Monthly variations in physico-chemical characteristics of Bhiwapur Lake dist. Nagpur (M.S) India

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Abstract:

The present study deals with appraisal of the water value of Bhiwapur Lake, Nagpur district [M.S] India. The physico-chemical characteristics were studied and analyzed during July 2012 - Jun 202013. The month wise water sample was collected from Five different sample stations on the lake by estimating the various physical-chemical parameters like- Temperature, Conductivity, Total Dissolved solid, Free CO_2, Chloride for testing the appropriateness for drinking, agricultural purposes. The data revealed that there was significant seasonal variation in some Physico-chemical Parameter. The study details discuss about the investigation of water quality and put forward the means to improve through conservation.

***Keywords*:**Bhiwapur Lake, Physico-chemical, appropriateness, Conservation.

Introduction:

Water is an indispensable requirement for life and has been put to miscellaneous uses together with human and domestic consumption, Drinking, agricultural, irrigation, industry, and aquaculture and is also a basic requirement for nourishing a high quality of life for economic and social development. Lake and their surroundings are unique assets and valuable ecosystems of society and nature; these are of social, cultural, and aesthetic value [1].Water with chlorine to demolish disease producing contaminants that may be present in water. Water excellence provides up to date information about the concentration of various solutes at a given place and time. Water quality parameters provide the source for judging the appropriateness of water for its selected uses and to recover obtainable provision For most advantageous improvement and supervision for the favorable uses, current information is needed which provided by water quality programmers [2].

In India some hydrobiological work on historic shallow water bodies like temple reservoir and village ponds have been done [3-9].

Material and Methods:

Bhiwapur is the tahsil of Nagpur district in Maharashtra (India). Bhiwapur town is located east from Nagpur at 74 km.having 79°, 31'04.78"E latitude and 20°45'40.77"N longitude. While, on the way after Bhiwapur three districts border connected in Bhiwapurtahsil namely Nagpur, Bhandara and Chandrapur. Bhiwapur Lake is in Bhiwapurtahsil.

Five sampling stations are selected for the collection of water samples in view of human activities observed along the lake. Station A is located in the Eastern part, Station B is located in the Northern part, Station C is located in southwestern part and Station D is located in Western and middle part of a water body is considered as station E. A study was conducted from July 2012 to June 2013. For the analysis samples were collected from Bhiwapur Lake in the early morning between 8.30 to 11.00 a.m. in every month at regular interval. The samples were collected three liter container from a depth of 15-20 cms below the surface of water by holding the container upward. Temperature, Conductivity, Total dissolved solid, was analyzed in the field by means of ELIKO makes a digital

Water analysis kit at the spot of collection. Standard methods were employed for the estimation of physico-chemical factors periodically tested by using standard methods given by [10].

Result and Discussion:

Temperature:

Temperature plays significant role in aquatic ecosystem as an important factor. It affects physico-chemical characteristics of water as well as biochemical reaction, population instability in a water body. Atmospheric Temperature followed seasonal climatic pattern. The atmospheric temperature observed lowest during the month of January and highest during the month of June. The temperature started decreasing from October and became lower in January. Enhanced values of temperature during summer may be due to intense solar radiation, higher ambient temperature and low water level in the lake. It is supported by [11] and [12] has recorded similar findings.

Conductivity:

The conductivity of water depends on ions present in the water. Measurement of electrical conductivity can be used to calculate approximately the number of ions in the solution. Inorganic salts separate easily in water while the majority of the organic molecules does not separate in aqueous solution and thus do not contribute to the conductivity. Conductivity measurements are useful in estimating quick changes in water quality due to dissolved salts.

During present investigation, conductivity was recorded maximum in monsoon months and moderate during summer season while minimum during winter. The Maximum value of conductivity is due to inflow during rainy seasons, it's a content domestic waste, sewage content, clay and lots of outside mater from the catchment area of the lake, the moderate values of conductivity during summer may be due to decomposition of macrophytes. It shows positive correlation with Total dissolved solid and minimum conductivity during winter season may be because expression of low ionic substance and decreased in TDS range responsible for decreasing the value Electric conductivity during winter season. Similar observation state by [13] studied on Chulbandh reservoir.

Total Dissolve Solid:

Water has a large number of salts dissolved in it which basically administrate its physico-chemical properties and in turn it has an indirect effect on aquatic organisms. Total dissolved solids are resolute as the residue remains left after evaporation of filtered sample. The suspended solid determination is particularly useful in the analysis of sewage and other waste in water. And play a significant role to verify the range of different physico-chemical parameters.

In the present investigation highest TDS values obtained during monsoon and minimum values were recorded during winter. The maximum value during monsoon season due to surface inflow in the lake, Slaughterhouse wastes, and decaying matter from the catchment, moderately increased during summer due to increased rate of evaporation and detergent increase the proportion of salt in water and minimum value during the winter season due to dilution of water because of the higher water level in Ravivarpeth Lake. [14] has recorded similar finding.

Free Carbondioxide:

Free CO_2 plays a significant role in the aquatic environment. Respiratory activity of aquatic organism and process of decomposition are important sources of CO_2 in water bodies. In the present investigation, maximum CO_2 was recorded in monsoon and summer season and minimum in winter season at all sites.

Organic matter input by Slaughterhouse wastes, and anthropogenic activities is responsible for enhanced carbon dioxide in lake water. It showed maximum values during summer season. However, low values of free CO_2 during winter may be due to increased aquatic vegetation and maximum utilization of CO_2 by them during winter, Low values of CO_2 recorded during the winter season were also recorded by [15] in Saroornagar Lake, Hyderabad. Similar results observed by [16]

Chloride:

Chlorides are always present in natural waters and the source of chlorides can be accredited to suspension of salt deposits or due to detergent which are used for washing clothes, inflow discharge sewage material, domestic waste, and contamination from shelter etc. Chlorides play a vital role in water quality determination. Maximum concentration of chlorides is always regarded as a sign of eutrophication [16]. The high value of chloride and calcium in drinking water is generally not harmful to human being but high concentration of chlorides may be affecting a person who already suffers from diseases of heart and kidney.

During present investigation maximum value recorded during summer season moderated during monsoon and minimum value during winter seasons. High chloride due to increased temperature and consequent evaporation of water from the water body, especially in summer and inflow in lake brought salts from a catchment area during monsoon and daily cloths washing activities also responsible for higher values of chloride and low during the winter because of dilution effect and renewal of water [17]. Observation High chloride content in this reservoir was observed during summer months and monsoon months, which was due to increased temperature and consequent evaporation of water from the water body, especially during summer and runoff water brought salts from a catchment area during monsoon on Tighra reservoir Gwalior (M.P) India. Similar observations have also been made by [18].

Table. 1- Water Temperature:

Spot➔ Month🡻	A	B	C	D	E
JULY	27.1±0.091	26.5±0.168	26.6±0.129	26.4±0.108	26.8±0.374
AUG	25.0±0.070	25.1±0.177	25.0±0.177	24.5±0.182	25.4±0.336
SEP	27.8±0.195	28.0±0.158	27.8±0.212	27.6±0.129	28.2±0.365
OCT	29.5±0.187	29.8±0.313	29.6±0.185	29.3±0.070	30.0±0.316
NOV	25.0±0.254	25.6±0.129	25.4±0.168	25.3±0.147	25.8±0.316
DEC	21.8±0.168	21.5±0.147	21.4±0.129	21.2±0.129	21.7±0.216
JAN	18.7±0.216	19.2±0.091	19.0±0.108	18.8±0.195	19.6±0.408
FEB	22.3±0.158	22.8±0.129	22.6±0.108	22.5±0.108	23.0±0.244
MAR	28.7±0.108	29.4±0.158	29.0±0.187	28.9±0.168	29.8±0.294
APR	30.5±0.195	31.3±0.091	31.0±0.178	30.8±0.204	31.5±0.244
MAY	32.2±0.182	35.3±0.129	34.7±0.158	33.2±0.108	33.1±0.258
JUNE	33.4±0.091	35.5±0.091	35.0±0.108	33.6±0.182	33.5±0.294

Table. 2- Conductivity (µmhos/cm):

Spot➔ Month🡻	A	B	C	D	E
JULY	442	455	456	435	354
AUG	422	434	437	419	338
SEP	378	396	385	377	314
OCT	357	370	360	343	300
NOV	335	350	341	310	269
DEC	320	334	325	301	245
JAN	295	301	298	287	229
FEB	324	342	329	312	239
MAR	345	368	356	335	265
EPR	339	357	347	324	251
MAY	358	381	375	348	280
JUNE	376	399	390	366	295

Table. 3- Total dissolved solid (mg/l):

Spot➔ Month🡻	A	B	C	D	E
JULY	360	381	376	363	290
AUG	345	361	361	356	258
SEP	314	335	320	319	221
OCT	278	304	303	270	219
NOV	254	275	265	220	178
DEC	236	251	246	211	154
JAN	202	216	207	198	138
FEB	241	263	241	224	145
MAR	263	310	290	252	175
EPR	258	291	277	240	162
MAY	282	327	316	271	190
JUNE	317	340	330	308	208

Table. 4- Free CO_2 (mg/l):

Spot➔ Month🡻	A	B	C	D	E
JULY	1.22±0.050	1.34±0.030	1.35±0.032	1.14±0.022	0.93±0.035
AUG	1.10±0.048	1.26±0.016	1.26±0.016	1.06±0.030	0.87±0.028
SEP	1.00±0.023	1.15±0.020	1.18±0.022	0.92±0.015	0.79±0.027
OCT	0.92±0.025	1.00±0.029	1.10±0.041	0.86±0.011	0.67±0.037
NOV	0.85±0.020	0.95±0.012	1.00±0.039	0.70±0.024	0.56±0.026
DEC	0.78±0.034	0.82±0.018	0.85±0.025	0.65±0.018	0.49±0.019
JAN	0.54±0.038	0.68±0.035	0.62±0.027	0.50±0.037	0.40±0.041
FEB	0.96±0.048	1.00±0.041	0.95±0.043	0.86±0.048	0.78±0.053
MAR	1.48±0.037	1.62±0.035	1.47±0.047	1.22±0.052	1.00±0.072
EPR	1.42±0.047	1.55±0.027	1.40±0.039	1.13±0.031	0.94±0.036
MAY	1.86±0.035	2.00±0.086	2.00±0.011	1.78±0.074	1.38±0.045
JUNE	2.00±0.023	2.14±0.017	2.20±0.018	1.95±0.039	1.53±0.030

Table. 5- Chloride (mg/l):

Spot➔ Month🡻	A	B	C	D	E
JULY	36	38	35	31	28
AUG	34	36	33	30	27
SEP	33	35	33	29	27
OCT	31	33	31	27	26
NOV	29	32	30	27	25
DEC	28	30	28	26	24
JAN	25	26	24	22	20
FEB	36	37	32	28	25
MAR	48	52	45	40	34
EPR	50	49	43	38	32
MAY	52	56	48	44	36
JUNE	53	58	49	46	38

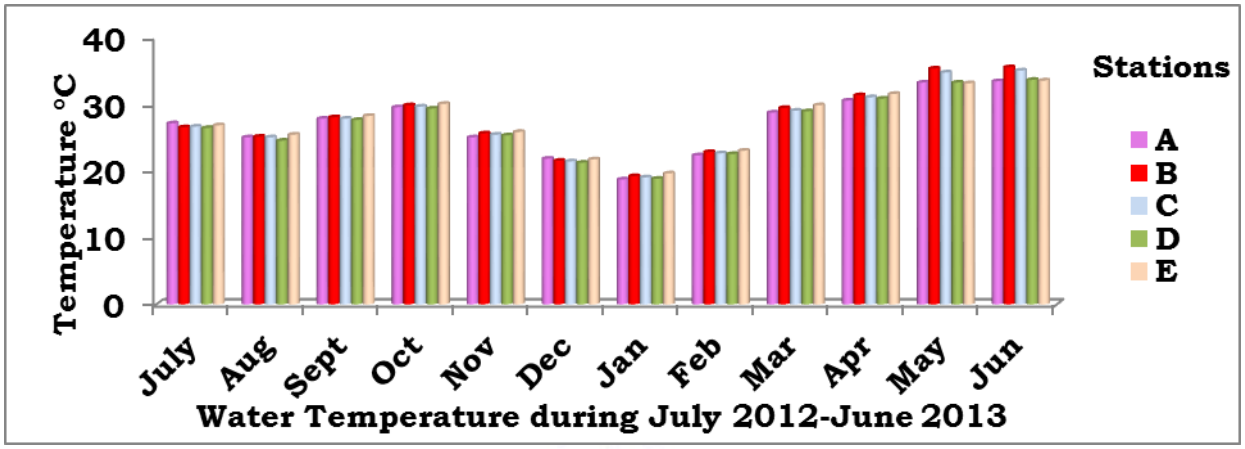

Figure. 1- Graph Showing Monthly Variation of Temperature:

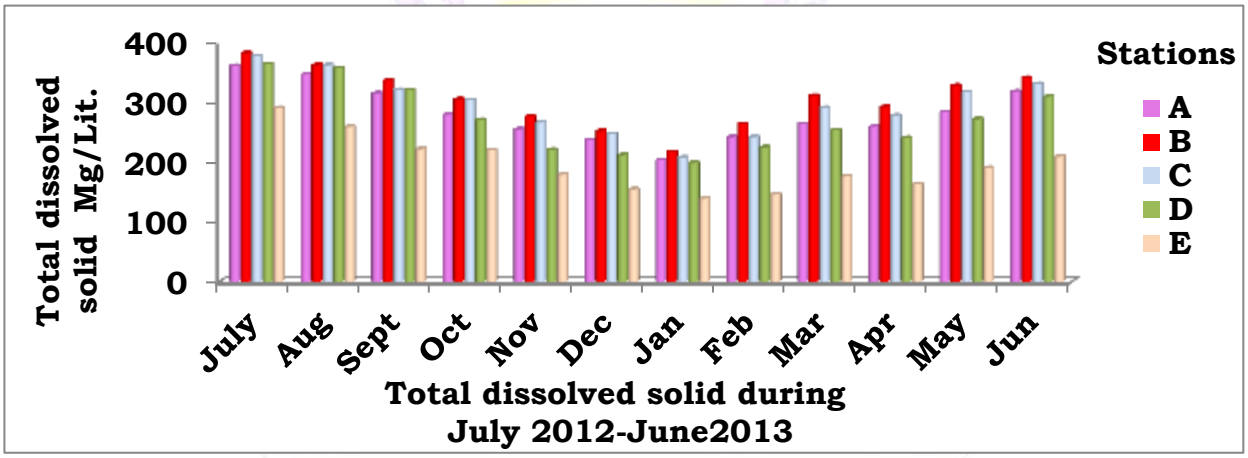

Figure.2- Graph Showing Seasonal Variation of Total dissolved solid (mg/l):

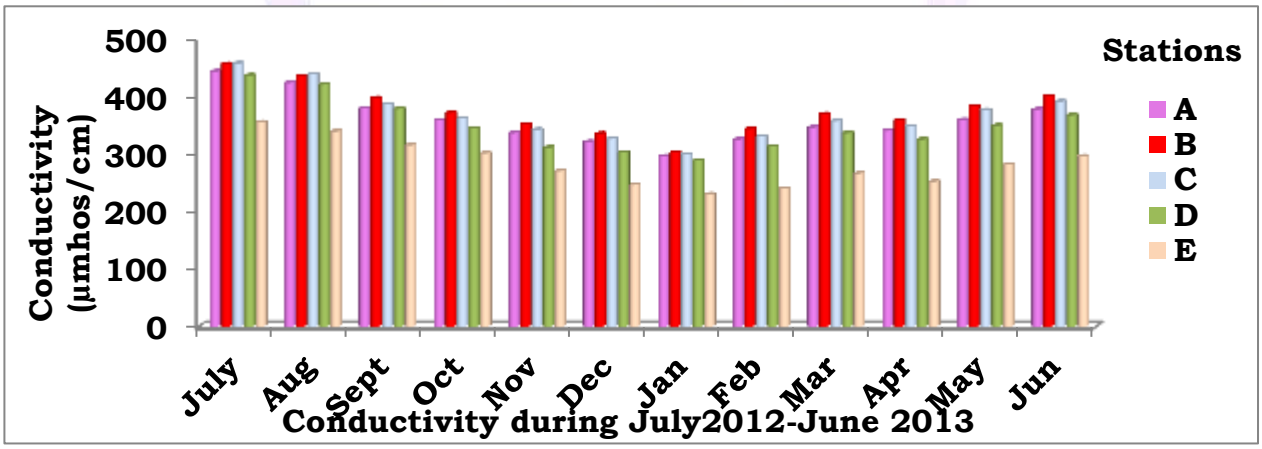

Figure. 3- Graph Showing Monthly Variation in Conductivity (µmhos/cm):

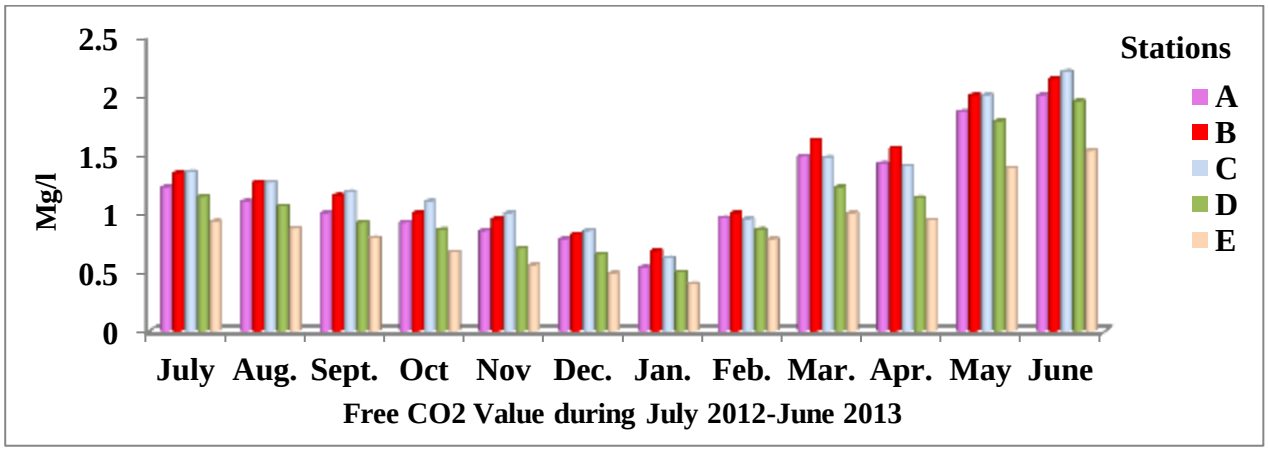

Figure. 4-Graph Showing Monthly Variation of Free carbondioxide (mg/l):

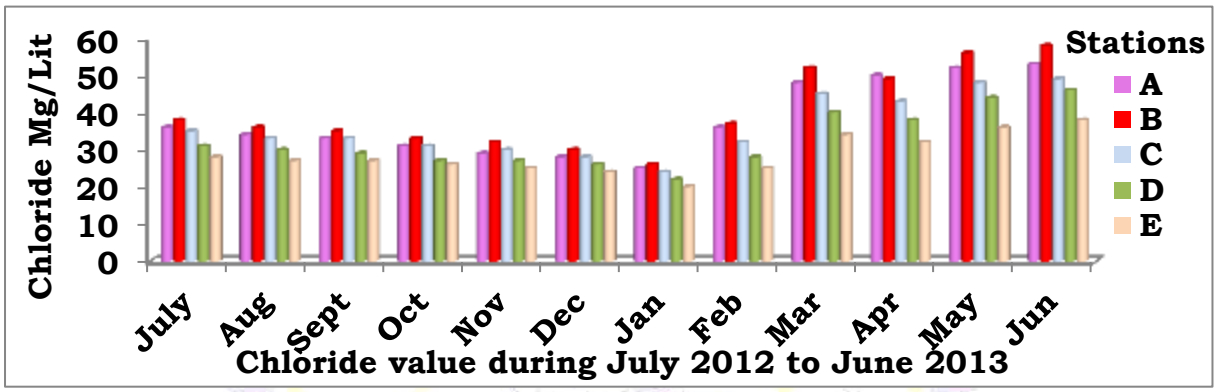

Figure. 5- Graph Showing Monthly Variation of Chloride (mg/l):

Conclusion:

Present study indicate all the parameters fluctuate Monthly During the study period, it is observed that human activities around the lake is the only cause of the deterioration of water, therefore, There is a need of proper management of lake concerning with waste input as well as monitor human activities, in order to ensure that such activities have minimal negative effects on lakes present within Bhiwapur town. Awareness, proper understanding, planning and management of environmental resources are essential to prevent environmental degradation of these surface water resources (lakes).

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