Water Quality Analysis Of Hebbal Lake, Bangalore, Karnataka, India For The Survival Of Fishes

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Abstract:
Water is crucial for the life of fish which support all their needs including breathing, eating, growing and reproducing. The configuration of lake water changes frequently, ciphering on meteorological and repetitive changes. It is required good management so that fishes can be survived in Lake Water. If the water is polluted then fishes cannot be survived. This investigation is associated with the analysis of Physico-chemical parameters of Hebbal lake water such as potential of Hydrogen(pH), Total Dissolved solids(TDS), Chemical Oxygen Demand(COD), Biochemical Oxygen Demand(BOD), Total Suspended solids(TSS), Chloride(Cl), Fluoride(Fl), Dissolved Oxygen(DO) and Free Carbon Dioxide(CO_2). After investigation it is cleared that the lake water is not suitable for survival of fishes. Hence Precautionary measurement should be maintained so that the lake water will be suitable for the life of fishes and other species which inhabits in lake water.

Keywords: Hebbal Lake,

1. Introduction

Water is the life of all human being[1][2][3][4]. Without water survival of the human being is not possible. To maintain the ecosystem water is very crucial. Lake water is contaminated through the unwanted activities of human and animals. Thus the lake water is getting unsuitable for the survival of fishes and other water born species. Hebbal Lake is investigated in this study.The main point is to identify the attributes quality whether they are under limits of BIS or not. If proper management is developed then the lake water will be suitable for survival of the species. Also lake water can be used for domestic purposes.

2. Materials and Methods

2.1 Study Area

Hebbal Lake is primeval lake in Bangalore(Map a and Map b and Fig 1). It is famous for dwelling for various enticing regional and seasonal birds. The lake is positioned in the northward section of Bangalore. The canvas area of lake is about 150 acres.

Kempe Gowda, the founder of Bangalore has created the lake. It is one of the three lakes which are created by him. Over the passage of time, the lake has lost its prestige due to water pollution and the lack of appropriate preservation.

2.3 Collection of Specimen:

Water samples were collected in early hours from the tabbed locations of the lake in closed bottle to prevent fortuitous abridgement in specimen using suitable approach[5][6]. The physicchemical parameters of the specimen were properly studied.

2.4 Investigation of Samples:

The parameters were examined for different attributes such as potential of Hydrogen(pH), Total Dissolved solids(TDS), Chemical Oxygen Demand(COD), Biochemical Oxygen Demand(BOD), Total Suspended solids(TSS), Chloride(Cl), Fluoride(Fl), Dissolved Oxygen(DO) and Free Carbon Dioxide(CO_2). as per the standard methods (APHA, 1998)[7][8]. The experimental of values of the parameters of water quality characterization are shown in table 2 and BIS standard of the parameters are shown in Table 1. The parameters of the Hebbal lakes are graphically presented in Fig 3, Fig 4 and Fig 5. In Fig 3 scattered plots are represented. In Fig 4 Box plots are represented and in Fig 5 Bar graphs are represented.

3. Results and Discussion:

Diverseness of various 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 nitrate(TN)and total coliforms(TC) absorption along the Gandhi Sagar Lake water are listed in Table 3.pH is under the desirable limit prescribed by BIS.Total Dissolved solids, Chemical Oxygen Demand and Biochemical Oxygen Demand are below the desirable limit. Total suspended solids are above the prescribed limits. Dissolved Oxygen limit is too less though it is very essential for survival of the fish. Thus the results clearly mentioned that that water is not suitable for survival if fishes and other species in Hebbal lake. Using IBM SPSS 21 software Cluster analysis is completed and a Dendogram is shown

in Fig 6 and Component plot is shown in Fig 7. There are two demographically coherent clusters are organized. Suggest result affirms that the results are not similar in cluster 2 and cluster 1. Through Dendogram it is cleared that there is similarity between the attributes which is also represented through component plot also. Factor analysis is also performed using Systat 13 software and data matrix is shown in Fig 8 and corresponding loading plot is shown in Fig 9. This also enables us that the attributes are different in nature. Correlation matrix also performed using IBM SPSS 21 software which shows the relationship between the attributes and it cleared that some attributes are negatively correlated and some attributes are negatively correlated. Overall from the above discussion it is clear that Hebbal Lake is not suitable for survival of the fishes. So appropriate measurement is required for the survival of fishes and other water born species.

Conclusion

It is concluded that the water of Hebbal Lake is unfit for the survival of fishes. So necessary steps should be required for the survival of fishes and other water born species.

Conflict of interest:

No conflict of interest regarding this research paper.

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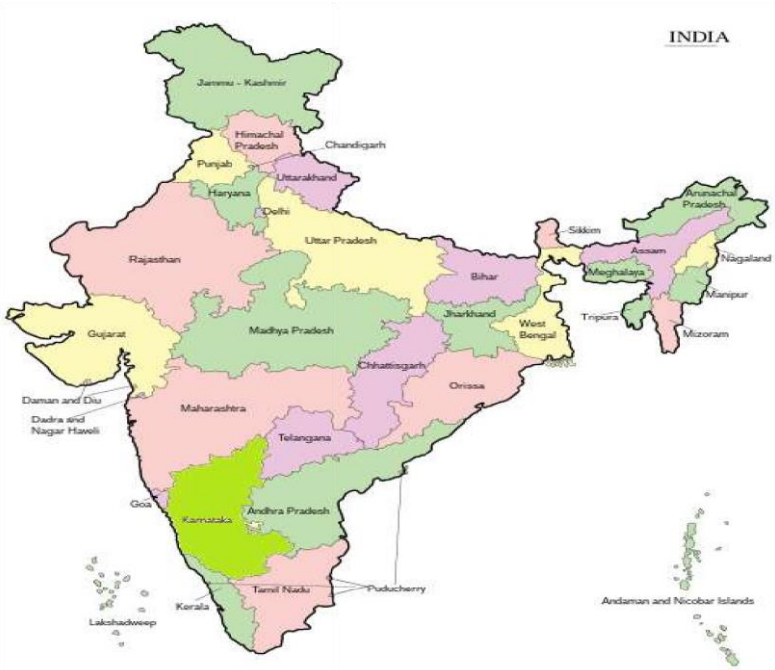
Map a: Map of India



Map b: Map of Karnataka

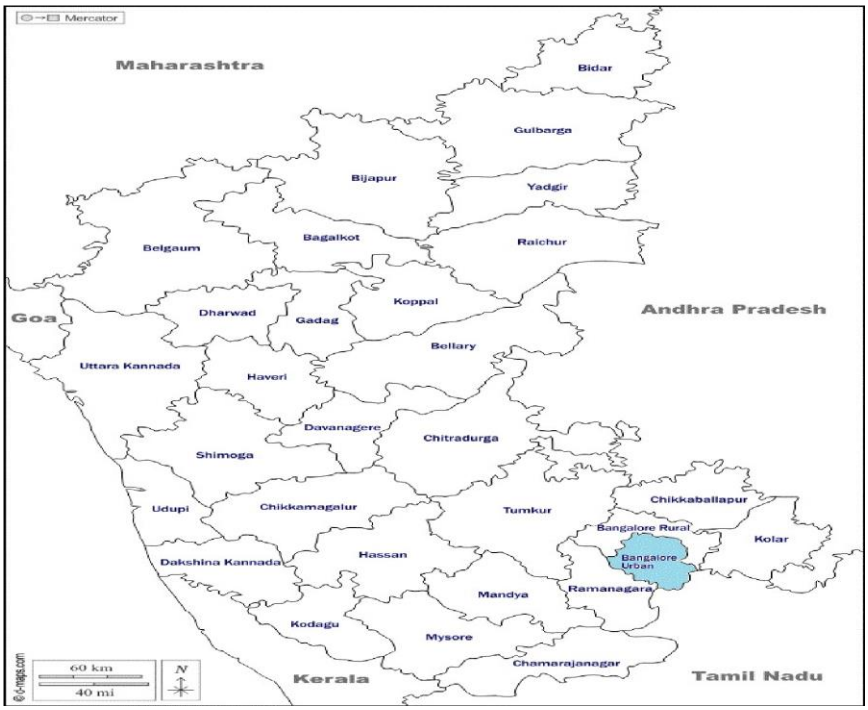


Fig. 1. Hebbal Lake at a glance

Table 1 Standard value of attributes.

Attributes	Standard value according to BIS
pH	6.5 – 8.5
Total Dissolved Solids(TDS)	500
Biochemical Oxygen Demand (BOD)	30
Chemical Oxygen (COD)	250
Total Suspended solids(TSS)	500
Chloride(Cl)	250
Fluoride(Fl)	1.0
Dissolved Oxygen(DO)	5.0
Free Carbon Dioxide(CO_2)	--

All units except pH are in mgL^{-1} pH is without unit.
BIS – Bureau of Indian Standards

Table2. Water Quality at of Hebbel lake water

Name of Station	pH	TDS (mgL^{-1})	COD (mgL^{-1})	BOD (mgL^{-1})	TSS (mgL^{-1})	Cl (mgL^{-1})	Fl (mgL^{-1})	DO	Co_2
S1	7.68	152	44	18.9	8752	187	0.88	0.74	15.2
S2	7.69	156	48	19.4	8748	183	0.92	0.78	14.4
S3	7.72	148	42	19.3	8754	188	0.86	0.66	15.6
S4	7.62	154	43	18.8	8746	182	0.90	0.72	14.8

Table 3. Correlation Matrix Correlation Matrix[a,b]

		pH	TDS	COD	BOD	TSS	Cl	Fl	DO	CO2
Correlation	pH	1.000	-.547	.068	.783	.827	.756	-.462	-.278	.462
	TDS	-.547	1.000	.798	-.066	-.855	-.862	.983	.917	-.983
	COD	.068	.798	1.000	.474	-.417	-.474	.834	.900	-.834
	BOD	.783	-.066	.474	1.000	.310	.192	.088	.045	-.088
	TSS	.827	-.855	-.417	.310	1.000	.992	-.849	-.584	.849
	Cl	.756	-.862	-.474	.192	.992	1.000	-.877	-.589	.877
	Fl	-.462	.983	.834	.088	-.849	-.877	1.000	.878	-1.000
	DO	-.278	.917	.900	.045	-.584	-.589	.878	1.000	-.878
	CO2	.462	-.983	-.834	-.088	.849	.877	-1.000	-.878	1.000

a. Determinant = .000
b. This matrix is not positive definite.

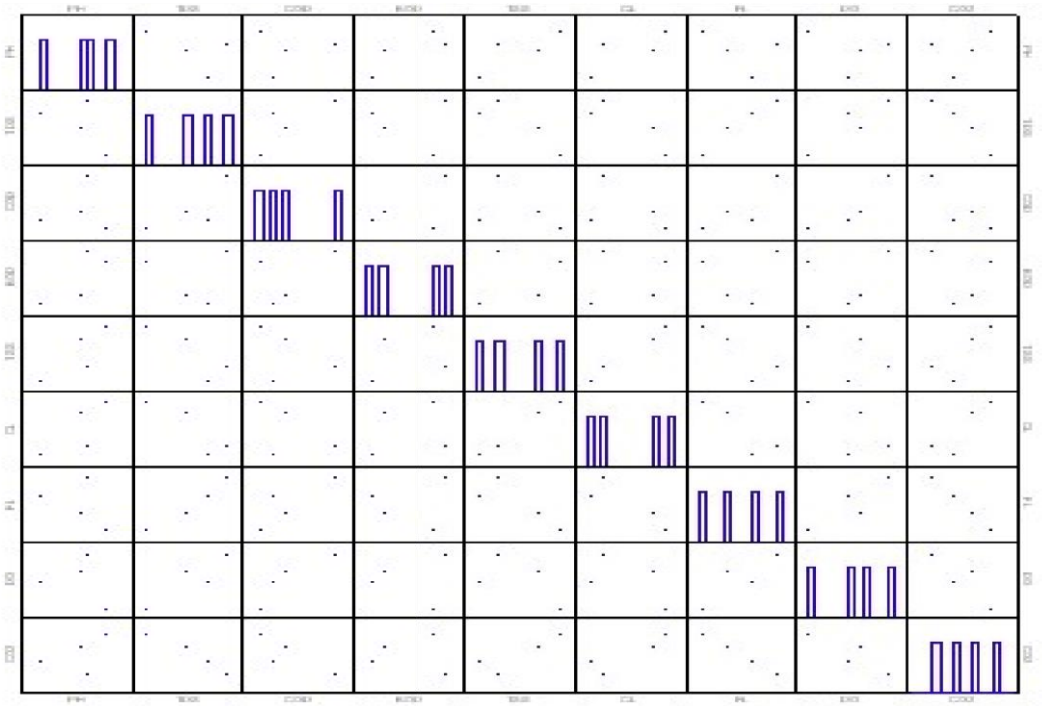


Fig. 3. Scatter Plot Matrix

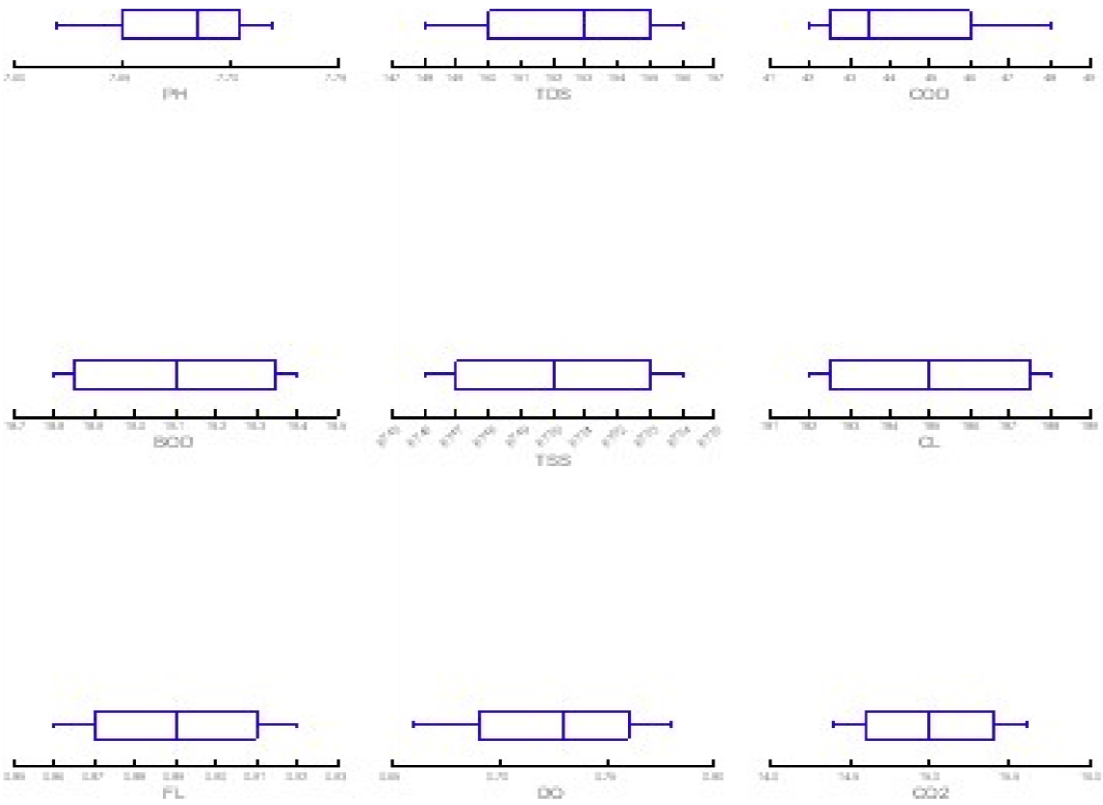


Fig. 4. Box Plots

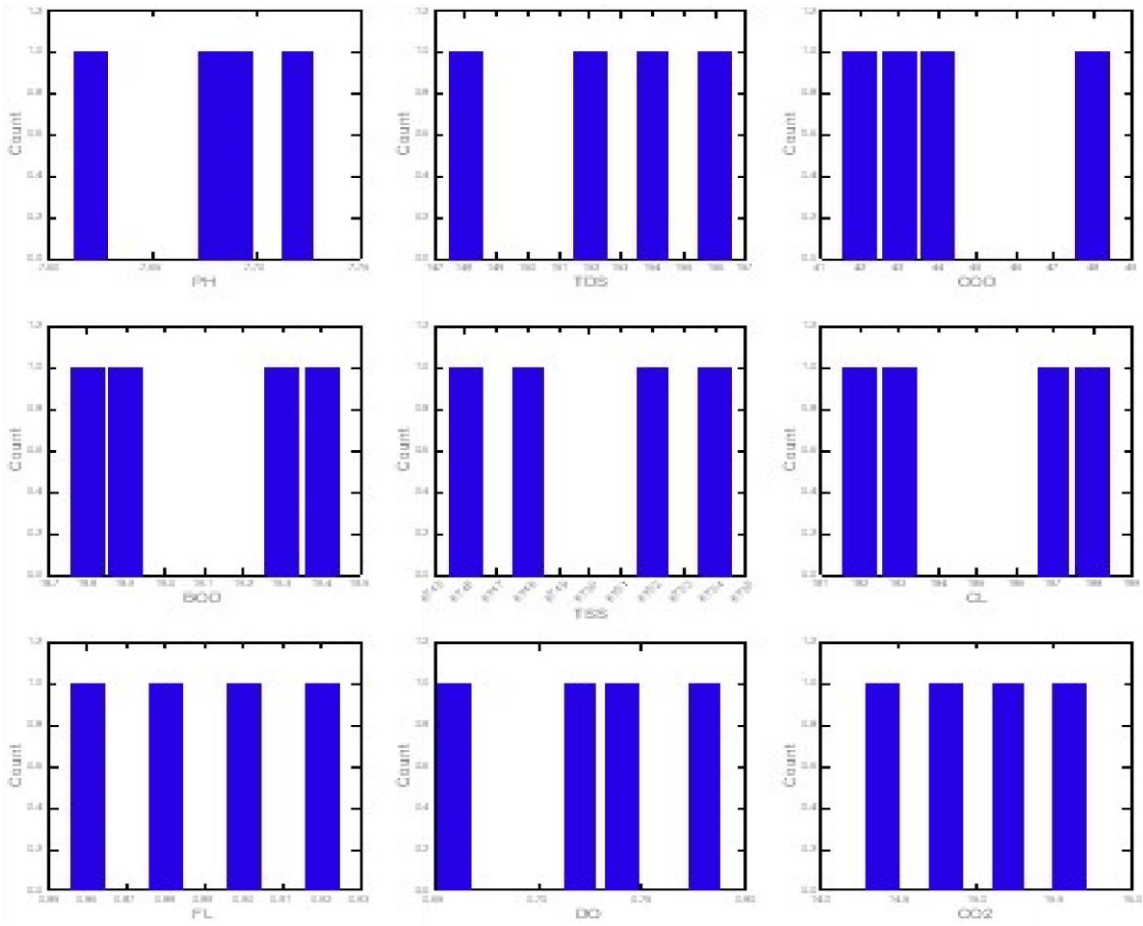


Fig. 5. Bar Graphs

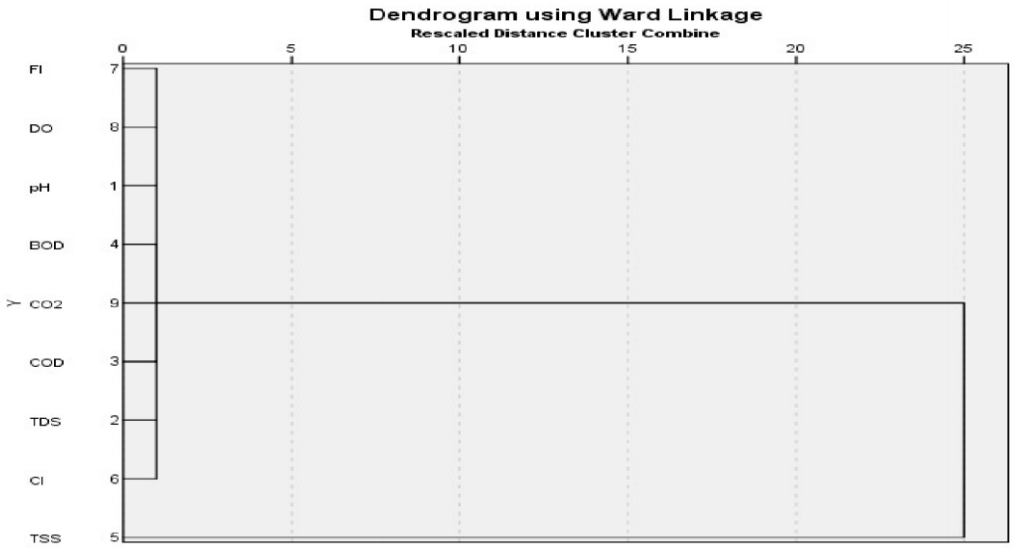


Fig 6. Dendrogram using Ward Linkage

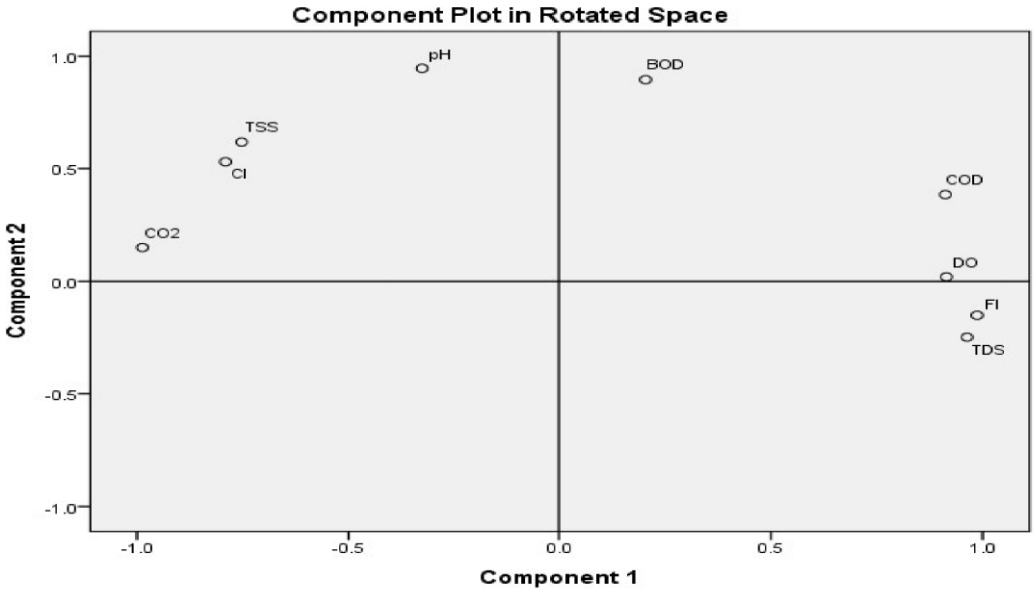


Fig 7. Component Plot

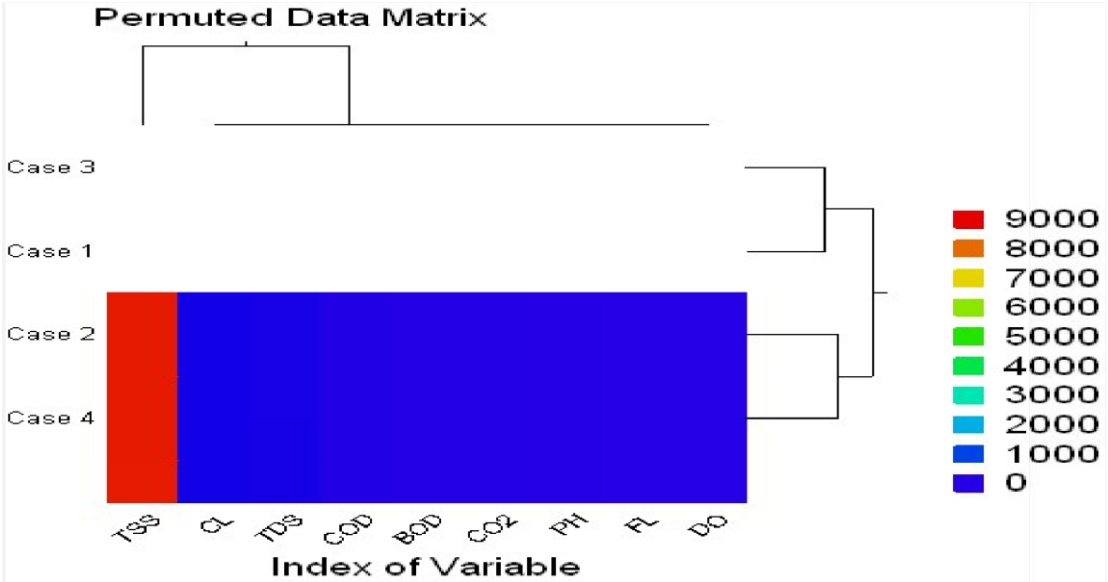


Fig 8. Data Matrix

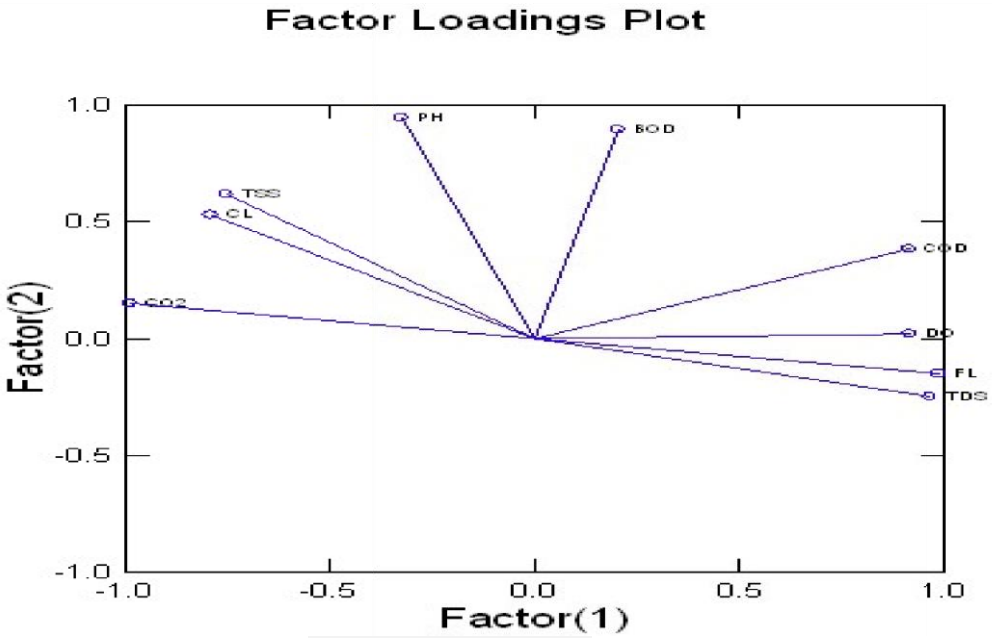


Fig 8. Factor Loading Plot