

Analysis of Futala Lake Water Nagpur City, Maharashtra, India

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Abstract

This paper concerned the study of Futala lake water. The water of Futala Lake is debased due to substantial release of contaminated materials without acceptable treatment to expunge pernicious compounds. Water quality checking and review of the Futala Lake was implemented for numerous physico-chemical parameters in the winter season during 2015-2016. These components are: (i) pH, (ii) Electric Conductivity, (iii) Dissolved Oxygen, (iv) Biochemical Oxygen Demand, (v) Chemical Oxygen Demand, (vi) Total Phosphorous, (vii) Suspended Solid (viii) Total Nitrogen and (ix) Total Coli forms respectively. Statistical analysis like Pearson Correlation matrix and Cluster analysis were carried out to the data set to know the relationship among the studied parameters.

Keywords: Futala Lake, Nagpur city, American Public Health Association.

Introduction

Water is very important to sustain life^{7,8,9,10}. It is concluded that two-thirds of the human body is unified of water. Water gets desecrated with microbe through duodenal discharge of human and animal. The rapid growth of population and technological and industrial boom has brought prodigious problems and decadence of environment chemical and toxic elements are being let into the drain streams and even open spaces adjoining the industrial areas without any check.

A correlation matrix is a table showing correlation coefficients between variables. Each cell in the table shows the correlation between two variables⁹.

Hierarchical agglomerative clustering is the most usual way, which implements inevitable relationships between any one sample and the entire data set and is naturally illuminated by a Dendrogram. The Dendrogram shows an image summary of the clustering processes⁹.

Materials and Methods

Study Area:

Futala Lake (21.154°N 79.042°E) was built by Raja Bhosle and is stretch over 60 acres. The lake is one of the very beautiful lakes in Nagpur, Maharashtra. Perhaps the best attraction at this lake is the coloured fountains.

Sample collection:

Water samples were collected in the morning hours from the selected sites of the lake in plastic container to avoid unforeseeable changes in characteristic as per standard procedure American Public Health Association (APHA, 1998)^{1,2,4,5,6}.

Investigation of Samples:

The collected samples were investigated for various physico-chemical parameters such as pH, Electric Conductivity (EC), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Total Phosphorous (TP), Suspended Solid (SS), Total Nitrogen (TN) and Total Coliforms (TC) as per the standard methods (APHA, 1998)^{10,11}. Parameters of water quality characterization and standards are shown in table 1.

Fig 1: Location map of the study area

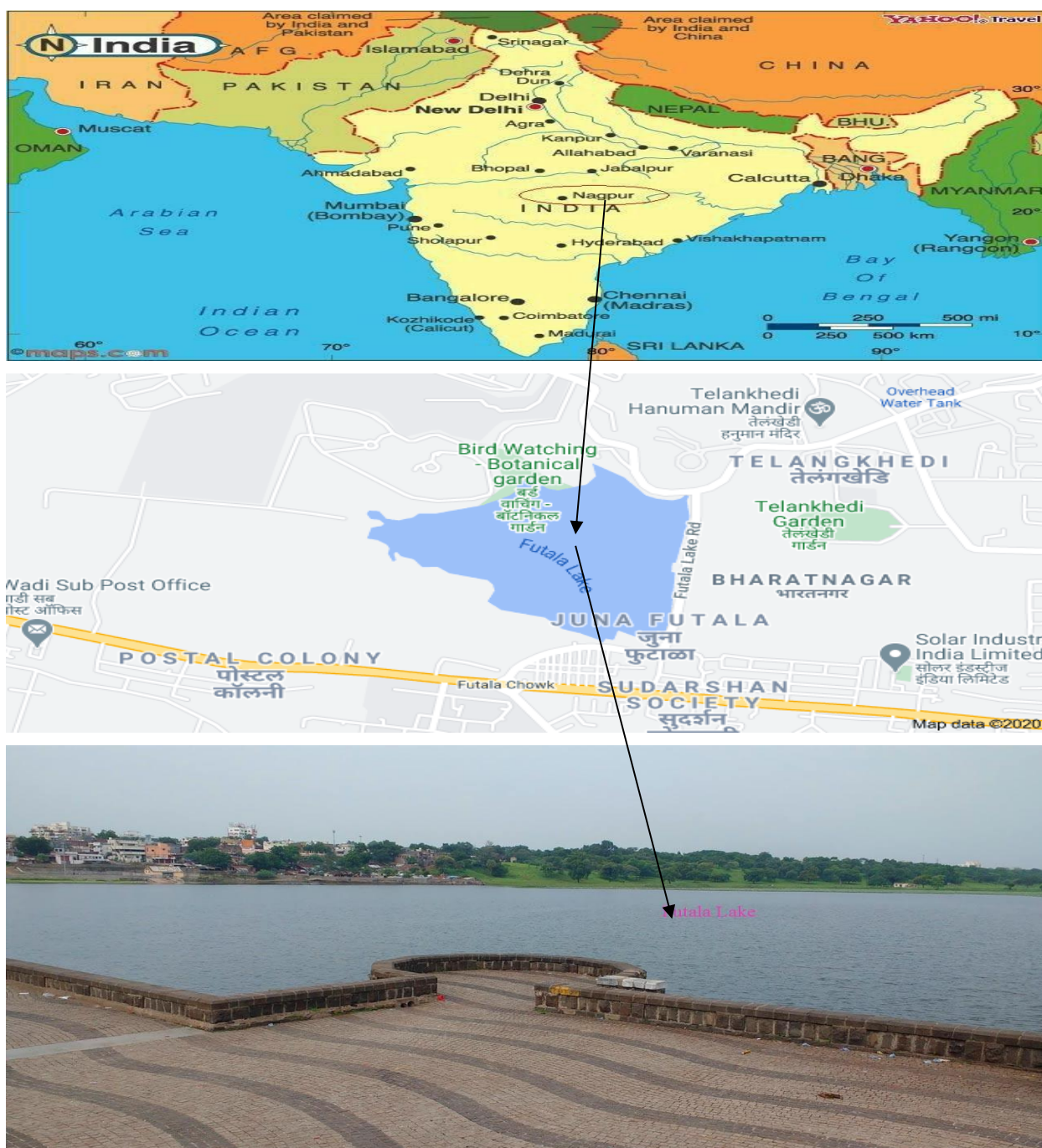


Table I. Parameters of water quality characterization and standards.

Parameters	WHO	ICMR	USPH	ISI
pH	6.5 – 9.2	7.0 – 8.5	6.0 – 8.5	6.5 – 8.5
Electrical conductivity Mho/cm	300	300	300	-
Nitrate	45	20	45	45
Phosphate	-	-	-	-
Dissolved O2	4 – 6	-	4.6	3.0

BOD	6.0	-	5	-
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All units except pH and Electrical Conductivity are in mg/l

WHO - World Health Organization

ICMR - Indian Council of Medical Research

USPH - United States public drinking water standard

ISI - Indian Standard Institution

Results and Discussion

The divaricating of multifarious parametrs such as pH, Electric Conductivity(EC), Dissolved Oxygen(DO), Chemical Oxygen Demand(COD), Biochemical Oxygen Demand (BOD), Total Phosphorous(TP), Suspended Solid(SS), Total Nitrogen(TN) and Total Coli forms(TC) retention along the Futala Lake water are listed in Table 2 and shown in Fig.2. Maximum attributes does not satisfy the prescribed limit given by standard organization which is mentioned in table 1. It is bring to light that water samples cannot be used for drinking purposes.

Statistical treatment of data:

Cluster analysis has performed by IBM SPSS 21 software and a Dendogram is shown in Fig 3. 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 3 for determining the relationship between the physico-chemical variables.^{3,9,10} The analysis shows that maximum attributes are positively correlated and very less attributes are negatively correlated.

Table 2. Average Water Quality of Futala Lake water in the winter season during 2015-2016(Laboratory Analysis)

Name of Sample Sites	pH	EC	DO	COD	BOD	TP	SS	TN	TC
S1	8.1	830	2.4	112	28	0.35	156	0.54	830
S2	7.8	690	2.2	72	21	0.22	123	0.35	445
S3	7.6	610	1.8	60	19	0.20	89	0.23	382
S4	7.9	590	2.9	86	32	0.56	95	0.98	1114

pH-pH, EC-Electric conductivity, DO-Dissolved Oxygen, COD-Chemical Oxygen Demand, BOD- Biochemical Oxygen Demand, TP- Total Phosphorous, SS- Suspended Solid, TN- Total Nitrogen,TC- Total Coli forms.

Fig 2: Graphical representation of Samples

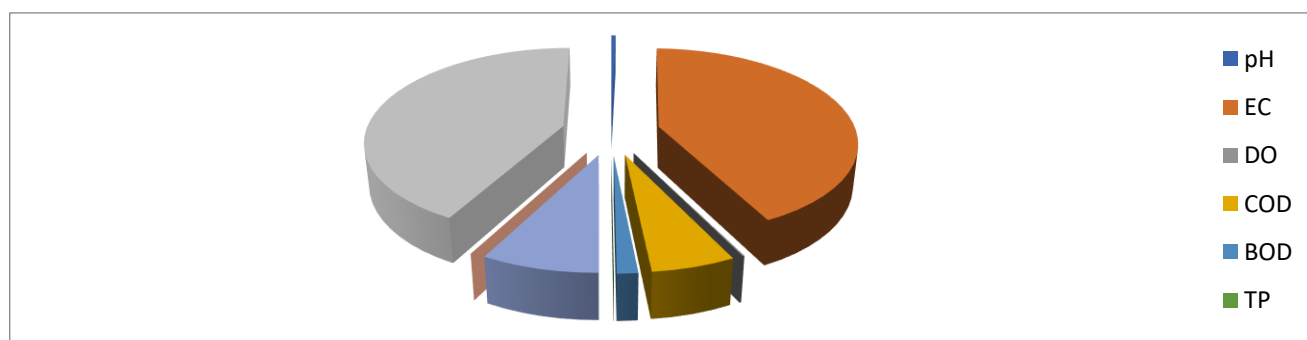
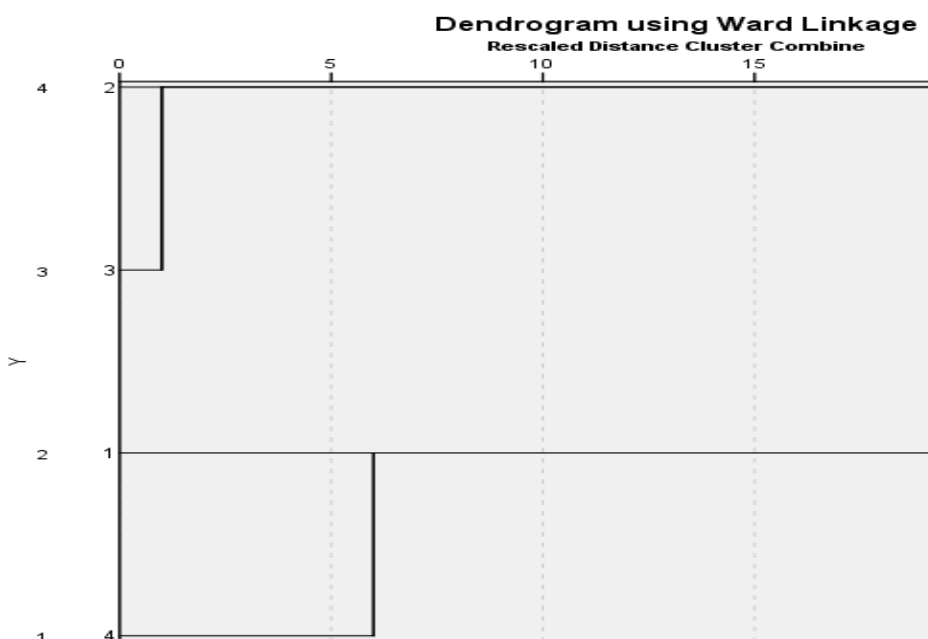


Table 3. Pearson Correlation Matrix for the Samples

	pH	EC	DO	COD	BOD	TP	SS	TN	TC
pH	1								
	0.734								
EC	976	1							
	-								
	0.647	0.033							
DO	729	45	1						
CO	0.981	0.763	0.565						
D	405	851	707	1					
BO	0.740	0.101	0.950	0.714					
D	44	067	876	169	1				
	-								
	0.526	0.179	0.949	0.493	0.960				
TP	976	23	533	003	655	1			
	-								
	0.801	0.983	0.100	0.798	0.192	0.084			
SS	878	293	46	081	158	54	1		
	-								
	0.530	0.184	0.973	0.476	0.953	0.994	0.073		
TN	371	1	368	241	463	21	19	1	
	-								
	0.677	0.017	0.947	0.656	0.995	0.979	0.104	0.969	
TC	792	365	307	002	793	876	426	063	1

Fig 3: Dendrogram using Ward Linkage



Conclusions

Conclusion of the study resolved that Futala Lake water is polluted and not consummately protected for drinking prospect. It desires disburse survey and environment management plans to control the release of dispersal. It displays that the amount of profanation a due to unearthing, industrial exonerate, domestic release. There is positive co-relationship between some attributes and also negative co-relationship between some attributes. By cluster analysis it shows that there is a difference in the physico-chemical properties of cluster 2 and cluster 1.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this article.

Acknowledgment

The author is very thankful to the Editor of the Journal for valuable suggestion to complete this research paper.

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