

Physico-Chemical Analysis of Water of Surrounding Area of Kaliasote Dam, Bhopal (M.P.) India

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ABSTRACT

Physico-chemical analysis such as temperature, pH, dissolved Oxygen, TDS, Chloride, Total Alkalinity, Calcium and Magnesium hardness, BOD, COD, Turbidity of water samples has been carried out from ten sampling stations of the study area during 2006-07 in order to assess water quality index.

Keywords: Physico-chemical analysis, Kaliasote dam, TDS, quality index.

INTRODUCTION

Fresh water is finite resource, essential for agriculture, industry and even human existence, without fresh water of adequate quantity, sustainable development will not possible¹. Since water quality and human health are closely related, water analysis before usage is of prime importance. Certain physical, chemical and microbiological standards, which are designed to ensure that the water is palatable and safe for drinking before it can be described as potable².

Physicochemical property like pH for water should be in the range of 6.5 to 8.5 for drinking and domestic purposes³. As a momentous role of DO amount in water quality of ground water, the average concentration of DO was highest in post monsoon period and lowest in monsoon consequently increase in BOD and COD⁴. The parameters like pH, dissolved oxygen(DO), biological oxygen demand(BOD), chemical oxygen demand(COD) total hardness(TH), calcium and magnesium were analyzed using standard procedures⁵.

The fluctuations in optimum pH ranges may lead to an increase or decrease in the toxicity of poisons in water bodies⁶. The high level of total hardness is due to mixing of sewage effluents into the rivers. The permanent hardness is mainly caused by chlorides and sulphates⁷. Faecal coli forms counts/100 ml should be zero for water to be considered as no risk to human health. In general high levels of free CO₂ might be the reason for low pH values obtained in the river water samples, which may consequently affect the bacterial count⁸.

Ground water contains high amount of various ions, salts etc. so if we were using such type of water as potable water then it leads to various water-borne diseases⁹. Unsafe drinking water contributed to numerous health problems in developing countries such as the one billion or more incidents of diarrhoea that occur annually¹⁰. The coli form bacterium is the primary bacterial indicator for faecal pollution in water¹¹⁻¹².

Concentration of DO is one of the most important parameters to indicate water purity and to determine the distribution and abundance of various algal groups¹³. High level of TDS in water used for drinking purposes leads to many diseases which are not water-borne but due to excess salts¹⁴.

In one research paper the chemical oxygen demand (COD), total nitrogen, nitrate, nitrite, ammonium, orthophosphate and total phosphate concentrations of each sample were analyzed using Aqualytic AL282 as described by the manufacturer. The concentrations of heavy metals (Pb^{+2} , Cd^{+2} , Cu^{+2} , Al^{+3} and Hg^{+2}) in water were measured using an atomic absorbance spectrometer. The temperature, pH, conductivity, dissolved oxygen (DO) concentration and turbidity were monitored on site using Corning Checkmate II with portable thermometer, pH, turbidity and DO meters and Aqualytic turbidity meter respectively. Biological oxygen demand (BOD) values were obtained based on the instructional manual of the Aqualytic Sensomat System¹⁵.

MATERIALS AND METHODS

The Water Samples were collected from four Different Stations in the Morning Hours between 9 to 11 am, in Polythene Bottles. The Water samples were immediately brought in to Laboratory for the Estimation of various Physico-chemical Parameters like Water Temperature Transparency and pH were recorded at the time of Sample Collection, by using Thermometer and Pocket Digital pH Meter. Transparency was measured with the help of Secchi Disc. while other Parameters Such as DO, TDS, Free CO₂, Hardness, Chlorides, Alkalinity, Phosphate and Nitrate were Estimated in the Laboratory by using Standard Methods as Prescribed by APHA, AWWA.

Table 1: During pre monsoon season 2006-07

Sr. No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	Temp.	^o C	38.9	38.6	37.9	38.9	39.3	38.5	38.6	38.8	36.9	39.7
2	pH		7.9	8.2	8.4	8.3	8.5	7.9	7.8	8.6	9.3	8.9
3	Turbidity	NTU	7.8	7.9	9.3	8.9	7.5	7.9	8.2	9.1	8.5	9.1
4	Ele. conductivity	MΩ ⁻¹ /cm	1012	1122	1260	1310	1190	1185	1380	1260	1190	1310
5	Total solids	mg/l	690	735	890	615	785	845	940	735	880	1995
6	Total hardness	mg/l	610	710	870	590	755	805	905	715	845	955
7	Ca hardness	mg/l	400	480	535	315	585	635	765	545	705	765
8	Mg hardness	mg/l	210	230	335	275	170	170	140	160	140	190
9	COD	mg/l	975	990	810	790	980	835	735	865	890	990
10	BOD	mg/l	392	415	435	375	390	415	472	370	405	410
11	DO	mg/l	7.5	6.5	7.2	7.1	6.3	7.4	6.9	7.6	7.5	6.1
12	Fe	mg/l	0.53	0.7	0.69	0.4	0.67	0.95	0.87	0.73	0.83	0.93
13	Mn	mg/l	0.31	0.41	0.51	0.63	0.3	0.49	0.53	0.59	0.69	0.56
14	Cu	mg/l	0.93	0.97	0.83	0.87	0.63	0.78	0.87	0.89	0.72	0.7
15	Zn	mg/l	14.8	13.9	6.3	5.9	13.9	6.7	9.3	14.9	13.9	12.2

RESULTS AND DISCUSSION

The physico-chemical data of the water samples collected during 2006-07 are recorded in table 1, table -2 and table - 3 respectively. The results of the samples vary with different collecting places because of the different nature of the soil contamination¹⁶⁻²⁰.

Table 2: During Monsoon 2006-07

Sr. No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	Temp.	°C	35.6	35.4	34.7	35.6	36.0	35.3	35.4	35.5	33.8	36.4
2	pH		7.2	7.5	7.7	7.6	7.8	7.2	7.1	7.9	8.5	8.2
3	Turbidity	NTU	7.1	7.2	8.5	8.2	6.9	7.2	7.5	8.3	7.8	8.3
4	Ele. conductivity	MΩ ⁻¹ /cm	927	1028	1147	1200	1090	1085	1264	1154	1090	1200
5	Total solids	mg/l	557	673	815	563	719	774	861	673	806	911
6	Total hardness	mg/l	559	650	797	540	692	737	829	655	774	875
7	Ca hardness	mg/l	366	440	490	289	536	582	701	499	646	701
8	Mg hardness	mg/l	192	211	307	252	156	156	128	147	128	174
9	COD	mg/l	893	907	742	724	898	765	673	792	815	907
10	BOD	mg/l	359	380	398	344	357	380	432	339	371	376
11	DO	mg/l	6.9	5.9	6.6	6.4	5.8	6.8	6.3	7.0	6.9	5.6
12	Fe	mg/l	0.49	0.64	0.63	0.37	0.61	0.87	0.80	0.67	0.76	0.85
13	Mn	mg/l	0.28	0.38	0.47	0.58	0.27	0.45	0.49	0.54	0.63	0.51
14	Cu	mg/l	0.85	0.89	0.76	0.80	0.58	0.71	0.80	0.82	0.66	0.64
15	Zn	mg/l	13.6	12.7	5.8	5.4	12.7	6.1	8.5	13.6	12.7	11.2

Table 3: During post monsoon 2006-07

Sr. No.	Parameter	Unit	Sampling Stations									
			1	2	3	4	5	6	7	8	9	10
1	Temp.	°C	36.1	35.8	35.1	36.1	36.4	35.7	35.8	36.0	34.2	36.8
2	pH		7.3	7.6	7.8	7.7	7.9	7.3	7.2	8.0	8.6	8.3
3	Turbidity	NTU	7.2	7.3	8.6	8.3	7.0	7.3	7.6	8.4	7.9	8.4
4	Ele. conductivity	MΩ ⁻¹ /cm	938	1040	1130	1214	1103	1098	1279	1168	1103	1214
5	Total solids	mg/l	362	681	825	570	728	783	871	681	816	922
6	Total hardness	mg/l	565	658	806	547	700	746	839	663	783	885
7	Ca hardness	mg/l	371	445	496	292	542	589	709	505	654	709
8	Mg hardness	mg/l	195	213	311	255	158	158	130	148	130	176
9	COD	mg/l	904	918	751	732	908	774	681	802	825	918
10	BOD	mg/l	363	385	403	348	362	385	438	343	375	380
11	DO	mg/l	7.0	6.0	6.6	7.5	5.8	6.9	6.4	7.0	7.0	5.7
12	Fe	mg/l	0.49	0.65	0.64	0.37	0.62	0.88	0.81	0.68	0.77	0.86
13	Mn	mg/l	0.29	0.38	0.47	0.58	0.28	0.45	0.49	0.55	0.64	0.52
14	Cu	mg/l	0.86	0.90	0.77	0.81	0.58	0.72	0.81	0.83	0.67	0.65
15	Zn	mg/l	13.7	12.9	5.8	5.5	12.9	6.2	8.6	13.8	12.9	11.3

Sampling stations

1. Near Guest House
2. At down site of Kamla Nagar
3. At downhill towards MANIT
4. At sluice gate

5. Near temple site
6. Near spill over of Kaliasote dam
7. Near middle centre of reservoir
8. Near Barkheri Khurd
9. Near Bhoj University
10. Near spill of reservoir

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