Seasonal 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 APHA[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 Gaike et al., [11] and Khan et al., [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 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 fromthe 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 B. B. Purshuramkar et al., [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 recordedduring 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. Telkhede et al., [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 monsoon and 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 Swarnalatha [16] in Saroornagar Lake, Hyderabad. Similar results observed by B. B. Purshuramkar et al., [15]

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	31.00±0.17	30.8±0.204	31.5±0.244
MAY	35.2±0.182	35.8±0.129	35.7±0.158	35.2±0.108	36.1±0.258
JUNE	35.4±0.091	36.0±0.091	36.0±0.108	35.5±0.182	36.5±0.294

Table. 2- Conductivity (µmhos/cm):

Spot➔ Month🡻	A	B	C	D	E
JULY	451	477	456	445	374
AUG	442	465	447	419	368
SEP	378	396	387	355	324
OCT	357	401	374	344	318
NOV	335	350	341	310	289
DEC	320	339	325	301	265
JAN	295	301	298	287	239
FEB	324	342	329	312	243
MAR	345	368	356	325	265
EPR	349	371	359	331	268
MAY	364	381	375	348	285
JUNE	380	399	390	366	304

Table. 3- Total dissolved solid (mg/l):2

Spot➔ Month🡻	A	B	C	D	E
JULY	417	445	419	396	344
AUG	401	420	408	390	357
SEP	363	381	369	352	290
OCT	322	343	330	315	263
NOV	316	340	321	299	259
DEC	291	310	300	270	226
JAN	262	284	271	252	200
FEB	295	314	305	276	229
MAR	311	338	322	307	244
EPR	319	341	327	315	251
MAY	335	366	349	328	270
JUNE	346	373	356	335	278

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

Spot➔ Month🡻	A	B	C	D	E
JULY	3.55±0.073	4.00±0.018	4.20±0.014	3.80±0.021	2.50±0.015
AUG	3.12±0.020	3.41±0.019	3.55±0.024	3.31±0.017	2.20±0.027
SEP	2.75±0.061	3.10±0.010	3.10±0.015	2.90±0.019	2.05±0.021
OCT	3.29±0.010	3.66±0.022	3.80±0.015	3.40±0.010	2.30±0.018
NOV	2.70±0.014	3.40±0.012	3.55±0.021	2.82±0.028	2.00±0.051
DEC	2.40±0.014	2.60±0.007	2.90±0.016	2.58±0.019	1.70±0.020
JAN	1.96±0.042	2.16±0.022	2.24±0.021	2.00±0.048	1.00±0.035
FEB	2.60±0.020	2.84±0.027	3.00±0.053	2.70±0.020	1.75±0.014
MAR	3.20±0.021	3.40±0.019	3.52±0.033	3.24±0.021	2.18±0.024
EPR	2.90±0.038	3.32±0.020	3.39±0.027	3.00±0.017	2.00±0.034
MAY	3.22±0.059	3.48±0.016	3.62±0.014	3.32±0.015	2.25±0.015
JUNE	3.30±0.024	3.56±0.024	3.70±0.014	3.38±0.023	2.32±0.015

Table. 5- Chloride (mg/l):

Spot➔ Month🡻	A	B	C	D	E
JULY	79	85	81	76	66
AUG	74	80	77	70	61
SEP	66	67	64	61	50
OCT	61	60	58	55	44
NOV	59	57	60	57	41
DEC	53	58	56	50	39
JAN	58	47	40	36	30
FEB	52	63	56	50	43
MAR	78	84	80	72	62
EPR	76	80	78	70	60
MAY	81	86	82	74	65
JUNE	97	109	103	94	79

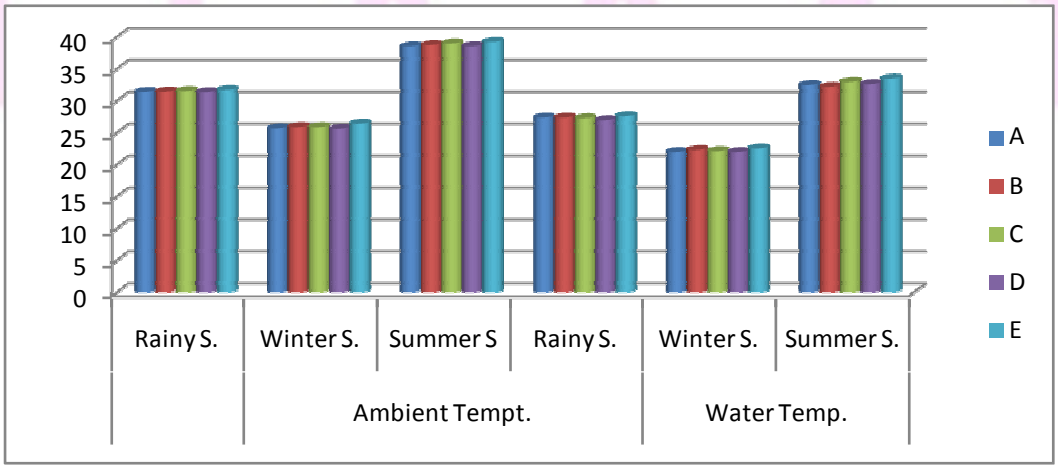

Figure. 1- Graph Showing Seasonal Mean of Tepmrature:

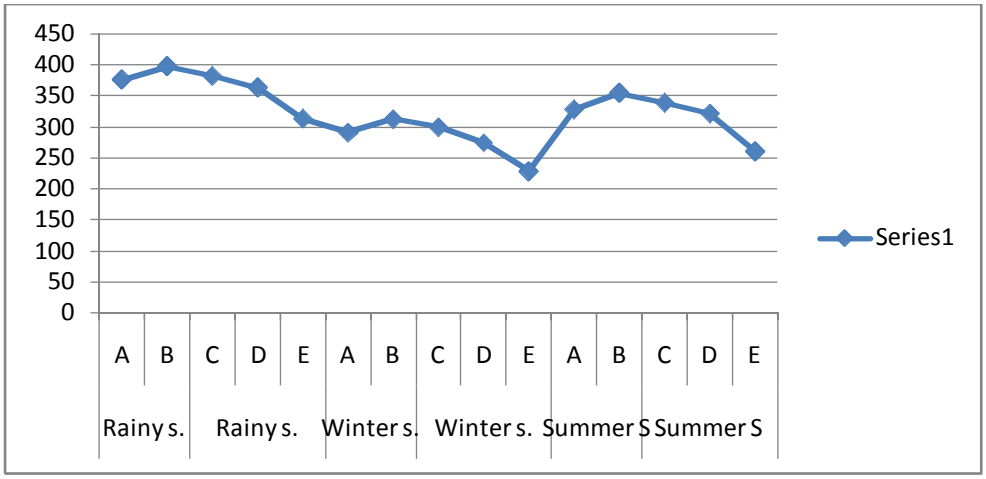

Figure. 2- Graph Showing Seasonal Mean of Total dissolved solid (mg/l):

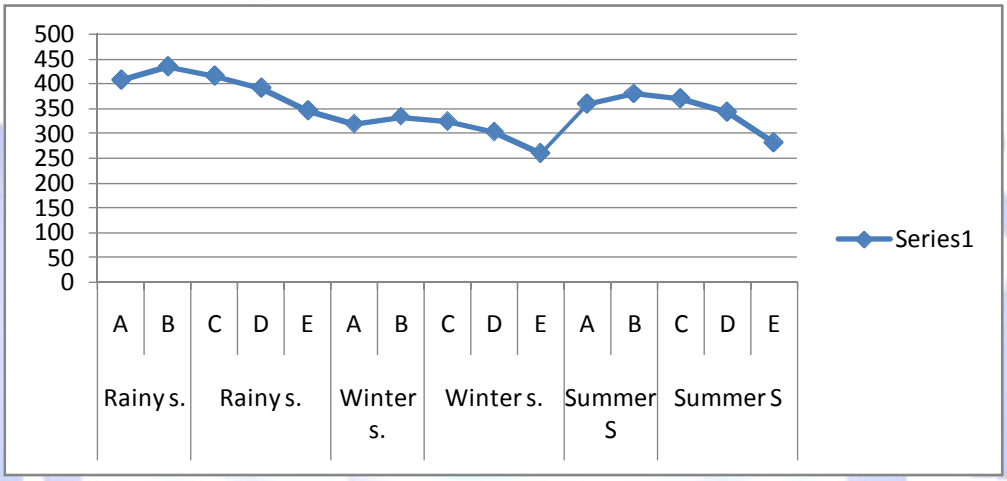

Figure. 3- Graph Showing Seasonal Mean of Conductivity (µmhos/cm):

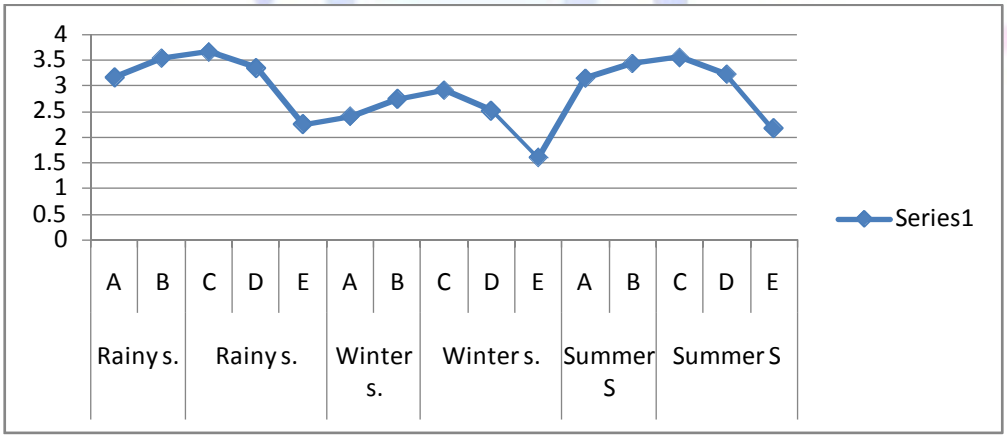

Figure. 4-Graph Showing Seasonal Mean of Free carbondioxide (mg/l):

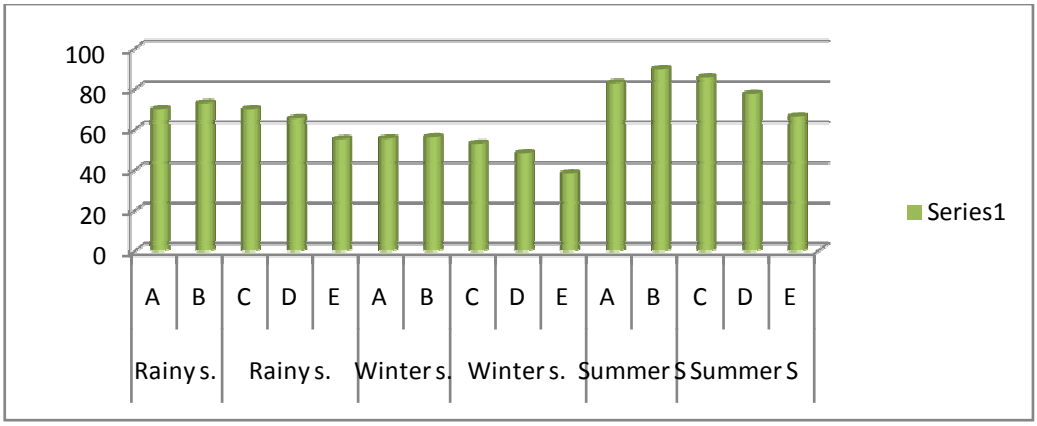

Figure. 5- Graph Showing Seasonal Mean of Chloride (mg/l):

Conclusion:

Present study indicate all the parameters fluctuate seasonally 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 Bhivapur 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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