

Water Quality Analysis of Surha Tal, Ballia, Uttar Pradesh, India

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Abstract:

Water is very crucial for all life augmenting systems on earth. Fresh water becomes scanty due to over profiteering and impurity.

Since the industrial innovation, industries have been thriving and wherefore, millions of anthropophaginan commixtures have enrolled in our habitat. Assiduous biological toxin has been found even in remote areas of the world. The adroit factors for the desecration of water are industries, agriculture and sedentary activities. The present study is based on Physico-Chemical Parameter of Surha Tal of Ballia, Uttar Pradesh. The water of Surha Tal is attenuated due to vast release of degraded materials without peachy keen medication to abolish malignant compounds. The Physico-Chemical parameters such as Turbidity(TD), Electric Conductivity(EC), pH, Dissolved Oxygen(DO), Alkalinity(AK), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD) and Chlorine(CL) are examined to know the present status of the water quality. Statistical analysis like Pearson Correlation matrix and Cluster analysis were implemented to the data set to know the relationship among the studied parameters. The analysis provided positive correlations occurred between some attributes and negative correlations occurred between some attributes.

Key words: Surha Tal, American Public Health Association, Dendogram, Correlation matrix.

Introduction:

Water is one of the most precious and decisive wealth on earth^{1,2,5,6,8,9,10,12,17}. Water inadequacy is flourishing worldwide and anxiety on the actual water resources is snowballing due to burgeoning extortion of contrastive section such as domiciliary, agronomy etc^{7,13,14,15,17}.

Study Area:

Surha Taal is a natural lake, positioned north of Ballia town. It is a lake of elliptic type. It has an area of 34.32 square kilometer. It is hedged by agricultural fields. Local farmers use the lake water for irrigation.

Location Map of the study area:



Methods and Methodology

Sample collection:

Water samples were collected in the early bright hours from the selected sites of the lakes monthly. Samples were collected in plastic container to avoid unforeseeable changes in characteristic as per standard procedure American Public Health Association (APHA, 1998)¹⁷.

Investigation of Samples:

The collected samples were ratiocinated for different physico-chemical parameters such as Turbidity(TD), Electric Conductivity(EC), pH, Dissolved Oxygen(DO),

Alkalinity(AK), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand(COD) AND Chlorine(CL) as per the standard methods (APHA, 1998)^{10,11,17}.

Turbidity

The Turbidity was calculated by turbidity meter (Systronic, model no.135). Results were presented as Jackson Turbidity Unit (JTU).

Electric Conductivity

Electric Conductivity of the samples was measured by using conductivity meter (Systronics, model no. 306).

pH

pH was measured by water analysis kit by using hydrogen ion selective electrode.

Dissolved oxygen

It was measured by Winkler's method with azide modification.

Biochemical oxygen demand (BOD)

Biochemical oxygen demand was determined by measuring the difference of the Oxygen concentration (By modified Winkler's method).

Chemical Oxygen Demand (COD)

The Chemical Oxygen Demand (COD) is the amount of the oxygen consumed by organic matter from boiling acid potassium dichromate solution. Reflux condensation method was used for the determination of Chemical Oxygen Demand.

Statistical tool

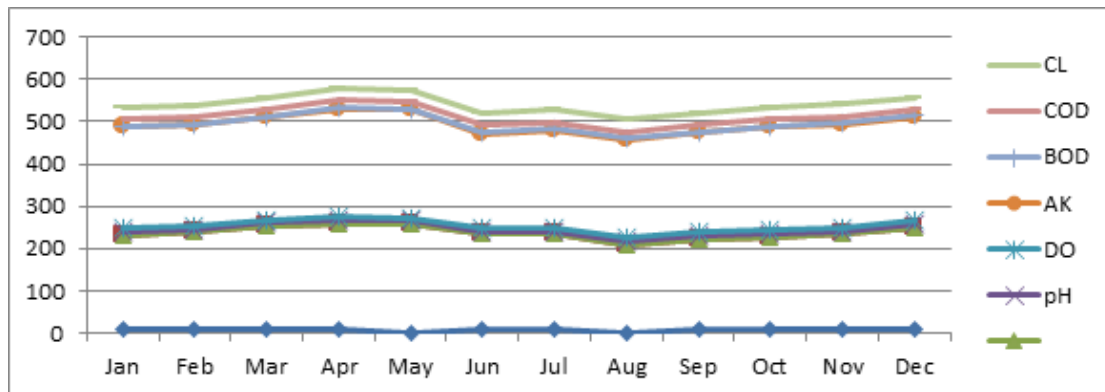
IBM SPSS 26 is used for cluster analysis and Proximity matrix and Microsoft Excel 7 is used for Correlation matrix.

Results and discussion:

The multifariousness of various attributes such as Turbidity(TD), Electric Conductivity(EC), pH, Dissolved Oxygen(DO), Alkalinity(AK), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand(COD) congregations along the Surah Tal water are listed in Table 1 and shown in Fig.1. Cluster analysis has performed by IBM SPSS 26 software and a Dendogram is shown in Fig 2. There are two statistically coherent clusters are formed which is shown in Agglomeration Schedule(Table 3). Present study proclaims 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.^{16,17,18} The analysis provided positive correlations occurred between some attributes and negative correlations occurred between some attributes.

Table 1: Water Quality at different months of Surha Tal (Laboratory Analysis)

Name of Attributes	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
TD(JTU)	7.32	7.41	7.42	8.21	8.32	8.52	8.32	7.75	7.22	7.25	8.12	7.45
EC(mS/cm)	225.24	230.25	245.32	250.24	256.42	224.56	225.42	210.24	216.42	220.14	225.42	242.45
pH	8.14	8.10	8.06	8.28	8.36	7.18	7.76	7.58	7.92	8.16	7.84	7.96
DO(mg/L)	8.26	8.14	8.12	7.94	7.86	7.88	8.24	8.12	8.32	8.46	8.34	8.42
AK(mg/L)	238.26	237.46	240.32	256.65	254.46	224.12	230.32	232.14	234.43	243.56	245.34	244.32
BOD(mg/L)	2.72	3.12	3.18	3.45	3.46	2.92	2.78	2.69	2.68	2.73	2.96	2.84
COD(mg/L)	15.72	15.86	16.82	16.84	16.86	15.92	15.72	15.64	15.46	15.42	15.32	15.30
CL(mg/L)	26.66	26.84	27.12	27.18	27.88	28.34	28.88	28.54	28.78	28.42	28.12	27.68

**Figure 1:** Graphical representation of Samples**Table 2:** Pearson Correlation Matrix for the Samples

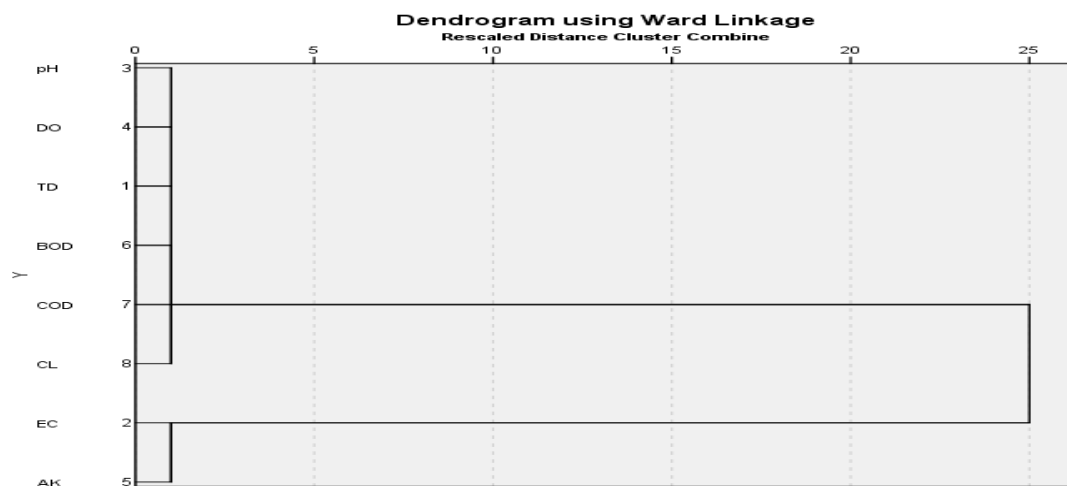
	<i>TD</i>	<i>EC</i>	<i>pH</i>	<i>DO</i>	<i>AK</i>	<i>BOD</i>	<i>COD</i>	<i>CL</i>
TD	1							
EC	0.271954	1						
pH	-0.35217	0.579041	1					
DO	-0.6605	-0.45335	0.100756	1				
AK	0.029003	0.725899	0.823672	-0.09033	1			
BOD	0.431555	0.870542	0.487489	-0.68792	0.684827	1		
COD	0.349401	0.757084	0.397721	-0.78049	0.461407	0.858868	1	
CL	0.27601	-0.50824	-0.52036	0.179802	-0.39815	-0.46729	-0.41971	1

Table 3: Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	3	4	1.054	0	0	2
2	1	3	4.625	0	1	3
3	1	6	230.467	2	0	4
4	1	7	1044.005	3	0	6
5	2	5	2078.208	0	0	7
6	1	8	5816.708	4	0	7
7	1	2	909294.313	6	5	0

Table 4: Proximity Matrix

Case	Matrix File Input							
	TD	EC	pH	DO	AK	BOD	COD	CL
TD	.000	600214.307	5.359	6.407	648771.787	280.394	797.612	4852.131
EC	600214.307	.000	599289.148	598146.045	2068.408	626252.194	557346.738	497571.101
pH	5.359	599289.148	.000	2.109	647774.149	299.162	764.033	4774.588
DO	6.407	598146.045	2.109	.000	646552.503	328.437	723.768	4661.035
AK	648771.787	2068.408	647774.149	646552.503	.000	675859.947	604173.189	541639.964
BOD	280.394	626252.194	299.162	328.437	675859.947	.000	2012.741	7455.181
COD	797.612	557346.738	764.033	723.768	604173.189	2012.741	.000	1732.069
CL	4852.131	497571.101	4774.588	4661.035	541639.964	7455.181	1732.069	.000

**Figure 2:** Dendrogram using Ward Linkage

Conclusion

The current investigation was performed for the period of twelve months from January 2018 to December 2018 to scrutiny the physico-chemical parameters of Surah Tal. The present study clearly reveals that water quality of Surah Tal varies from month to month. Analysis concludes that the situation is not too inferior but it is distressing. It needs proper conservation and management plans, strategies for the restoration etc.

Conflict of Interest

Authors declare that they have no conflict of interest.

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