International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 08 | Aug 2020 www.irjet.net p-ISSN: 2395-0072

Physico-Chemical Parameters Studies on Ramanthapur Lake, Hyderabad, Telangana

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Abstract: In the present study to study the Physico-chemical parameters in Ramanthapur lake, Hyderabad. Ramanthapur Lake, also known as Pedda Cheruvu, it is located in Ramanthapur, Hyderabad. Physico-chemical parameters have been conducted on Ramanthapur Lake over a period of one year starting from June 2018-May 2019. Physico- chemical studies were based on the parameters like temperature, pH, carbonates, bicarbonates, chlorides, dissolved oxygen, biological oxygen demand, organic matter, chemical oxygen demand, total hardness, calcium, magnesium, sulphates, phosphates, nitrates, nitrites, total solids, total dissolved solids, and total suspended solids. Standard methodology was adapted to carryout the physico-chemical parameters (APHA, 1995). Due to rapid increase of urbanization and population, the lake is converted into a waste dumping site, particularly industries and sewage in view of this the present work has been undertaken.

Keywords: Ramanthapur Lake, Physico-chemical parameters and Pollution

Introduction:

The most important use of water in agriculture is for irrigation, which is a key component to produce enough food. Irrigation takes up to 90% of water withdrawn in some developing countries and significant proportions in more economically developed countries. Water is also used in power generation Deeksha Dave (2011).

Physico-chemical environment plays a vital role in influencing the quality of water bodies besides topographical, geological and other environmental factors. In lentic waters physical and chemical parameters keep fluctuating by the cycling of water through evaporation and its subsequent return in rain. These changes in addition to the anthropogenic activities affect also the biological environment. The main objective of physico-chemical analysis of water is to determine the nutrient status of the medium. Since the water contains dissolved and suspended constituents in varying proportions it has different physical and chemical properties along with biological variation. The quality of water may be affected in various ways by pollution.

Eutrophication can produce problems such as bad tastes and odours as well as green scum algae. Also, the growth of rooted plants increases, which decreases the amount of oxygen in the deepest waters of the lake. It also leads to the death of all forms of life in the water bodies. Industrial effluents of mines, drainage, metal processing, organic wastes, refuge burning, transport and power generation etc., disperse many toxic elements into aquatic ecosystem which cause pollution and deteriorate the quality of water.

Material and Methods:

Ramanthapur Lake, also known as Pedda Cheruvu, is a lake located in Ramanthapur, Hyderabad. It is one of the largest lakes in Hyderabad.

Location : Hyderabad, Telangana, India

Coordinates : 17.42124°N 78.55403°E

Type : Natural Lake

Surface area : 9 acres (3.6 ha)

Surface elevation : 1,759 ft (536 m)

Settlements : Ramanthapur

Sampling stations

Three sampling stations were selected from the lake and are characterized as follows. Station I is located at the right side of the lake. Station II is situated at the left side of the lake. This station gets polluted due to anthropogenic activities. Station III is located 200 meter after station II.

Collection of water samples

The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of one year starting from June 2018-May 2019. Water samples were collected in separate 250 ml glass bottles (BOD bottles) for the estimation of dissolved oxygen. All the samples were carried to the laboratory. The samples were analyzed on the same day for different physico-chemical factors following the standard methods (APHA, 1995). The following factors have been analysed.

Temperature, pH, Carbonates, Bicarbonates, Chloride, Dissolved Oxygen, Biological Oxygen Demand, Chemical Oxygen Demand, Oxidizable Organic Matter, Total Hardness, Calcium, Magnesium, Phosphates, Sulphates, Nitrates, Nitrites, Total Solids, Total Dissolved Solids and Total Suspended Solids.

Results and Discussion:

Physico-chemical characteristics:

The one year average values of physico-chemical parameters are given in Table-1.

The physico - chemical characteristics exhibited certain interrelationships. The pH and carbonates are directly correlated. The pH and carbonates are inversely proportional to bicarbonates. Chlorides showed an inverse correlation with carbonates. Dissolved oxygen shows an inverse correlation with organic matter and biological oxygen demand. The total hardness negatively correlated with carbonates. Sulphates and phosphates showed positive correlation with chlorides. Nitrates showed positive correlation with carbonates, bicarbonates, calcium and negatively correlated with total dissolved solids.

Temperature exerts a major influence on the biological activities and growth. Temperature is one of the most significant factors that affect the aquatic environment (Sedamkar and Angadi, 2003). pH is indicative of hydrogen ion concentration and it expresses the intensity of acidity or alkalinity. The high values of carbonates may be due to dissolution of calcium carbonate in bottom layer of lake (Wetzel and Likens, 2000 and Araoye, 2009). Maximum values of bicarbonates were recorded at Station-II and minimum at station-I the variation in the concentration probably due to the fluctuations in the inflow of domestic and industrial wastes. In the present study the chloride values were very high indicating high salinity and heavy sewage pollution.

Dissolved oxygen affects the nutrient availability resulting in the altered productivity of the entire water body. In the present study high loads of industrial sewage and domestic sewage from the surrounding areas being dumped into the lake. A high pollution load may also decrease the DO values to a considerable level (Yeole and Patil, 2005).

In the present investigation COD values were low in winter. High COD values are indicative of the presence of chemically oxidisable carbonaceous matter as well as inorganic matter such as nitrate and sulphates are observed by Yeole and Patil (2005) and Imdranio gupta (2009). In the present investigation accumulation of organic matter in water was observed at high temperature. This is in accordance with the observations made by Gowd and Kotaiah, (2000).

In the present investigation the highest total hardness recorded in summer and the lowest values were recorded in winter. In the present study, the accumulation of calcium content was more in Ramanthapur lake. This may be due to discharge of sewage from the city. The observations of the current study are in agreement with the Rajeev Sharma and Ajay capoor (2010) and Rajakumar *et al.,* (2006). Though there is no relationship between calcium and magnesium, magnesium showed a direct relation with total hardness. The high values observed in summer could be due to evaporation, increasing the concentration of magnesium (Ravikumar, 2006).

In the lake, the sulphates, nitrates and phosphate values were on higher in winter and monsoon with minimum values during summer. Similar observation was made by Mishra *et al.,* (2008) and Mustapha (2003).

Determination of solids is relevant in the present study in view of their ecological significance in an aquatic ecosystem. Total solids in natural water refer to suspended and dissolved material. Greater content of total solids is

recorded in lake due to high alkalinity. High values were recorded in early summer in winter. This is in accordance to the observations made by Ugale and Hiware (2005).

Conclusion:

The water was alkaline in Ramanthapur Lake. Carbonates and dissolved oxygen were recorded in low concentration. Organic matter, COD, phosphates and nitrates were recorded in high concentration. From the comparison of the present data with ISI and WHO standards that the water is polluted in the lake (Table: 1). All the physico-chemical parameters are above the permissible limits.

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Table 1: AVERAGE VALUES OF PHYSICO-CHEMICAL PARAMETERS AND COMPARISON OF THE PRESENT DATA WITH ISI AND WHO AND STANDARDS

All Parameters are expressed in mg/L except pH and Temperature (^{0}C)

S.No	Physico-Chemical Parameters	Station - I	Station - II	Station - III	ISI 1991	WHO 1971
1	Temperature	24.30	23.0	24.80		
2	pH	8.52	8.26	8.8	6.5 - 8.5	6.5-8.5
3	Carbonates	16.30	18.13	12.62	.	.
4	Bicarbonates	223.12	227.68	246.88	.	.
5	Chlorides	374.82	365.29	385.82	.	250

6	Dissolved Oxygen	2.12	3.18	2.82	6	3
7.	BOD	84.00	88.00	98.00	.	.
8	Organic Matter	18.22	17.82	18.28	.	.
9	COD	98.82	92.18	88.24		
10	Total Hardness	559.28	546.28	532.84	300	300
11	Calcium	78.14	82.64	88.12	200	75
12	Magnesium	67.14	70.78	71.21	75	30
13	Total Solids	728.26	788.28	812.12	.	.
14	Total Dissolved Solids	432.58	452.26	484.42	.	.
15	Total Suspended Solids	348 .24	328.86	388.96	.	.
16	Sulphates	46.22	44.56	38.54	200	150
17	Phosphates	4.76	4.52	4.88	.	.
18	Nitrites	0.26	0.22	0.28	.	.
19	Nitrates	8.26	7.26	8.68	45	.