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Analysis of the water quality of Rengepar Kotha Lake Water, Bhandara, Maharashtra, India

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Abstract

Water is a renewable natural resource which is very importance for all life sustaining systems on earth. Fresh water becomes a rare commodity due to its over exploitation and pollution.

Since the industrial revolution, industries have been booming and, consequently, millions of anthropogenic compounds have entered our environment. Persistent organic pollutants have been found even in remote areas of the world. The causative factors for the pollution of water are industries, agriculture and domestic activities. Further, the industrial growth and consequent pollution let into the freshwater system in the form of sewage are a challenge to this fragile ecosystem. The present study is based on Physico-Chemical Parameter of Rengepar Kotha Lake of Bhandara, Maharashtra. The study was carried out for a year from January 2016 to December 2017. The water of Rengepar Lake is polluted due to substantial release of contaminated materials without acceptable treatment to expunge pernicious compounds. The Physico-Chemical parameters such as Turbidity(Td), Electric Conductivity(EC), pH, Dissolved Oxygen(DO), free CO_2(CD), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand(COD) were examined to know the present status of the Lake 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.

Keywords: Rengepar Kotha Lake, American Public Health Association, Cluster analysis, Correlation matrix.

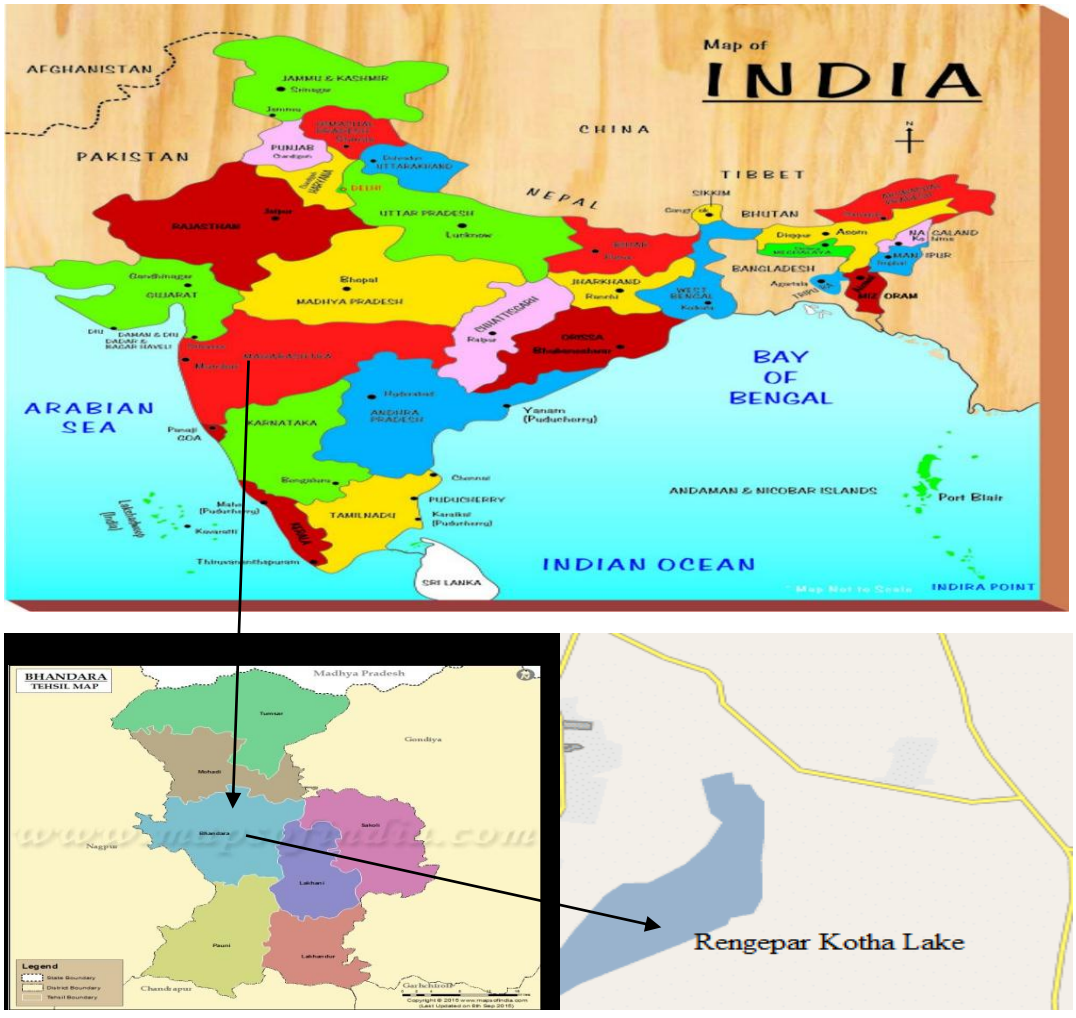
INTRODUCTION:

Water is one of the most plausible and pivotal wealth on earth[1,2,5,6,8,9,10,12]. 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[7,13,14,15]. Lakes are one of the relevant water resources used for irrigation, drinking, fisheries and flood control prospect[6,13,14,15].

Study Area:

Rengepar Kotha Lake (21°7'6"N 79°49'40"E) was created as part of irrigation proposals by Government of Maharashtra in the year 1976. The Length of the lake is 1034 m (3392.388 Feet) and the Height of the lake above lowest foundation is 10.18 m (33.3989 feet). Project has no appropriate cornucopia as such. Length of the affluence is not known. The lake has undated cornucopia. Maximum storage capacity is 3.03 MCM. Live storage capacity is 2.88 MCM.

Location Map of the study area:



METHODS AND METHODOLOGY

Sample collection:

Water samples were collected in the morning 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).

Investigation of Samples:

The collected samples were analyzed for different physico-chemical parameters such as Turbidity(Td), Electric Conductivity(EC), pH, Dissolved Oxygen(DO), free CO_2(CD), Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand(COD) as per the standard methods (APHA, 1998)[10,11].

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.

CO_2

The samples were analyzed in situ using a headspace analysis technique according to Hope et al. (1995).

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 21 is used for cluster analysis and Microsoft Excel 7 is used for Correlation matrix./

RESULTS AND DISCUSSION:

The diversification of various attributes such as Turbidity(Td), Electric Conductivity(EC), pH, Dissolved Oxygen(DO), free CO_2, Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand(COD) concentrations along the Rengepar Kotha Lake water are listed in Table 1 and shown in Fig.1. Cluster analysis has performed by IBM SPSS 21 software and a Dendogram is shown in Fig 2. There are two statistically comprehensible 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.[16,17,18] The analysis provided positive correlations occurred between some attributes and negative correlations occurred between some attributes.

Table 1. Water Quality at different months of Rengepar Kotha Lake water (Laboratory Analysis)

Name of Attributes	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Td(JTU)	13.9	16.8	21.2	27.9	20.9	32.9	40.3	33.9	27.8	25.9	30.2	25.2
EC(mS/cm)	89	96	91	95	101	99	97	66	69	71	77	82
pH	8.1	8.0	7.3	8.2	8.3	7.1	7.7	7.5	7.9	8.1	7.8	7.9
DO(mg/L)	7.2	6.9	7.1	6.1	5.9	6.0	5.8	6.1	6.3	6.5	6.9	7.3
CD(mg/L)	3.58	4.49	5.41	7.02	7.03	3.19	0.10	0.10	3.49	4.02	4.10	3.17
BOD(mg/L)	2.9	3.7	3.9	4.6	5.0	3.9	3.7	3.5	3.4	3.4	3.0	2.8
COD(mg/L)	7.9	8.5	15.8	15.3	16.8	15.9	14.2	12.3	11.4	15.3	12.9	11.2

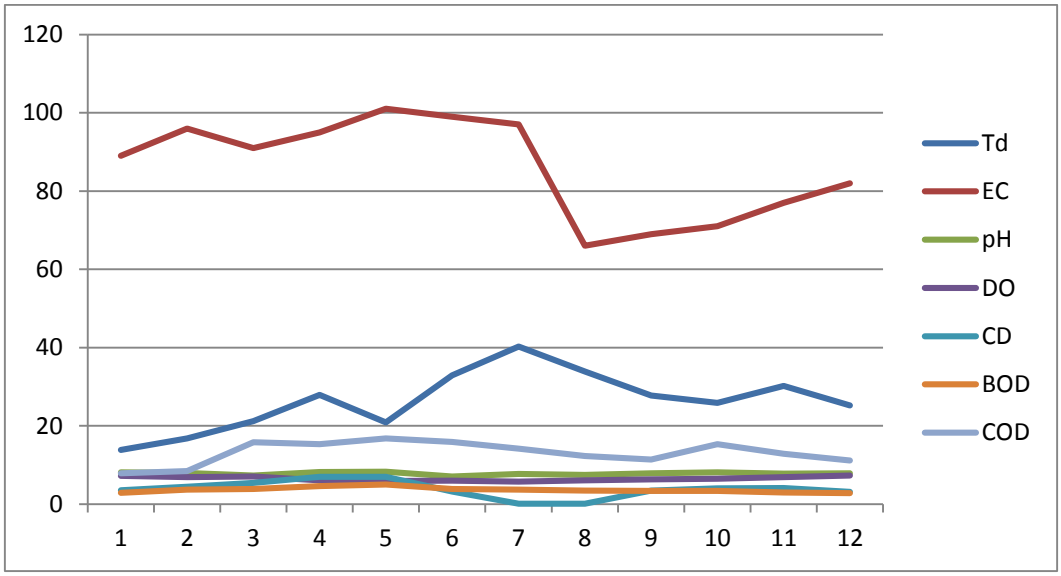


Fig 1: Graphical representation of Samples

Table 2. Pearson Correlation Matrix for the Samples

	Td	*EC*	*pH*	*DO*	*CD*	*BOD*	*COD*
Td	1						
EC	-0.18014	1					
pH	-0.4475	0.013287	1				
DO	-0.63888	-0.17376	0.057915	1			
CD	-0.59514	0.393946	0.459546	0.146389	1		
BOD	0.020671	0.578119	0.149482	-0.64602	0.54807	1	
COD	0.427457	0.238353	-0.22215	-0.57131	0.293249	0.658013	1

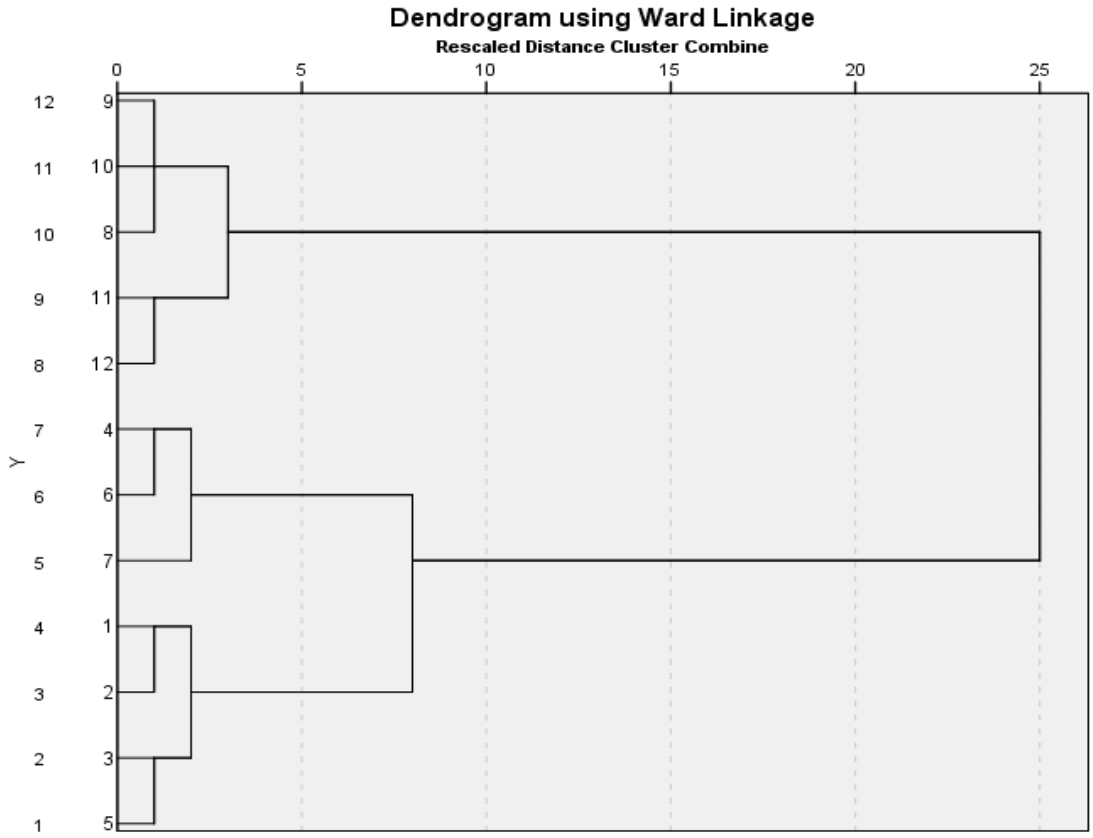


Fig 2: Dendrogram using Ward Linkage

CONCLUSION

The current study was conducted for the period of twelve months from January 2016 to December 2017 to investigate the physico-chemical parameters of Rengepar Kotha Lake. The present study clearly reveals that water quality of Rengepar Kotha Lake varies from month to month. Analysis reveals that the situation is not too worst but it is alarming. It needs proper conservation and management plans, strategies for the restoration etc.

Authors' contributions

Salahuddin executed the statistical analysis and method development. Intazar Husain organized a preliminary work of the article. The authors read and approved the final manuscript.

Conflict of Interest

Authors declare that they have no conflict of interest.

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