HYDROCHEMICAL MONITORING AND
SURVEILLANCE OF TOXIC POLLUTANTS IN
DRINKING WATER QUALITY OF BERASIA, BHOPAL (INDIA)

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ABSTRACT

Hydrochemical analysis of ground water (handpumps) of Berasia, Bhopal of M.P. has been done in post monsoon, pre monsoon and monsoon season for one year 2003-04. Four readings in each season has been observed to analyse the water for water quality assessment. Temperature turbidity, pH, electrical conductivity, chloride, total alkalinity. Total hardness, Ca-H, Mg-H, D.O., B.O.D., C.O.D., phosphate, Nitrate, Nitrite, Fe, F⁻, Cu, Zn and Mn has noted at Harrakheda village. This study has its significance for hygienic point of view as the water is polluted by different man's and animals activities day by day.

INTRODUCTION

Water is the most important commodity for all living beings. The changes in physico-chemical parameters are the direct and indirect - indices of water quality. Proper ground water (hand-pumps) sampling and analysis are important to assure effective monitoring. Harrakheda village, has population of about 10,000 and the main source of drinking water is hand-pumps water.

The increase in population coupled with unplanned urbanization has resulted deterioration in hand pumps water quality. Non-point pollution is after more difficult to identity and to correct, in agriculture biological contaminants are primarily from animal and human wastes, dairies and septic system domestic sewage are the major sources of biological pollution.

Different hydro chemical parameters were analysed water born diseases and health hazards are also noted due to contamination by inorganic, organic and microorganisms. Hence, this study has been done to assess and analyse the water quality in public interest.

MATERIAL AND METHODS

The samples of hand pumps are collected in presterilized 2 litre polythene jerry canes with necessary precautions. The methods applied for analysis are usually same as prescribed by various workers[1,2,8,9]. Total hardness is determined by using EDTA and Eriochrame black - T, The trace elements there determined by Perkin Elmer Atomic Absorption spectrophotometer with air - acetylene flame and proper slit needle.

RESULTS AND DISCUSSION

In the present investigation, temperature ranges from 16.4 - 32.8°C as temperature of water influences the biological reactions in water. Higher value of turbidity can make water unfit for drinking. Ground water is less turbid. Turbidity here ranges from 0-5 N.T.U. Normal pH of water has no adverse effect on human health. Lower pH of 5.0 produces sour taste of water pH in the present study ranges from 7.1-8.2 in post, pre monsoon and monsoon season is well within the permissible limit 5.0 recommended by W.H.O. Electrical conductivity measures the dissolved ions, it ranges from 115-245 u Mhos/cm. In this study chloride, Total alkalinity, T-H, Ca-H and Mg-H ranges from 132-233, 247-474, 255-394, 124-204 and 51-167 mg/L respectively in different season. Chloride concentration in ground water is due to dissolution of salts, discharge of untreated domestic sewage. Higher value of Total alkalinity is due to leaching of

Table - Hydrochemical monitoring and surveillance of toxic pollutants in drinking water quality of Berasia Distt. Bhopal at sampling on Sktp-1 during 2002-03

PARAMETER	UNIT	POST MONSOON						PREMONSOON					MONSOON			
		NOV	DEC	JAN	FEB	MEAN	MAR	APR	MAY	JUN	MEAN	JULY	AUG	SEP	OCT	MEAN
Temperature	°C	24.6	20.1	16.4	19.7	20.2	23.0	27.2	31.5	32.8	28.6	26.2	25.4	24.6	25.4	25.4
Turbidity	NTU	0	0	0	0	0	1	1	1	1	1	5	4	3	0	3
pH		7.0	7.7	7.0	7.4	7.2	7.5	8.0	7.1	7.1	5.9	7.2	8.1	8.2	7.3	7.7
El. conductivity	µMhos/Cm	115	175	192	245	182	128	144	185	204	165	134	134	196	216	170
Chloride	mg/l	204	165	170	132	168	227	175	233	148	196	221	184	194	142	185
Total Alkalinity	mg/l	247	247	247	278	255	418	422	451	474	441	309	299	284	319	303
Total hardness	mg/l	289	267	256	283	274	394	284	278	266	306	255	269	272	280	269
Ca Hardness	mg/l	188	175	171	165	175	124	128	175	184	153	204	186	194	192	194
Mg Hardness	mg/l	101	92	85	199	99	167	157	103	83	127	50	73	78	89	73
DO	mg/l	3.92	3.19	3.78	3.35	3.56	0.05	2.70	2.06	1.92	2.43	2.78	2.86	2.90	2.96	2.88
BOD	mg/l	3.07	2.55	2.47	2.88	2.74	2.08	2.47	2.78	2.68	2.50	3.17	2.99	2.12	2.99	2.95
COD	mg/l	13.2	13.0	13.3	12.6	13.0	12.8	14.0	13.3	14.3	13.6	13.5	13.2	12.8	13.0	13.1
Phosphate	mg/l	0.08	0.09	0.09	0.06	0.08	0.07	0.08	0.10	0.09	0.09	0.09	0.10	0.10	0.08	0.09
Nitrate	mg/l	12.4	11.8	9.0	14.9	12.0	15.6	11.1	14.6	6.8	12.0	17.4	10.1	9.2	13.9	12.6
Nitrite	mg/l	0.008	0.009	0.019	0.039	0.019	0.006	0.004	0.004	0.022	0.009	0.007	0.031	0.030	0.042	0.028
Iron	ppm	0.299	0.330	0.113	0.216	0.239	0.216	0.391	0.144	0.144	0.224	0.319	0.361	0.381	0.185	0.312
Fluoride	ppm	0.288	0.422	0.298	0.212	0.305	0.216	0.442	0.330	0.216	0.301	0.323	0.412	0.339	0.111	0.296
Copper	ppm	0.068	0.068	0.061	0.073	0.067	0.56	0.072	0.053	0.064	0.061	0.063	0.056	0.54	0.065	0.059
Zinc	mg/l	0.29	0.12	0.33	0.30	0.26	0.30	0.43	0.41	0.33	0.37	0.41	0.43	0.31	0.42	0.39
Manganese	mg/l	0.16	0.19	0.22	0.20	0.19	0.022	0.18	0.27	0.25	0.23	0.25	0.14	0.13	0.29	0.20

soil during natural filtration of water from sewage. Hardness of water has not adverse effect on human health. Water above hardness 200 mg/L may cause scale deposition in the water distribution system and more soap consumption.

D.O., B.O.D. and C.O.D. ranges from 1.92-3.92, 2.08-3.71 and 12.6-14.3 mg/l respectively. Dissolved oxygen reflects the water quality. Depletion of D.O. is due to high temperature in summer and increased microbial activity[7,4]. B.O.D. is the amount of oxygen utilized by microorganisms white COD estimates the carbonaceous fraction of organic matter. The findings are similar with Kataria[5,6].

Phosphate nitrate, nitrite ranges from 0.06-0.10 and 6.8-17.4 mg/L respectively in different season. Total irons, (fluoride) Cu, Zn and Mn. Trace elements ranges from 0.113-0.391, 0.054-0.073, 0.12-0.42 and 0.13-0.29 mg/L respectively. Maximum permissible limits for iron is 0.01 - 1.0 pm, ISI, 1983, Cu 1.0 ppm (IS: 10500)[3], 0.05-5.0 mg/L (WHO, 1979) for drinking water. Zn 5-15 ppm. Mn 0.05-0.50 ppm. Fluoride ranges from 0.111-0.442 ppm The results are summarised in Table -1.

Most of the parameters are found well within the permissible limit recommended by WHO[10] while alkalinity and Hardness are having some higher values. Due to MIC gas leakage in 1984 and raw dumped materials of the factory, untreated sewage wastes are percolated and contaminated in ground water level is creating pollution of hand pumps water. So it requires recommended for proper treatment before public use.

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