Investigation of the Quality of Shahpura Lake Water, Bhopal, Madhya Pradesh, India

Salahuddin

PDM University, Bahadurgarh, Haryana, India

Email:vsludn@gmail.com

Abstract:

The present study is based on Physico-Chemical Parameter of Shahpura Lake of Bhopal, Madhya Pradesh. The water of Shahpura Lake is polluted due to substantial release of contaminated materials without acceptable treatment to expunge pernicious compounds. The Physico-Chemical parameters such as Chloride(Cl), Total Hardness(TH), Alkalinity(A), pH(pH), Electric Conductivity(EC), Total Dissolved Solids (TDS), Fluoride(F), Iron(Fe), Turbidity(Td), Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD) and Sulphate (S) were examined to know the present status of the Lake water quality. Statistical analysis like Pearson Correlation matrix and Factor loadings were implemented to the data set to know the relationship among the studied parameters.

Key words: Shahpura Lake, American Public Health Association, Bhopal, Domiciliary,Storage capacity.

Introduction:

Water is one of the most plausible and pivotal wealth on earth[1,2,5,6,8,9]. Water exiguity is accumulating worldwide and burden on the actual water resources is increasing due to thriving exaction of diverse category such as domiciliary, agronomy etc. Lakes are one of the relevant water resources used for irrigation, drinking, fisheries and flood control prospect[6,13].

Study Area:

Shahpura Lake is positioned in one of the opulent area of Bhopal, the capital city of state of Madhya Pradesh[17]. This is also one of the water bodies present in Bhopal and this is a man made permanent lake and construction during the period of 1974-1975. The latitude of the lake is 23°12N and longitude of the lake is 77°25E. It has an area of 8.29 km². The origin and preeminent purpose of the lake water is to rain sewage water of residential colony, irrigation dissipation and hydroponics also. The storage capacity of the Shahpura Lake is 2.29 m^3. The maximum depth of the lake is 5.6 m and minimum depth of the lake is 1.5 m.

Location Map of the study area:
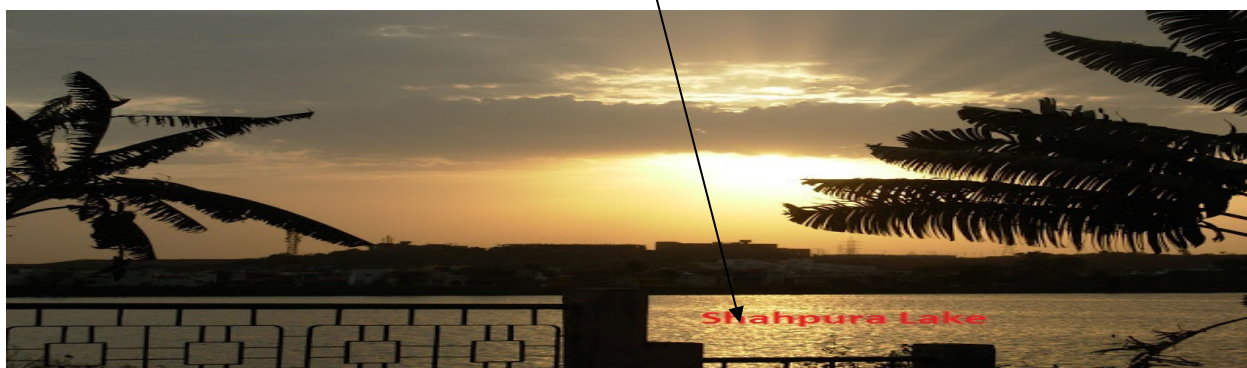
Sample collection:

Water samples were collected from five sampling stations namely Manisha Market(MM), Janki Nagar(JN), Manoria Care(MC), Bansal Hospital(BH) and Lalita Nagar(LN). Samples were collected in plastic container to avoid unforeseeable changes in characteristic as per standard procedure American Public Health Association (APHA, 1998).

Investigation of Samples:

The collected samples were analyzed for different physico-chemical parameters such as Temperature(T), Chloride(Cl), Total Hardness(TH), Alkalinity(A), pH(pH), Electric Conductivity(EC), Total Dissolved Solids (TDS), Fluoride(F), Iron(Fe), Turbidity(Td), Dissolved Oxygen (DO),Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD) and Sulphate as per the standard methods (APHA, 1998)[10,11].

Results and discussion:

The diversification of various attributes such as Temperature(T), Chloride(Cl), Total Hardness(TH), Alkalinity(A), pH(pH), Electric Conductivity(EC), Total Dissolved Solids (TDS), Fluoride(F), Iron(Fe), Turbidity(Td), Dissolved Oxygen (DO),Biochemical Oxygen Demand

(BOD), Chemical Oxygen Demand(COD) and Sulphate concentrations at the diverse locations along the Shahpura Lake water are listed in Table 1 and shown in Fig. 1. Agglomeration Schedule has adapted using IBM SPSS 21 software and tabulated in Table 3. Cluster analysis has performed by IBM SPSS 21 software and a Dendogram is shown in Fig 2. There are two statistically significant clusters are formed. Present study reveals that there is a difference in the physico-chemical properties of cluster 2 and cluster 1. Correlation matrix has performed within the studied attributes using Microsoft Excel 7 software and tabulated in Table 2 for determining the relationship between the physico-chemical variables.[16] The analysis yielded positive correlations occurred between some attributes and negative correlations occurred between some attributes.

Table 1. Water Quality at different locations of Shahpura lake water (Laboratory Analysis)

Name of Area	Cl (mg/L)	TH (mg/L)	A (mg/L)	pH	EC (mS/cm)	TDS (mg/L)	F (mg/L)
MM	80.6	383	371	8.3	1028	702	0.84
JN	74.5	318	338	7.9	986	634	0.74
MC	78.2	298	304	8.0	984	698	0.82
BH	79.4	386	375	8.3	1102	742	0.72
LN	72.5	322	312	8.1	898	653	0.76

Name of Area	Fe (mg/L)	Td (mg/L)	DO (mg/L)	BOD (mg/L)	COD (mg/L)	S (mg/L)
MM	0.34	56.22	5.8	84	224	54.34
JN	0.22	48.32	4.6	46	124	48.42
MC	0.36	50.21	4.5	42	120	52.22
BH	0.18	41.35	5.6	86	226	47.43
LN	0.23	38.32	4.3	68	188	41.56

Fig 1: Graphical representation of Samples

Table 2. Pearson Correlation Matrix for the Samples

	Cl	TH	A	pH	EC	TDS	F	Fe	Td	DO	BOD	COD	S
Cl	1												
TH	0.635205	1											
A	0.634966	0.947661	1										
pH	0.644935	0.908503	0.735715	1									
EC	0.809088	0.726535	0.814078	0.573063	1								
TDS	0.829347	0.650541	0.545575	0.771185	0.791614	1							
F	0.439489	-0.07077	-0.15372	0.118782	-0.16185	0.092061	1						
Fe	0.415503	-0.23913	-0.28967	-0.04585	-0.16523	0.079302	0.970143	1					
Td	0.607149	0.112374	0.227981	0.027498	0.234296	0.071373	0.769792	0.760079	1				
DO	0.838533	0.941976	0.936708	0.841269	0.825189	0.715557	0.148896	0.019265	0.402162	1			
BOD	0.444328	0.933886	0.781488	0.954277	0.490348	0.592881	-0.07869	0.27477	-0.11589	0.790457	1		
COD	0.425037	0.910634	0.739996	0.956979	0.443884	0.585329	-0.04761	0.246155	-0.12953	0.762137	0.99773	1	
S	0.807787	0.214194	0.317496	0.161512	0.482185	0.369994	0.698145	0.722874	-0.93959	0.525955	-0.04106	-0.05989	1

Table 3. Agglomeration Schedule for the Samples

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	2	3	2859.874	0	0	3
2	1	4	6549.567	0	0	4
3	2	5	15321.861	1	0	4
4	1	2	53006.987	2	3	0

Fig 2: Dendrogram using Ward Linkage

Dendrogram using Ward Linkage
Rescaled Distance Cluster Combine
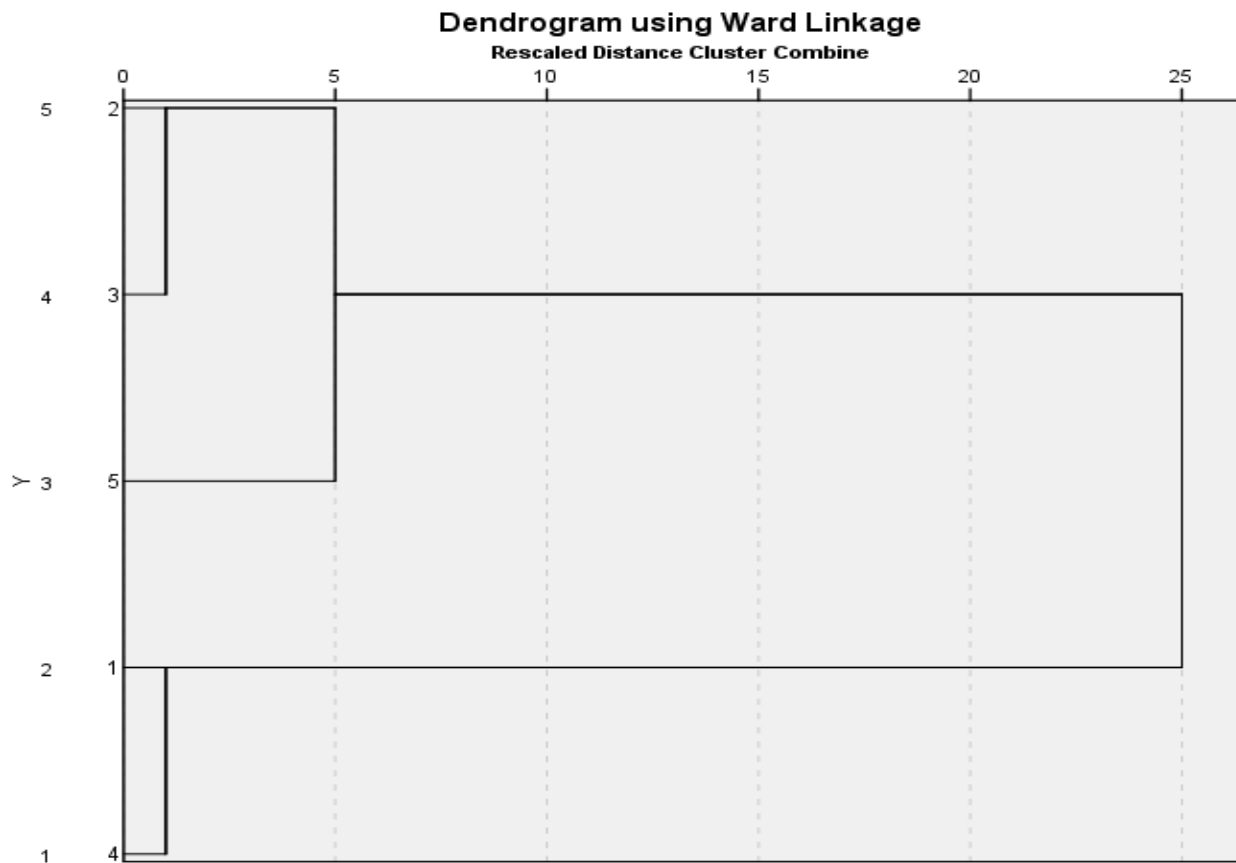
REFERENCES

1. Anita. and Salahuddin.(2019). Analysis of Electrical conductivity of Ground water at different locations of Phooli of U.P, India. *International Journal of Emerging Trends in Engineering and Development*, 3, 1-5.

2. Ansari, Farid**.** and Salahuddin. (2013). Groundwater Temperature Variation Analysis of Industrial Area Nandganj, Ghazipur (India). *Australian Journal of Basic and Applied Sciences,* 7 (14),539-542.

3. APHA. (1998). Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WPCF, Washington D.C.

4. Babu,Y. S. and Mohan, M.R. (2018). A study on Physico-Chemical parameters of Errarajan of Bangalore Rural. *International Journal of Scientific Research*, 7(2), 401-402.

5. Chaudhary, M. P. and Salahuddin (2014). Analysis of COD in water at different locations of upper lake in Madhya Pradesh. *European Journal of Applied Engineering and Scientific Research*, 3(2), 37-39.

6. Chaudhary, M. P. and Salahuddin. (2015).   Physico-Chemical analysis in winter season

of Bhojtal water in Bhopal region of Madhya Pradesh, India. *International Journal of Mathematical Archive*, 6 (4),78-81.

7. Khan, M. F. (2020). Physico-Chemical and Statistical Analysis of Upper Lake Water in Bhopal Region of Madhya Pradesh, India. *International Journal of Lakes and Rivers.*13(1),01-16.

8. Salahuddin. (2013). Analysis of Chloride Content in the Surface of water at different locations of Madhya Pradesh. *International Journal for Pharmaceutical Research Scholars*, 2(4), 107-109.

9. Salahuddin.(2014). Physico-chemical analysis of upper lake water in Bhopal region of Madhya Pradesh, India. *Advances in Applied Science Research*, 5(5), 165-169.

10. Salahuddin.(2015). Analysis of electrical conductivity of ground water at different locations of Dildar Nagar of U.P, India, *Advances in Applied Science Research*, 6(7), 137-140.

11. Salahuddin. (2020).Analysis of Magnesium contents of Ground water at surrounding areas of Dildar Nagar of U.P. India. *International Journal of Innovative Research in Science, Engineering and Technology*, 9(4), 1607-1610.

12. Salahuddin. and Ansari, Farid.(2013). Statistical Analysis for the Presence of pH Content of Ground Water at Different Locations of Industrial area at Ghazipur in India.*Global Journal of Science Frontier Research (F),* 13 (9),55-59.

13. Salahuddin. and Husain, Intazar.(2020). Analysis of Lower Lake Water in Bhopal Region of Madhya Pradesh, India. *International Journal of Lakes and Rivers.*13(1), 17-25.

14. Salahuddin. Khola , R. K.(2014). Physico-Chemical Analysis for the Presence of Oxygen Content of Ground Water at Different Locations of Dildar Nagar of U.P, India. *Global Journal of Science Frontier Research (B),* 14 (6),01-03.

15. Salahuddin and Khola, R. K. (2013). Analysis of Chloride Content in the Surface of water using two way Anova. *International Journal for Pharmaceutical Research Scholars,* 2(4), 51-53.

16. Salla, S. and Ghosh, S. (2014). Assessment of water quality parameters of lower lake, Bhopal. *Advances in Applied Science Research*, 6, 8-11.

17. Shahpura Lake, Bhopal (2020, November), Shahpura Lake. Retrieved from website: http://ibhopal.blogspot.com/2010/12/shahpura-lake-bhopal.html

18. Sirajudeen., Mohidheen, M. K., and Vahith, R. A.(2014). Physico-chemical contamination of groundwater in and around Tirunelveli district, Tamil Nadu. *Advances in Applied Science Research*, 5(2), 49-54.