

Bio-chemical analysis of water of shahpura lake of Bhopal Madhya Pradesh

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Abstract

Environmental Management is an attempt to control human impact and interaction with the environment in order to preserve natural resources and also focuses on the improvement of human welfare for present and future generation. Environmental technology (Envirotech), green technology or clean technology is the application of one or more environment science, green chemistry, electronic devices to monitor, model and conserve the natural environmental, water resources and to curb negative impact of human involvement. Due to population growth, industrialization and increasing anthropogenic activities day-by-day avail waste water and effluents consumption degrade the water quality. Waste water percolates into groundwater resources and pollute them. Shahpura lake is also fed by waste water from adjoining area Shahpura and Chunabatti. Hence it becomes necessary to assess the water quality by monitoring seasonally. It affects the ground water quality. An attempt has been made to measure pollution of lake and ground water simultaneously.

Key Words: Percolation, waste water, ground water pollution, Indiscriminate, Green Technology.

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INTRODUCTION

Indiscriminate and improper waste disposal have led to deterioration in the water quality of surface water of Shahpura lake i.e. fed by waste water. Surface water is collection of water on the ground or in a stream, river, lake, wetland. A lake is a large body of water surrounded by land and inhabited by various aquatic life forms. Lake is subjected to various natural processes taking place in the environment, such as the hydrological cycle. Due to rapid urban development, lakes are facing different environmental problems resulting in deterioration of its water quality. The study area and sampling stations are selected to estimate the water quality and pollution level in Shahpura lake of Bhopal. It is located in southern part of city made in 1974-75 under Betwa irrigation project. The degradation of the lake has occurred not only due to waste water effluent inflow but also by siltation, domestic

sewage, immersion of idols and other activities around the lake. The overall impact has resulted in the deterioration of the water quality. The polluted water of lake may enter into aquifer or ground water resources specially in downstream areas by percolation and influent seepage. The natural quality of hand pumps, bore-wells and drinking water resources are degraded and affected in the fringe area of lake. This indicates the alarming and high contamination of the lake from the standard prescribed values of ISI, Nutrient load in the lake is very high and hypereutrophic conditions are prevailing. Hence seasonal monitoring and preventive measures are necessary to save the people and lake from eutrophication.

MATERIAL AND METHODS

To investigate the water quality status of Shahpura lake 09 sampling stations and 09 sampling stations of drinking water of fringe area of lake has been chosen. The methods of water analysis are used as prescribed by APHA, NEERI (1986) Nagpur. Water samples were collected 2015 in jerry cane. The analysis of following parameters has carried out : pH, Electrical Conductivity (EC- □ mhos/cm), TDS mg/L, Nitrate, Total Phosphorus, Iron, Fluoride, COD, DO, T-H, Ca-H, Mg-H, Chloride, Sulphate, Carbonate in mg/L and Coliforms No/100 ml.

RESULT AND DISCUSSION

The bio-chemical data analysed are summarised sampling stations wise in Table 1 and 2. In the present study pH, EC, TDS, NH₃, NO₃⁻, Fe, F⁻, PO₄³⁻, D.O., C.O.D., BOD, T-H, Ca-H, Mg-H, Cl⁻, SO₄²⁻, Carbonate and MPN has ranged from Minimum values of 7.3-8.3, 668-982 □ mhos/cm, 376-578 mg/L, 0.08-8.9 N/L, 2.8-8.4 mg/L, 0.16-0.40 mg/L, 0.14-1.24 mg/L, 0.12-1.0, 0.84-7.02 mg/L, 12.8-136 mg/L, 1.64-4.84 mg/L, 224-328 mg/L, 198-254 mg/L, 26-60 mg/L, 78-106 mg/L, 38-42 mg/L, 0.80-6.12 mg/L and 10-62 No/100 ml—respectively in surface water of Shahpura lake. While in selected sampling stations of ground water the values of different parameters has recorded and found in the range of as pH 7.5-8.3, EC 668-1254 □ mhos/cm, TDS 428-842 mg/L, NO₃⁻, Total P, F⁻ 1.68-10.2, 0.0-0.80, 0.0425-0.158, 0.88 mg/L, COD, T-H, Ca-H, Mg-H, Chloride, SO₄²⁻ HCO₃⁻ has found in the range of 1.0-32.4, 172-468, 422, 22-46, 62-118, 32-124 mg/L, 250.6-438.8 mg/L respectively and T. Coliforms are found (+)ve on GW₁, 2, 3, 4, 5 and 8 and (-)ve on GW₃ and 7. pH shows alkaline water. Higher pH favours fish culture in reservoir. Higher concentration of acid, base and salts increase EC values. TDS develops a particular tase in drinking water, its higher concentration reduces potability of water. High TDS values indicate hard water, permissible limit of TDS is 200 mg/L (WHO), D.O. prescribed limit is 4.6-6.0 mg/L by WHO, it is recommend limit of Nitrate-N 10 mg/L equivalent to 45 mg/L (ICMR). Dixit S., *et al.* Phosphate and Nitrate

content of lake increase due to anthropogenic influence of lake, it is alarming in lake water. F⁻, Cl⁻ and SO₄²⁻ are also higher shows hypereutrophic conditions of lake water Cl⁻ and SO₄²⁻ are below the recommended limit 250 mg/L and 150 mg/L respectively. The findings of this study is similar with those of Savita Dixit *et al.* (2005), Jain, S.K. *et al.* (2008), Kataria *et al.* (1994, 2006), Manisha Sonel *et al.* (2010), Anoop Chandra *et al.* (2011), Abdul Raheem and Syed Hussain (2011).

Table 1:

Description of Sampling Stations (SW) - Surface Water	Ground Water
SW ₁ = Kotra drainage	1. GW ₁ = Tubewell BSNL premi
SW ₂ = Drainage nallah-Char Imli	2. GW ₂ = Behind PCB
SW ₃ = Dhobighat behind PCB	3. GW ₃ = Catchment area (eastern
SW ₄ = Near Shahpura Park	4. GW ₄ = Near M.P. tourism (Manisha
SW ₅ = Infront of Administration Academy	5. GW ₅ = C-Sector Shahpura
SW ₆ = Near Waste Weir (Outlet)	6. GW ₆ = Kashish Restaurant, Kola
SW ₇ = The Shahpura lake (Fishing point)	7. GW ₇ = Sardarji tubewell-Chuna
SW ₈ = Near Amrapali Colony	8. GW ₈ = Tubewell Jugal Kishore -Chu
SW ₉ = Earthen dam (down stream lake)	9. GW ₉ = Tubewell Amaltas Pha

While in sampling stations of ground water the values of different parameters has reported as pH 7.3-8.3, EC 668-982 □ mhos/cm, TDS 376-578 mg/L, NH₃ 0.08-8.3 N/L, NO₃⁻, Fe, F⁻, PO₄³⁻ are ranged from 2.8-8.4, 0.16-0.40, 0.14-1.24, 0.12-1.0 mg/L and D.O., B.O.D., COD, 0.84-7.02, 1.64-4.84, 12.8-136, T-H, Ca-H, Mg-H, Chloride, Sulphate, Carbonate ranged from 224-328, 198-254 mg/L, 26-60, 78-106, 38-42 and 0.80-6.12 mg/L respectively and MPN (Most Probable).

Table 1: Analysis of water samples of Shahpura lake of Bhopal 2016

Para-meters	Unit	Sampling Stations								
		SW ₁	SW ₂	SW ₃	SW ₄	SW ₅	SW ₆	SW ₇	SW ₈	SW ₉
pH	-	7.2	7.6	7.4	7.7	8.0	8.2	7.8	7.9	8.3
EC	□ mhos /cm	768	984	790	814	783	845	748	670	726
TDS	mg/L	452	580	494	485	504	486	378	489	464
NH ₃	N/L	8.9	10.3	4.08	0.19	1.08	0.39	1.04	0.09	0.084
NO ₃ ⁻	mg/L	4.42	7.6	5.4	4.42	2.88	8.42	4.5	2.5	5.64
Fe	mg/L	0.38	0.44	0.19	0.24	0.242	0.33	0.29	0.17	0.18
F ⁻	mg/L	0.52	1.26	0.55	0.93	0.73	0.92	0.33	0.14	0.42
PO ₄ ³⁻	mg/L	0.13	0.15	1.02	0.29	0.45	0.84	0.56	0.22	0.49
D.O.	mg/L	2.14	0.86	4.12	3.64	5.24	7.08	6.4	5.18	5.4
C.O.D.	mg/L	136	136	78.4	28.6	12.84	27.84	68	36.8	28.2
B.O.D.	mg/L	1.68	1.84	2.86	2.88	3.94	4.86	3.8	3.16	3.18
T-H	mg/L	328	286	278	298	292	302	228	234	295
Ca-H	mg/L	268	240	242	256	266	261	200	202	262
Mg-H	mg/L	60	46	36	42	26	40	28	32	33
Chloride	mg/L	88.2	108	98.8	103	104	93	88	78.2	108
SO ₄ ²⁻	mg/L	58	84.2	72.4	64	80	42	68.8	5.6	48.2
Carbonate	mg/L	0.84	1.82	1.24	2.48	4.2	0.82	3.4	5.8	6.16
MPN	NO / 100 ml	10	14	28	38	74	58	50	12	18

* Minimum, ** Maximum

Table 2: Water assessment parameters of Shahpura lake of Bhopal 2015-16

Para-meters	Unit	Sampling Stations								
		GW ₁	GW ₂	GW ₃	GW ₄	GW ₅	GW ₆	GW ₇	GW ₈	GW ₉
pH	-	8.1	8.0	8.3**	8.2**	7.8	7.9	7.9	8.0	7.4
EC	µ mhos/cm	844	806	794	1258**	944	848	1028	830	670*
TDS	mg/L	544	514	738	843**	605	542	656	530	430*
NO ₃ ⁻	mg/L	10.4**	5.0	5.4	2.6	1.9	4.9	1.70*	6.4	8.4
Total P	mg/L	0.25	0.18	0.12	0.05	0.82**	0.10*	0.12	0.11	0.14
Iron	mg/L	0.044**	0.36**	0.18	0.19	0.16	0.05	0.16	0.120	0.138
Flouride	mg/L	0.50	0.88**	0.78	0.18*	0.56	0.40	0.34	0.40	0.78
C.O.D.	mg/L	32.8	6.8	22.6	26.88	38.6	2.82	7.4	4.8	1.0*
T-H	mg/L	388	318	300	398	390.2	308	326	174*	470**
Ca-H	mg/L	354	292	278	354	356	288	294	144*	422*
Mg-H	mg/L	34	26	22	44	44.2	2.0*	32	30	48*
Chloride	mg/L	78	72*	79	89	152**	86	64	120	108
Sulphate	mg/L	32.4*	56	64.8	125**	86.4	44.2	72	44	38
Bicarbonate	mg/L	318.8	292.2	342.4	316.4	440*	250.8	243*	280	344
T. Coliform	mg/L	+ve positive	+ve positive	+ve positive	+ve positive	+ve positive	+ve positive	+ve positive	+ve positive	+ve positive

* Minimum, ** Maximum

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