

Potentiality of Kolar Dam Water for Drinking Purposes

R.K. Jain, G.K. Jais, Abhaya Saxena, Nisha Upadhyay, Rajshree Shukla, P.K. Shrivastava*

MP Pollution Control Board, Paryavaran Parisr, E-5 Arera Colony, Bhopal-16 , MP, India

* E-mail of the corresponding author: shrivastava.prem@rediffmail.com

Abstract

Kolar Dam, a major masonry dam, is located about 35 km away from [Bhopal](#), near [Lawakhari](#) village in [Sehore District](#). Constructed across the Kolar River, a tributary of [Narmada](#) on the right bank, the dam is about 45 m high. The maximum storage capacity is 270 Mcm. Kolar reservoir is the important sources of potable water supply for the Bhopal city. To assess its suitability for drinking purpose, the physico-chemical and microbiological characteristics were studied on monthly basis. In general almost all the parameters are within the range except coliform bacteria. Coliform bacteria were found beyond the norm prescribed for drinking water by various agencies. The analysis indicates that the water of Kolar reservoir is moderately soft with moderate alkalinity, transparent, low BOD, COD level as apparent by the study. The overall water quality of Kolar reservoir is not much affected by anthropogenic sources as it is surrounded by thick forest and less human activities are evident in this area. Therefore its water can only be used for drinking purposes but only after conventional treatment and disinfection.

Keywords: Kolar Dam, Water quality, Physico chemical parameter, Drinking water.

1. Introduction

If we look at the present scenario, we are leading towards crisis. About 85 % of rural population in India is solely depended on ground water, which is depleting at a fast rate. In the urban areas though about 60% of the population is depended on surface water sources, the availability and quality are questionable. Population growth is expected to result in a decline in the per capita availability of fresh water. In 1947, this was measured at 5,150m³. By the year 2000, it was around 2,200m³. It has been recently estimated that by 2017 India will be 'water stressed' - per capita availability will decline to 1600 cu m.

The shortage of water in the country is slowly affecting the lives of people as well as the environment around them.

In Bhopal, MP the Upper Lake and Kolar dam both are the important sources of potable water supply for the city. Both sources of water supply is precious for the city and are rain-fed sources and are thus vulnerable to seasonal fluctuations. Host to Asia's biggest man-made lake (the upper lake), is facing a water crisis like never before. The lake, which used to be the major source of potable water for the city which serve a population of over 1.8 million, has dried up due to insufficient rainfall for the past two consecutive years. Now the Kolar dam is become the important sources of potable water supply for the almost entire Bhopal city. Therefore it is essential to keep a regular watch on the quality of its water. The physico-chemical and microbiological characteristics were studied on monthly basis to ascertain the drinking water quality.

2. Material & Methods

2.1 Study Area:

Kolar Dam, a major masonry dam, is located about 35 km away from [Bhopal](#), near [Lawakhari](#) village in [Sehore District](#), M.P., constructed across the Kolar River, a tributary of [Narmada](#) on the right bank, the dam is about 45 m high. The maximum storage capacity is 270 Mcm. of which 5,000 Million liters is dead storage. As per an agreement with the Water Resources Department 56,600 ML (12466 MG) is

reserved for drinking water supplies, irrespective of the amount of water available in the dam or the seasonal variation in demand.

2.2 Sampling

The study area was kept under observation for three years from Apr 2007 to 2008. Sampling was performed on monthly basis during the study span. Samples collected & transported to the laboratory as per standard procedure for analysis APHA(1992).

2.3 Analysis:

Analysis of dam water samples was performed in the laboratory as per the Standard Methods for the Examination of Water and Wastewater, APHA(1992).

3. Results and Discussion

In dam water resource evaluation, the quality of water is nearly equal importance to quantity. The physico-chemical characteristics of dam water determine to ascertain its use for drinking water supplies. The observe data are presented in table 1.

pH

pH is the measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions in water. Generally surface water has pH values between 5.0 and 9.0. In the present study of Dam water pH varied between 7.2 and 7.7 with a mean value of 7.4. Kolar dam water has the ideal pH level required for drinking water as the human body maintains pH equilibrium on a constant basis and will not be affected by water consumption.

Turbidity

In the present study turbidity was found in the range of 2 to 152 NTU. There are significant fluctuations in the amount of turbidity was noticed in dam water body at different times in a year.. Heavy rainfalls, strong winds, and convection currents can greatly increase the turbid state of both lakes and rivers. Warm weather and increases in the temperature can also add to the problem. For with warmer weather, microorganisms and aquatic plants renew their activity in the water. As they grow and later decay, these plant and animal forms substantially add to the turbid state of water. Also, they frequently cause an increase in odor and color problems. High turbidity value makes the water unfit for consumption. Most of the time turbidity values was beyond the desirable limit (10 NTU)of BIS mentioned for drinking water.

Conductivity

Conductivity of the dam water fluctuated between 210 to 460 μ mhos/cm during the study span. Conductance is generally found to be a good measure of the concentration of total dissolved solids.

Alkalinity

Alkalinity has no adverse effect on human health, however, beyond 200 mg/l it causes unpleasant taste to water. Therefore, BIS has set a desirable limit of alkalinity as 200 mg/l and permissible as 600 mg/l in drinking water. In the present study value of alkalinity were found in the range of 17 to 380 mg/l. The average value of alkalinity of dam water is found within the desirable norm of BIS.

Solids

In the present study total solids were found in the range of 103 to 476 mg/. The concentration of suspended solids was found to be 6 to 314 mg/l. BIS has not recommended any norms for total solids & total suspended solids in drinking water.

Concentration of is an important parameter in drinking water. They give a particular taste to the water at higher concentration and also reduce its palatability. However BIS has recommended the limit of Total dissolved solids is 500 mg/l as desirable and 2000 mg/l as permissible for potable water. In the present study TDS fluctuated in the range of 78 to 398 mg/l which is within the norm of BIS

Dissolve Oxygen

In the present study Dissolved oxygen 6.5 to 8.6 values met all criteria set by the BIS.

Chemical Oxygen demand (COD) & Biological Oxygen Demand (BOD)

COD & BOD is the most important parameter to assess the quality of water and is the most reliable characteristics and may serve as a useful pollution index of water body (Trivedi R.K.,1986). In the study of dam water values were obtained in the range of 8.0 to 50 mg/ for COD and <2 to 6 mg/l with an average value <2 mg/l for BOD.

Chloride

Chloride is present in appreciable amount in almost all the natural water from very low to supersaturated concentration. The most important source of chloride is the discharge of domestic sewage. BIS has set the limit of chloride to be 250 mg/l and 600 mg/l as desirable and permissible respectively for drinking water. During the study period the concentration of chloride was found as 7.5 to 42 mg/l which is well within the norms.

Sodium & Potassium

BIS has not recommended any norm for sodium & Potassium whereas WHO prescribed in limit of 200 mg/l for sodium in portable water. In the study of ground water sodium content was found in the range of 5 to 140 mg/l. which was well within the limit. And potassium concentration was not remarkable; it fluctuated between 1 to 9 mg/l.

Hardness

Water hardness is primarily the result of interaction between water and the geological formations containing it or over which the water flows. The degree of hardness in water is based on the following classification.

Hardness Mg/l as CaCO ₃	Water class
0-75.1	Soft
150-300.1	Moderately hard
Over 300	Very hard

In the present study hardness was varied in the range of 84 to 188mg/l with a mean value of mg/l. Average value of hardness indicates that the ground water of Industrial area comes under water class "Moderately hard".

in the study period the maximum and minimum concentration of calcium hardness was found as 146 mg/l and 68 mg/l and magnesium hardness as 50 & 12 mg/l respectively. On the basis of desirable limit (Ca-75 mg/l & Mg – 30 mg/l) Ca & Mg concentration in dam water found within the norms.

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Nitrogen

The compound of nitrogen has great importance in the atmosphere and life process of animals and plants.

The nitrite nitrogen concentration in dam water was found from 0.007 to 11.3 mg/l , Nitrate from 0.01 to 2.1 mg/l and Ammonical nitrogen from Nil to 4.1 mg/l.

Phosphate

BIS was not prescribed any norms for phosphate in drinking water as phosphate is not considered harmful constituent in drinking water. However, its presence produce accelerated growth of algae. During the study period phosphate was found in the range of 0.82 to 5.2 mg/l

Sulphate

Sulphate levels in dam water typically ranges from 0.81 to 16.5 mg/L and these values met all criteria (150 mg/l) set by the BIS for drinking water.

Coliform Bacteria

The presence of coliform bacteria in any water body indicates that sewage or contaminated water is entering and polluted it. Along with coliform bacteria, other disease causing organisms may also be present. In the present study average value of bacterial count is beyond the BIS norms (10 MPN/100ml) The fairly high values of total Coliform are indicative of increasing pollution of the ponds by organic means which

5. Conclusion

On the basis of obtained data it was observed that almost all the parameters are within the range except coliform bacteria. Coliform bacteria were found beyond the norm prescribed for drinking water by various agencies. The analysis indicates that the water of Kolar reservoir is moderately soft with moderate alkalinity, transparent, low BOD, COD level as apparent by the study. The overall water quality of Kolar reservoir is not much affected by anthropogenic sources as it is surrounded by thick forest and less human activities are evident in this area. Therefore its water can only be used for drinking purposes but only after conventional treatment and disinfection.

Acknowledgements

The authors wish to offer their sincere thanks to Dr. N.P Shukla , Chairman, MP Pollution Control Board, Bhopal to provide their guidance and full cooperation and the staff of the Central Laboratory for their support during different phases of the work.

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Table 1 Physico Chemical Characteristics of Kolar Dam - Year 2007 to 2009

	Parameters	Unit	2007-08			2008-09			2009-10		
			min	max	avg	min	max	avg	min	max	avg
4	Turbidity	NTU	12	152	29	2	38	10	4	34	18
7	pH	pH Unit	7.2	7.7	7.4	7.0	8.2	7.5	7.0	8.8	7.7
8	Conductivity	μMhos/cm	210	298	248	104	426	271	210	460	344
9	T. Solids	mg/l	142	476	218	103	376	183	154	401	251
10	D. Solids	mg/l	108	214	152	78	298	148	144	341	207
11	S. Solids	mg/l	24	314	65	6	78	29	10	72	44
12	Amm. Nitrogen	mg/l	0.000	0.000	0.000	0.752	4.148	1.508	0.540	1.000	0.822
13	Nitrite Nitrogen	mg/l	0.020	0.040	0.028	0.007	11.324	1.604	0.027	1.200	0.707
14	Nitrate Nitrogen	mg/l	0.040	0.080	0.057	0.010	2.160	0.713	0.050	1.000	0.476
15	Phosphate (PO ₄)	mg/l	0.087	0.350	0.194	0.112	5.209	2.244	0.025	11.300	1.912
16	Chloride	mg/l	8.0	17.0	12.2	7.5	32.8	15.8	9.0	42.0	20.3
17	Sulphate (SO ₄)	mg/l	3.48	13.31	7.39	3.90	16.58	9.95	0.81	13.00	7.96
18	T. Alkalinity	mg/l	82	134	105	130	320	184	17	380	159
19	T. Hardness	mg/l	84	118	99	112	188	138	86	158	127
20	Calcium Hardness	mg/l	72	94	80	74	146	101	68	126	95
21	Magnesium H.	mg/l	12	28	19	16	46	37	18	50	32
22	D. Oxygen	mg/l	7.1	8.6	7.9	7.0	8.4	7.6	6.5	8.2	7.4
23	B.O.D.	mg/l	0.8	1.6	1.2	0.9	6.0	2.3	0.3	3.2	1.9
24	C.O.D.	mg/l	8	29	16	18	50	27	10	38	24
25	Sodium	mg/l				5	12	9	5	140	30
26	Potassium	mg/l				1	9	4	1	8	3
27	T. Coliform	MPN/100ml	48	2400	358	4	288	50	11	170	78

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