radius from the sugar factories. It is a established fact that, the waste from sugar industry has pH 4.5, COD in the range of 2000-4000 ppm and total suspended solids as 200-1800 ppm. The present study reveals that these parameters are very low in the water sample, which indicates that this might be due to underground water streams flowing opposite direction to the sampling sites or may be due to unknown reasons.

ACKNOWLEDGEMENTS

We are very much thankful to principal and management of Maulana Azad College for valuable suggestion during the work.

REFRENCES

1. R.K. Trivedi and P.K. Goyal, Chemical and Biological methods of water pollution studies Enviro media, Karad. India 35.(1986).
2. Standard methods for the examination of water and waste water, APHA, 18th Edn Washington (1992).
3. M.B. Ubale, Mazhar Farooqui, Pathan Md. Arif, Ahmed Zaheer and D.G. Dhuley, *Oriental J.Chem.,* **17(2)**, 347 (2001).
4. Ahmed Zaheer, Mazahar Farooqui, Quadri SH Pathan M. Arif and Maqdoom Farooqui, *Ultra Scientist of Phy.Sc.*, **15(3)**, 395 (2003)

(Received: 11 June 2010 Accepted: 3 July 2010 RJC-575)