Physico-Chemical Studies on Safilguda Lake, Hyderabad

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Abstract: *Physico-chemical studies were made on Safilguda Lake to assess the quality of water. Surface water samples were collected from the lake at monthly intervals from three sampling stations for a period of one year i. e., from May 2017 to April 2018 and analyzed for various physico-chemical parameters. pH, dissolved oxygen, chemical oxygen demand, alkalinity, chlorides, calcium, magnesium, total dissolved solids, organic matter, total hardness, nitrites, phosphates and sulphates were tested by using standard methods. The results showed higher concentrations of all the parameters and lower concentration of dissolved oxygen at all the stations in the lake compared to BIS limits. This is due to the direct release of untreated sewage, garbage and immersion of idols from the nearby colonies indicating the eutrophic condition and poor water quality of the lake and making the water unsuitable for drinking, domestic and recreational purposes.*

Keywords: Physico-chemical parameters, Safilguda Lake, water quality, eutrophic

1. Introduction

Water is the source of life on earth and earth is known as the 'Watery Planet' because it is the only planet in the solar system with the abundant source of water. Lakes are the best available fresh water resources on the earth's surface as we can freely access only the water in lakes. Lakes have traditionally served the function of meeting water requirements of the people for drinking, household uses like washing, for agriculture, for fishing and also for religious and cultural purposes. Apart from these functions, lakes are known to recharge ground water, controls runoff, moderate the hydrological events drought and floods, host variety of flora and fauna and provide a wide array of recreational activities and aesthetic benefits for humans to enjoy. With rapid urbanization and expansion of city boundaries, a number of lakes in urban areas are facing issues of over exploitation, encroachment, pollution etc. Therefore, it is needed to initiate efforts to restore and conserve the lakes.

2. Study Area

Hyderabad is the capital of Telangana which is the newly formed and youngest Indian state and one of the major urban cities in India. Aside from historical monuments, Hyderabad is popular for its lakes and was called as Limnological capital of India which provide a perfect escape from the hustle and bustle of city life.

With the increasing population and rapid urban sprawl of the city, many of the water bodies have been totally lost after getting encroached. Many lakes have been shrunk in size and while the waters of several lakes got polluted with the discharge of untreated domestic and industrial effluents.

Among the major lakes in Hyderabad, Safilguda lake also known as Nadimi cheruvu was formed naturally and is located in Malkajgiri area at a latitude $17^o27^{'}$N with longitude $78^o32^{'}$E. The lake was used by the Nawabs and British military authorities to quench their thirst and was also a source of irrigation to farmers but due to rapid urbanization, unplanned growth, encroachment and pollution, the lake water quality was contaminated. HUDA (Hyderabad urban development authority) restored the lake in the year 2001 under the lake conservation programme by constructing a bund to prevent encroachment of lake bed area and provided Sewage treatment plant to treat domestic waste water before letting into the lake. After restoration and cleaning, the lake and its surroundings were clean for some time. Ganesh immersion started in the lake from the year 2007. However, as years have passed, the lake is deteriorating in condition due to the discharge of effluents, sewage and dumping of garbage from the neighbouring colonies of Balaramnagar, Vinayakanagar, Krishnanagar and krupa complex. This lake needs cleaning on top most priority as the Sewage treatment plant is non fructuous as the capacity is 0.6 MLD whereas the sewage coming into the lake is 5 MLD [11]. Untreated waste water is creating a hazard to the locals as well as contaminating the quality of underground water due to the seepage and infiltration from the lake. While entering the Safilguda lake walker's footpath, it gives bad odour from the lake which is not a healthy hazard to the walkers. There is an urgent need to clean the lake and prevent the inflow of effluents and domestic sewage by the government authorities.

3. Materials and Methods

The present work was spread over for a period of one year from May 2017 to April 2018 to evaluate the quality of water. Surface water samples were collected from Safilguda lake at monthly intervals in clean one litre capacity polythene containers. Three sampling stations were selected for collection of surface water samples in the lake. Station I is situated at the entrance of the lake where immersion of ganesh idols takes place, Station II is situated near Katta

Maisamma temple and Station III is near Krupa complex. The water samples collected were analyzed for sixteen physico-chemical parameters following the standard procedures of American Public Health Association (APHA, 2005) [1]. pH, dissolved oxygen, chemical oxygen demand, alkalinity, chlorides, calcium, magnesium, total dissolved solids, organic matter, total hardness, nitrites, phosphates and sulphates were tested.

4. Results and Discussion

The water samples were collected and analyzed from the three sampling stations of Safilguda lake on monthly intervals for a period of one year from May 2017 to April 2018. The average concentrations and ranges i.e., minimum and maximum values of physico-chemical parameters are given in table 1 and 2.

pH: From the present investigation, it is evident that the Safilguda lake exhibit alkalinity with an average pH of 8.4. Carbonates ranged from 6.0 to 48.0 mg/L and bicarbonates were present in the range of 132.0 to 295.67 mg/L indicating alkaline nature of the lake. Alkalinity of lakes were reported in India [3]. The pH and carbonates are directly related and both are inversely proportional to bicarbonates [6].

Chlorides: Chlorides play an important role in determining the quality of water. The recorded average values of chlorides were 201.25 mg/L at station I, 238.62 mg/L at station II and 233.11 mg/L at station III. High concentration of chlorides indicates water pollution [2]. Sources of chloride in water are sewage and industrial effluents.

Dissolved oxygen: DO is a most important indicator of water quality and is of great importance to all the aquatic organisms. Safilguda lake has very low DO. The minimum and maximum DO values observed were 1.6 to 4.0 mg/L. D0 shows an inverse correlation to organic matter and water temperature [6]. Organic matter showed higher value than DO ranging between 1.9 mg/L to 7.5 mg/L.

Total hardness (TH): The hardness of water is not a pollution parameter but indicates water quality [8]. TH of the lake is very high when compared to the BIS standards. Station I showed maximum hardness value of 422.2 mg/L, station II 354.6 mg/L whereas station III 395.7 mg/L. High hardness might be due to discharge of domestic sewage or addition of detergents. [7]. Hardness of water is due to the presence of calcium and magnesium. The recorded concentrations of calcium at station I, station II and station III were 43.3 mg/L, 35.9 mg/L and 26.12 mg/L whereas magnesium were 20.2 mg/L, 9.5 mg/L and 13.8 mg/L respectively.

Nitrite: Nitrite concentration in surface water is normally low but fertilizer run off and sewage can lead to high levels of nitrites causing eutrophication of water bodies [5]. Nitrite values recorded from station I to station III are 0.003 mg/L, 0.0037 mg/L and 0.003 mg/L.

Phosphate: Phosphates are usually present in low concentration in natural freshwaters but agricultural fertilizers, domestic sewage and use of detergents rises the phosphates levels causing water pollution [8]. Phosphates ranged between 8.67 mg/L to 13.89 mg/L between station I to station III.

Sulphate: In the present study, sulphates ranged between 11.45 mg/L to 38.0 mg/L. The sources of sulphates in the fresh water are sewage and fertilizers [9].

Total dissolved solids: TDS are the dissolved ions of calcium, magnesium, carbonates, bicarbonates, chlorides, phosphates, sulphates, sodium and potassium in water [10]. The total dissolved solids recorded at station I, station II and station III are 645 mg/L, 634 mg/L and 670 mg/L.

Chemical oxygen demand: COD indicates the extent of chemical pollution mainly industrial effluents in suface water [11]. COD values observed are in the range between 100 mg/L to 560 mg/L.

The present physico-chemical studies shows that alkalinity, total hardness and total dissolved solids are in high concentration at all stations and dissolved oxygen is lower than BIS standards [4]shown in table 3.

Table 1: Average values of Physico-Chemical parameters of Safilguda Lake

S. No	Parameters	Station I Average	Station II Average	Station III Average
1	Temperature	21.4	21.3	21.4
2	pH	8.3	8.4	8.4
3	Carbonates	17.5	23.3	24.5
4	Bicarbonates	185.6	215.14	247.23
5	Chlorides	201.25	238.62	233.11
6	DO	3.5	3.1	3.3
7	OM	4.1	4.1	4.3
8	COD	350.8	355.6	274.5
9	Total hardness	422.2	354.6	395.7
10	Calcium	43.3	35.9	26.12
11	Magnesium	20.2	9.5	13.8
12	Phosphates	10.2	10.9	10.98
13	Sulphates	30	14.4	24.9
14	Silicates	0.91	0.94	0.91
15	Nitrites	0.003	0.0037	0.003
16	TDS	645	634	670

(All values are expressed in mg/L except pH and Temp.)

Table 2: Ranges and average values of Physico-chemical parameters of Safilguda Lake

S. NO	Parameters	Station I Average	Range Min	Range Max	Station II Average	Range Min	Range Max	Station III Average	Range Min	Range Max
1	Temperature	21.4	16.5	23.4	21.3	16	23.2	21.4	16	23.6
2	pH	8.3	8.0	8.6	8.4	8.0	8.6	8.4	8.2	8.8
3	Carbonates	17.5	6.0	36.0	23.3	6.0	36.0	24.5	12.0	48.0
4	Bicarbonates	185.6	132	281	215.14	138.11	286.12	247.23	208.5	295.67
5	Chlorides	201.25	140	297	238.62	200.24	298.73	233.11	207.2	265.8

6	DO	3.5	2.4	5.0	2.9	2.2	3.5	3.3	1.6	4.2
7	OM	4.1	2.0	7.5	3.1	1.9	5.2	4.3	1.5	6.7
8	COD	350.8	100	560	355.6	240	560	274.5	120	480
9	Total hardness	422.2	360	500	354.6	290	488	395.7	210	426
10	Calcium	43.3	20.32	64.33	35.9	16.2	64.33	26.12	13.0	48.3
11	Magnesium	20.2	10.0	32.0	9.5	6.9	12.5	13.8	6.0	26.0
12	Phosphates	10.2	8.98	11.77	10.9	8.67	12.98	10.98	9.72	13.89
13	Sulphates	30	23.0	38.0	14.4	11.45	18.34	24.9	22.37	28.89
14	Silicates	0.91	0.53	1.37	0.94	0.45	1.89	0.91	0.53	1.56
15	Nitrites	0.003	0.002	0.006	0.0037	0.002	0.006	0.003	0.002	0.006
16	TDS	645	600	680	634	600	670	670	610	740

(All values are expressed in mg/L except pH and Temp.)

Table 3: Comparison of Physico-chemical parameters of Safilguda Lake with BIS standards

S. NO	Parameter	Station I	Station II	Station III	BIS
1	pH	8.3	8.4	8.4	6.5 to 8.5
2	Alkalinity	203.1	238.44	271.73	200
3	Chlorides	201.25	238.62	233.11	250
4	DO	3.5	3.1	3.3	6
5	Total hardness	422.2	354.6	395.7	300
6	Calcium	43.3	35.9	26.12	75
7	Magnesium	20.2	9.5	13.8	30
8	TDS	645	634	670	500

(All values are expressed in mg/L except pH)

5. Conclusion

The present study shows that Physico-chemical parameters helps in assessing the quality of water. The factors analyzed in Safilguda lake indicate that the water is in deteriorating condition and is having poor quality making it unfit for human consumption and recreational purposes. It is therefore, suggested to restore the lake by the government authorities by cleaning the lake and letting only the treated sewage to be released into the lake by proper functioning and increasing the capacity of sewage treatment plant.

References

[1] American Public Health Association (APHA) (2005). Standard methods for examination of water and waste water, 21st edition, Washington D C.

[2] Ameetha Sinha, Baidyanath Kumar, Tanuja Singh, (2014). Water quality assessment of two ponds of Samastipur District (India). International Journal of Environmental Sciences Volume 4, No 4. ISSN: 0976-4402.

[3] Amin Hossaini Motlagh, K. Navatha and P. Manikya Reddy, (2013). Ecological Studies of Mir Alam Lake with Reference to Water Quality. Nature Environment and PollutionTechnology. Vol.12, No.2 pp.355-358, ISSN: 0972-6268.

[4] Bureau of Indian Standards (BIS) 2012: Drinking water specifications.

[5] Dinesh K. Uchchariya, (2012). Study of Nutrients and Trophic Status of Tighra Reservoir, Gwalior (Madhya Pradesh), India. Journal of Natural Sciences Research. Vol.2, No.8, ISSN 2224-3186.

[6] Nirmala K, 2011. Limnological studies on Ibrahimpatnam Lake with reference to water quality. Ph. D Thesis. O. U. Hyderabad.

[7] Padma Priya K T, (2015). Assessment of water quality in Sarrornagar Lake, Hyderabad. International Journal of Recent Scientific Research Vol.6, Issue, 11, pp.7536-7540.

[8] Saluja D S, 2020. Water Quality Analysis of Narmada River with Reference to Physico-Chemical Parameters at Hoshangabad City, M. P, India. International Journal of Science and Research, Volume 9 Issue 1, ISSN: 2319-7064.

[9] Sudha Rani, P., 2004. Environmental monitoring of Hussain Sagar lake water. Ph. D Thesis. O. U. Hyderabad.

[10] Suresh B, (2015). Multiplicity of phytoplankton diversity in Tungabhadra River near Harihar, Karnataka (India). International Journal of Current Microbiology and Applied Sciences. Volume 4 Number 2 (2015) pp.1077-1085. ISSN: 2319-7706.

[11] "The Hans India" epaper, article on: "The Lake that remains stinky for decades", 2nd October, 2019.