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Research Notes

Contamination of Nitrate in Ground Water Samples of Sawai Madhopur Town Rajasthan

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Abstract: Ground water samples from Sawai Madhopur town were collected and analyzed for the period during the month November and December 2010. 17 ground water samples were collected from different places of Sawai Madhopur town of Sawai Madhopur district. The quality analysis has been made for the various parameters like pH, EC, TDS, Total Hardness, Sodium, Potassium, Calcium, Magnesium, Chloride, Sulphate, Nitrate, Fluoride and Alkalinity. It was found that Nitrate concentration was ranging from 8 to 213 mg/l . The permissible limit by WHO of Nitrate is 40-50 mg/L. High Nitrate concentration may cause blue baby syndrome or methemoglobinemia[1].

Keywords: pH, EC, TDS, Total Hardness, Sodium, Potassium, Calcium, Magnesium, Chloride, Sulphate, Nitrate, Fluoride, Alkanity & Ground Water.

INTRODUCTION

The quality of public health depends largely on the quality of ground water, which should be clean and fresh. The modern civilization, industrialization, urbanization and increase in population have lead to fast degradation of our ground water quality. Water contamination is due to settlement, agriculture and industrial activities[2]. As the water is the most important component of eco-system, any imbalance created either in term of amount, which is presence of impurities added to it can hard the whole eco-system[3]. The purpose of this paper is to summarize various water parameters with special reference to nitrate ion concentration. Natural nitrate level in ground water is generally very low(less than 10mg/l) but its concentration grow due to human activity such as agriculture, domestic effluent and emission from combustion engines. The largest anthropogenic source of nitrate in ground water is septic tanks, application of nitrogen rich fertilizers and agriculture activities. According to World Health Organization (WHO) permissible limit of nitrate value is 40-50 mg/L[4]. The Indian Council of Medical Research has recommended

desirable limit of 20mg/L[7] of nitrate for drinking water. High Nitrate concentration was observed in ground water 50% samples[5-10].

MATERIALS AND METHODS

Polythene bottles of 2.0 liters and 2.5 liters used to collect the water samples from different locations of the town. The samples collected from bore wells as well as from deep hand pumps. The samples also collected in different seasons. It ensured that the concentrations of various water quality parameters do not changes in time that elapses between drawing of samples and the analysis in the laboratory. Some samples, which were turbid or containing suspended matter, filtered at the time of collection[11]. The samples were collected during the month November and December, 2010 and analyzed **(Table-1)** according to standard methods[12]

Table-1: Maximum permissible limit or Highest relax able limit or Maximum relaxable limit are set by W.H.O., I.S.I., I.C.M.R., Govt. of India.

Parameter and Unit	Within Maximum Permissible Limit		No. of Samples	Out of Maximum Permissible Limit	Range (Min. to Max.)	Unit
	No. of samples	%	No. of Samples	%		
pH	15	88.2	2	11.8	8-9.35	
E.C.	13	76.5	4	23.5	500-6248	µm/cm
Total Hardness	16	94.1	1	5.9	50-640	mg/l
TDS	15	88.2	2	11.8	252-3849	mg/l
Calcium	17	100.0	0	0.0	8-92	mg/l
Potassium	13	76.5	4	23.5	1.5-55	mg/l
Sodium	8	47.1	9	52.9	32-1341	mg/l
Sulphate	14	82.4	3	17.6	31-822	mg/l
Nitrate	4	23.5	13	76.5	8-213	mg/l
Chlorine	16	94.1	1	5.9	10-1110	mg/l
Fluoride	12	70.6	5	29.4	0.04-5.22	mg/l
Magnesium	16	94.1	1	5.9	7.3-112	mg/l
Alkalinity	16	94.1	1	5.9	110-1074	ppm

RESULTS AND DISCUSSION

The value of pH was within maximum permissible limit in 15 samples; only two samples were beyond permissible limit. The Electrical conductivity was ranging from 500 to 6248 µm/cm and in 23.5% samples; the E.C. was out of maximum permissible limit. The Total Hardness (TH) of samples was ranging from 50 to 640. In 5.9 % samples, it was out of maximum permissible limit. Total Dissolved Solids (T.D.S.) value was ranging from 252 to 3849; only two samples were beyond permissible limit. Calcium values were ranging from 8 to 92 and Sulphate values were ranging from 31 to 822. In calcium all, the samples were within maximum permissible limit. Value of Potassium were ranging from 1.2 to 55 and 23.5 % samples were out of maximum permissible limit. Fluoride contents were ranging from 0.04 to 5.22 and in 29.4 % samples; it was more than maximum permissible limit. Alkanity was ranging from 110 to 1074 and in 5.9% samples; it was more than maximum permissible limit. Chlorine content was ranging from 10 to 1110 and in 5.9 % samples; it was more than maximum permissible limit. Magnesium was more than 100 in 1 (5.9%) samples. Nitrate value was ranging from 8 to 213 and 76.5 % samples were having value more than maximum permissible limit. The above analysis is based on **Table -1 and Table -2**.

Table – 2: Ground water analysis of Sawaimadhopur town (Total Samples – 17)

Reading Of Ground Water Samples Collected From Sawai Madhopur Town																	
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	S14	S15	S16	S17
pH	8.71	8.26	8.37	8.83	8.12	8.34	8.35	7.96	8.66	9.3	9.35	7.98	8.89	8.35	8.25	8.89	8.7
EC	2304	2060	1364	500	1684	4336	1640	1524	608	562	530	998	1360	1550	6248	1220	1208
Alkalinity	488	354	173	126	305	206	428	110	218	145	193	305	406	295	1074	324	114
Total Hardness	130	50	220	160	390	640	320	470	170	150	80	220	80	340	310	220	350
Chloride	330	120	200	25	263	645	150	210	10	50	20	71	130	315	1110	161	150
Sulphate	160	496	192	51	144	822	144	208	39	31	39	108	106	64	528	53	165
Nitrate	83	30	47	25	84	213	68	171	52	24	12	40	8	10	42	52	87
Fluoride	5.22	1.4	0.64	0.22	0.59	0.04	2.13	0.23	0.04	0.23	0.19	0.33	1.56	0.66	2.83	1.56	1.06
TDS	1348	1298	769	252	970	3665	1002	926	365	337	271	567	832	920	3849	699	725
Calcium	20	8	36	44	92	72	56	56	20	16	16	32	20	56	32	20	44
Magnesium	19	12	28	12	39	112	32	68	22	14	12	34	7.3	36	28	41	46
Sodium	467	436	207	32	208	628	244	148	42	67	74	123	240	203	1341	168	112
Potasium	1.2	2.7	1.4	4.7	1.8	55	6.4	5.2	49	7.1	2	8.2	11	12	2.7	2.8	7.6

Table -3: Correlation Matrix for Different Water Quality Parameters

	pH	EC	Alkalinity	Total Hardness	Cl^-	SO_4^{--}	NO_3^-	F^-	TDS	Ca^{++}	Mg^{++}	Na^+	K^+
pH	1.000												
EC	-0.400	1.000											
Alkalinity	-0.221	0.765	1.000										
Total Hardness	-0.541	0.453	-0.061	1.000									
Chloride	-0.365	0.974	0.759	0.745	1.000								
Sulphate	-0.425	0.816	0.344	0.572	0.705	1.000							
Nitrate	-0.434	0.370	-0.184	0.917	0.326	0.585	1.000						
Fluoride	-0.003	0.398	0.644	-0.273	0.373	0.091	-0.067	1.000					
TDS	-0.379	0.978	0.640	0.685	0.937	0.890	0.485	0.293	1.000				
Calcium	-0.543	0.210	-0.129	0.843	0.267	0.235	0.566	-0.248	0.266	1.000			
Magnesium	-0.452	0.408	-0.176	0.951	0.399	0.605	0.902	-0.246	0.540	0.636	1.000		
Sodium	-0.317	0.973	0.866	0.374	0.944	0.730	0.183	0.499	0.915	0.034	0.196	1.000	
Potassium	-0.052	0.167	-0.192	0.455	0.118	0.393	0.466	-0.353	0.320	0.176	0.535	0.034	1.000

CONCLUSION

The ground water samples analysis confirms that the pH level of ground water was within limit. Four samples were having Electrical Conductivity more than Maximum Permissible Limit. It is suggested that this water cannot be used for drinking purpose. The value of T.D.S. was more than maximum permissible limit in 2 samples, these sample water are not suitable for drinking purpose ,one sample is found having TDS more than 3000, This cannot be used even for irrigation purposes. In 5 samples the fluoride was found more than maximum permissible limit. Excess fluoride may lead to tooth decay and kidney disease. The concentration of Nitrate was ranging from 8-213 mg/L.Nitrate concentration was higher in 13 samples which is 76.5% of total samples. High concentration of nitrate is possibly due to more agricultural activities and more disposal of domestic and agricultural waste in to water bodies High Nitrate concentration may cause blue baby syndrome or methemoglobinemia. The concentration remains same throughout the period, irrespective of rain/flood period. Reverse Osmosis, ion exchange and biological denitrification method can be used to reduce nitrate concentration. Correlation coefficient from table 3 shows that concentration of Nitrate depends on Total Hardness and concentration of Sulphate.

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