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Research paper

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

Salahuddin*

Department of Mathematic, PDM University, Bahadurgarh, Haryana ,India
**Corresponding author E-mail: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.

Keywords: *Shahpura Lake, American Public Health Association, Bhopal, Domiciliary,Storage capacity.*

1. 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].

2. 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:

3. 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).

4. 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].

5. 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

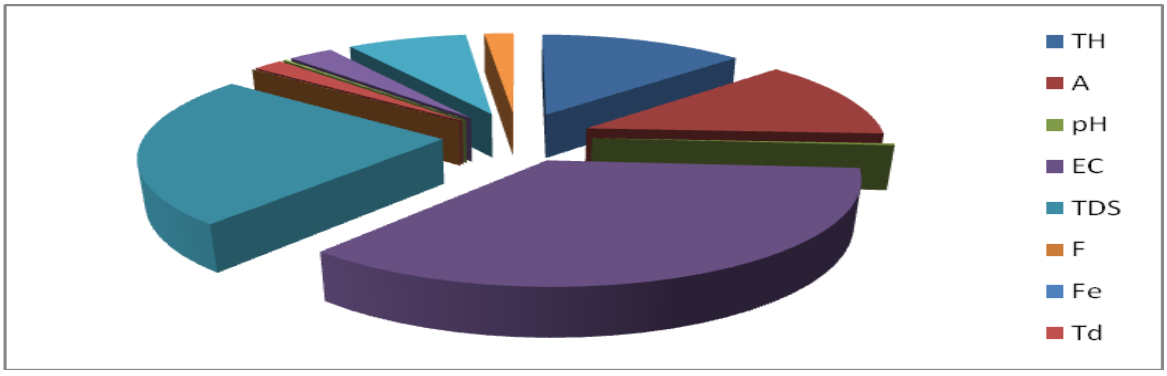


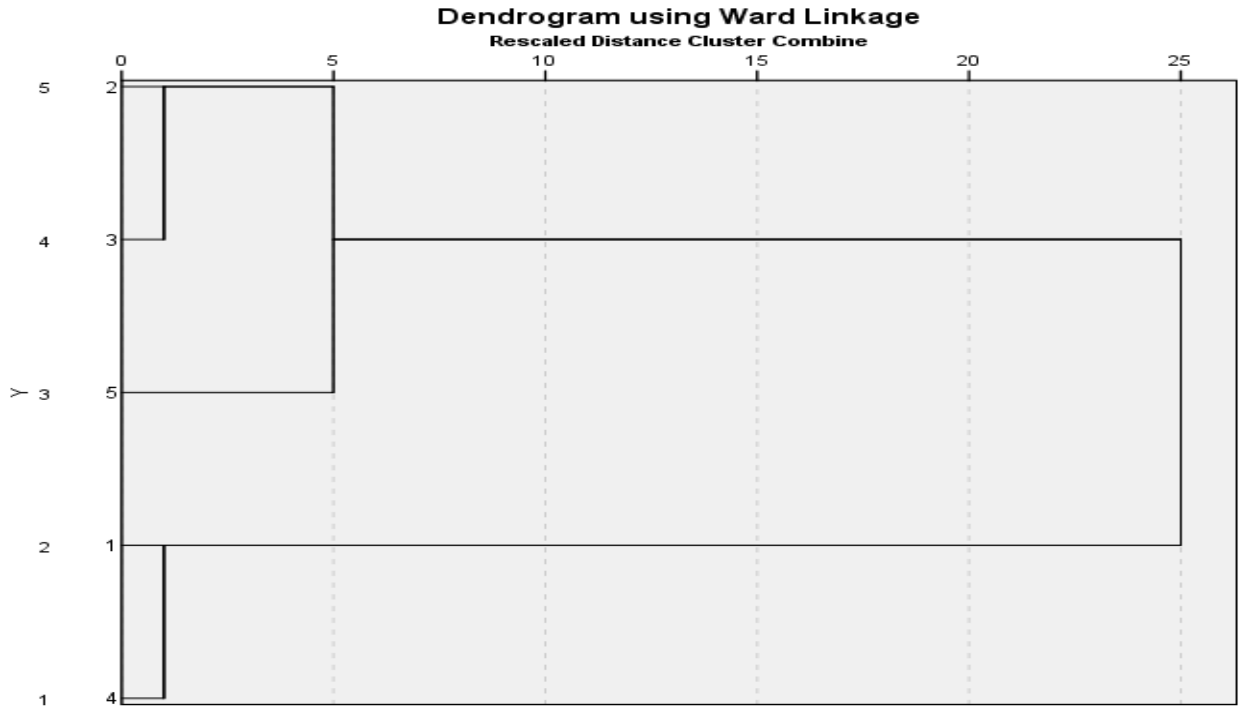
Table 2. Pearson Correlation Matrix for the Samples

	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	0.93678	0.841269	0.825189	0.715557	0.14886	0.019265	0.402162	1			
BOD	0.444328	0.933886	0.78148	0.95427	0.490348	0.592881	-0.07869	-0.27477	-0.11589	0.790457	1		
COD	0.425037	0.910634	0.73996	0.956979	0.443884	0.585329	-0.04761	-0.24615	-0.12953	0.762137	0.99773	1	
S	0.807787	0.214194	0.317496	0.161512	0.482185	0.36994	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



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