A Study on Physico-Chemical Characteristics of Municipal & Underground Water Samples In Around Vidisha City

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Abstract— Water is a momentous natural resource for perpetuation life and environment but the last some decades the water quality has been deteriorated due to it's over exploitation. Water quality is one of the most important criterions to determine its suitability for human beings. Water monitoring is needed for deterioration in water quality on regular basis. In this study we checked the physical and chemical quality of the Muncipal and underground water used by Vidisha city. Ten underground, municipal water samples collected from the study region and the samples were analyzed for different physical and chemical characteristics such as pH, Total hardness (TH), Total alkalinity (TA), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD) and Biochemical Oxygen Demand (BOD). Slight deviation was observed in Pitalmil chouraha and Ahmadpur Chouraha with Hardness and BOD; COD values are also within the limit which indicates that less contaminants of wastes in the ground water.

Keywords: Physico-chemical, BOD, COD, Hardness, Municipal Water

I. Introduction

It is even water more important for the human being as they depend upon it for food production, industrial and waste disposal (1).The quality of water is of very important concern for the mankind since it is directly linked with human safety (2). Underground water is an essential source of drinking water for human being. It contains over 90% of the fresh water resources and is a main reserve of good quality water. Groundwater, like any other water resource, is not just of public healthiness and economic value; it also has an important biological role (3). Underground water gets contaminated mostly due to uncontrolled use of fertilizers, herbicides and pesticides and unplanned use of industrial and urban wastes (4). Municipal Solid Waste is useless unnecessary material discharge as a result of human activity. Most commonly, they are solid, semi solid or liquids in container thrown out of houses, commercial or industrial premises (5). It is important to protect soil, surface and groundwater contamination due to leachates percolation in and around the dumpsite (6). Protection of groundwater is a major environmental problem because the importance of water quality on human health has attracted a great deal of interest lately (7-9). Access to adequate supply of safe drinking water for all is one of the primary goals of the World Health Organization (10).

II. Materials and Method

A. Study Area:

Vidisha is situated in Bhopal, Madhya Pradesh, India.

B. Sampling:

For collect water samples, plastic bottle 1L capability with stopper is used. All bottles was washed with 2% HNO3 and then rinsed three times by distilled water. The bottles were then preserved in a uncontaminated place. The bottles were filled with water leaving no air space, and then the bottles were sealed to prevent any leakage (11).

C. Physico-Chemical Analysis:

All the samples were analyzed for the following physicochemical parameters; pH, temperature, test and odor, Total Alkalinity(TA), Chloride, Total Hardness(TH), Ca hardness, Mg hardness, Dissolved Oxygen(DO), Biological Oxygen Demand (BOD), Chemical Oxygen Demand(COD).The physicochemical analysis of water samples were carried out in accordance to standard analytical methods (11).

III. Result and Discussion

The physico-chemical facts of the water samples are presented in the table 3, 4. A comparison of physico-chemical facts of the underground & municipal water samples with drinking water standards, WHO (12)-(13). In the present study pH was found to be acidic in nature at all the sites ranged from 6.6-8.5. The tolerance pH limit is 6.5 – 8.5(14). Out of 20 samples only two samples, underground & three samples municipal have detectable the values are much than permissible values set by both Indian standard and WHO. Underground water Samples No. 8, 9 contain highest Calcium and magnesium value of Ca2+ 243, 220& Mg2+ 160, 110 ppm . In the present study Ca2+& Mg2+ ranged from 75-200, 30-100ppm the values are much than permissible values. And Municipal water Samples No. 4, 5 & 10 contain highest BOD. I have also found the main cause of water pollution such as plant nutrients, sewage, synthetic organic compounds and oil, trace elements, complexes of metals with organic in natural water and organic metallic compounds, domestic sewage mixing of drain water in drinking water.

S. No	Parameters	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
1	Temperature	25.42	25.21	27.13	26.39	25.11	25.89	26.89	26.81	27.31	26.18
2	pH	7.81	7.02	7.85	7.61	7.23	7.11	7.43	7.59	7.68	7.77
3	Turbidity(NTU)	8.0	7.2	9.2	9.2	6.1	7.1	7.2	10.2	9.9	7.6
4	EC (µs/cm)	952	814	865	902	571	912	794	959	802	903

5	TDS (mg/L)	1296	990	1337	1179	846	874	896	1457	1413	1213
6	TSS (mg/L)	95	86	112	98	81	89	90	128	125	92
7	TS (mg/L)	1232	1026	1379	1310	998	1058	1068	1478	1426	1193
8	TA (mg/L)	460	400	400	460	360	500	360	300	340	360
9	Cl- (mg/L)	152	98	209	269	74	134	106	205	110	113
10	TH (mg/L)	492	324	552	504	300	380	388	688	676	428
11	Ca (mg/L)	92	123	144	212	104	140	170	243	220	104
12	Mg (mg/L)	80	20	88	92	96	40	28	160	118	37
13	DO (mg/L)	5.12	4.14	4.80	4.80	5.72	4.97	4.29	5.23	4.57	4.08
14	BOD(mg/L)	2.76	2.9	2.47	3.15	2.87	2.33	2.49	2.84	1.91	2.96
15	COD(mg/L)	11.1	10.1	08	09	11.12	10.45	9.21	12	11.2	10
16	NO^{3-} (mg/L)	2.1	14.2	12.4	22.1	6.9	54	ND	7.8	0.1	4.7
17	NO^{2-} (mg/L)	0.51	0.07	0.04	0.02	0.08	0.46	0.21	0.032	0.04	0.03
18	F^- (mg/L)	1.1	0.2	0.1	0.5	0.35	0.6	0.7	0.39	0.2	0.9
19	PO_4^{3-}(mg/L)	0.01	0.01	0.09	0.01	0.05	0.03	0.08	0.07	0.07	0.02
20	SO^{4-} (mg/L)	11.2	6.0	2.6	8.1	12.7	16	46	171	49	78
21	NH^+ (mg/L)	1.6	1.2	0.1	2.7	0.8	4.3	1.6	1.8	0.5	1.7
22	Fe^{++} (mg/L)	0.1	0.31	0.9	0.1	0.98	0.3	0.2	0.1	0.66	0.45

Table 3: Physico-chemical parameters of different underground water samples

ND: Not Detectable

S. No	Parameters	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8	S_9	S_{10}
1	Temperature	24.42	25.21	25.13	24.39	26.11	27.89	27.89	26.81	26.31	26.18
2	pH	7.11	7.52	7.75	7.51	7.43	7.31	7.13	7.19	7.28	7.37
3	Turbidity(NTU)	5.0	4.2	9.2	4.2	6.1	7.1	6.2	5.2	6.9	7.6
4	EC (µs/cm)	742	684	745	652	671	512	624	529	862	863
5	TDS (mg/L)	896	890	637	779	601	594	896	857	603	613
6	TSS (mg/L)	95	86	112	98	81	89	90	128	125	92
7	TS (mg/L)	832	826	979	890	888	858	968	878	726	723
8	TA (mg/L)	400	420	360	300	300	360	240	240	400	420
9	Cl^- (mg/L)	102	32	42	35	42	49	31	46	42	46
10	TH (mg/L)	372	368	184	180	164	152	268	296	152	180
11	Ca (mg/L)	40	92	24	28	45	24	36	72	84	94
12	Mg (mg/L)	32	48	60	52	72	72	91	84	89	48
13	DO (mg/L)	5.12	4.14	5.80	5.70	5.10	5.76	4.29	5.23	4.57	5.08
14	BOD(mg/L)	3.76	2.9	2.47	4.15	4.87	2.33	2.49	1.84	3.91	5.96
15	COD(mg/L)	12	13	11	14	13.9	10.5	11.1	10.2	12	16
16	NO^{3-} (mg/L)	1.1	1.5	2.69	6.1	7.9	8.2	8.7	6.8	2.1	4.7
17	NO^{2-} (mg/L)	0.51	0.68	0.54	0.22	0.08	0.46	0.07	0.04	0.12	0.03
18	F^- (mg/L)	1.4	0.5	0.4	0.3	0.04	0.05	0.7	ND	0.2	0.9
19	PO_4^{3-} (mg/L)	0.01	0.05	ND	0.01	0.05	0.07	0.04	0.07	0.01	0.02
20	SO^{4-} (mg/L)	10.2	6.0	3.9	8.9	6.7	12	46	17	49	24
21	NH^+ (mg/L)	ND	4.2	0.1	5.7	1.8	4.3	1.6	2.8	0.5	4.7
22	Fe^{++} (mg/L)	0.12	ND	0.05	0.1	2.3	0.3	0.2	0.1	0.66	0.09

Table 4: Physico-chemical parameters of different municipal water samples:

IV. CONCLUSSION

Conclusively, the present study shows that water quality parameters are within the permissible limit. Slight deviation was observed in Pitalmil chouraha (PCUS) and Ahmadpur Chouraha (ACUS) with Hardness and Muncipal water BOD of three samples MCMS1 RCMS1 and ACMS1 were found more than the WHO standard limit. Which indicated both the sample were found harder than other sample due to presence of industrial area in that region and decline the uncontrolled uses of fertilizers, herbicides and pesticides and unplanned use of industrial and urban wastes and the municipal water samples were more than the WHO standard due to the damage pipeline system, corrosion and leakage. From the experiential results it is recommended to monitor the water quality occasionally to avoid further contamination.

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