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WATER QUALITY ANALYSIS OF MEDCHAL LAKE OF HYDERABAD, TELANGANA

[1].Ms. Suprabha Panda
Assistant Professor of Zoology, Government Degree College for Women Sangareddy,

[2].Dr. Deepa Jaiswal
Scientist –E and Officer in-charge, Freshwater Biology Regional Centre, Zoological Survey of India.

[3]. Prof . Vanita Das
Department of Zoology, Osmania University, Telangana.

Abstract:
The water is very essential component of Earth and the freshwater source is very less compared to marine water. The Medchal lake is a nature preserve located in Medchal, Telangana, India, previously it is called as Medichelama. As the urbanization is growing the lake size has been decreased and the water quality is depleting. The study has included water quality assessment of lake for three seasons and samples were collected at three locations. Sixteen physico-chemical parameters were chosen for analysis such as Temperature, PH, electronic conductivity, total dissolved solids, total hardness, total alkalinity, chloride, calcium, magnesium, nitrites, nitrates, ammonia, phosphate, phosphorus, dissolved oxygen. Finally, results of the analysis were compared with water quality standards such as BIS 10500 (1991). It is observed that most the parameters are above the desirable limit and dissolved oxygen is less when compared the desirable limits. The reasons may be pollution due to over exploitation, urbanization and industrialization. The decreased oxygen levels may be due to eutrophication. The study suggests the need for restoration of lakes so that the water can be consumable.
Key words: Urbanization, over exploitation, Eutrophication.

I INTRODUCTION:

Hyderabad is known as city of lakes and there used to be 3000 to 7000 lakes in Hyderabad natural and man-made (Wikipedia). But due to rapid development and increase in population most of these lakes were disappeared and the present existing lake were shrunken in size.

Today only about 70 to 500 of them have survived. Most of them have disappeared due to encroachment or have been illegally drained for real estate projects by private or government agencies.

There are 400 small and big lakes available in Hyderabad City. Out of which 169 lakes were notified by Hyderabad Metropolitan Development Authority (HMDA) for protection and conservation of water spread area.

Water quality constitutes various biotic and abiotic factors associated with the ecosystem. The maintenance of healthy ecosystem is dependent on the physico chemical properties of water and biological diversity. The quality of ecosystem is dependent on the physico-chemical and biological characteristics (Medudhula Thirupathaiah., 2012). Water quality indicates the relation of all Hydrobiological properties; it reflects the botic and abiotic status of ecosystem. (Smitha AD, 2013).

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II. STUDY AREA:

The study area includes Medchal lake which is also known as Pedda cheruvu located in Raja bollaram village of Medchal mandal. The lake is listed in the Hyderabad Metropoliton Development Authority,s (HMDA) Lake Protection Committee. According to 2013 survey the full tank area is 57 acres and the bund length is 664 meters. The lakes perimeter is 2.4 km. The lakes latitude is 78.4839”E and longitude is 17.6209”N. The water of lake used to be the main source of drinking water for the villages around it and also for agriculture purpose during the time of Nizams.

III. METHODOLOGY:

The surface water samples were collected from three sampling stations for each season that is winter, summer and monsoon during the years 2022 and 2023 from the Medchal Lake. To collect water samples cleaned and rinsed plastic containers of one liter capacity were used. The water samples were analyzed for both physical and chemical parameters. The physical parameters such as temperature, total dissolved solids and electronic conductivity were measured by using digital thermometer and TDS meter and chemical parameter such as PH is measured by digital PH meter at the sample site itself. Further analysis of chemical parameters were carried out as per APHA method (APHA 2005) at ZSI lab total 15 parameters were analysed.

IV: RESULT AND DISCUSSION:

- The water samples were collected for three seasons ie summer, monsoon and winter during 2022 - 2023

Table 1: Winter season water quality analysis of Medchal Lake

S.No	Parameter	Units	Location 1	Location 2	Location 3
1	Surface Temperature	°C	22.7	22.8	22.6
2	Atmospheric temperature	°C	20.4	19.6	22.9
3	pH		8.49	7.9	8.02
4	Conductivity	µS/cm	0.54	0.53	0.53
5	Total dissolved solids	mg/l	268	268	268
6	Total hardness	mg/l	114	111	105
7	Total alkalinity	mg/l	138	147	153
8	Chloride	mg/l	56	56	53
9	Calcium	mg/l	95	80	90
10	Nitrite	mg/l	0	0	0
11	Nitrate	mg/l	0	0	0
12	Ammonia	mg/l	0.3	0.2	0.3
13	Phosphate	mg/l	0	0	0
14	Phosphorus	mg/l	0	0	0
15	Dissolved oxygen	mg/l	6.8	4.4	6

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Table 2: Summer season water quality analysis of Medchal Lake

S.No	Parameter	Units	Location 1	Location 2	Location 3
1	Surface Temperature	°C	30.2	29.7	31
2	Atmospheric temperature	°C	36.21	36	36
3	pH		8.81	8.2	8.5
4	Conductivity	µS/cm	0.7	0.7	0.7
5	Total dissolved solids	mg/l	351	354	350
6	Total hardness	mg/l	300	300	300
7	Total alkalinity	mg/l	225	225	225
8	Chloride	mg/l	177	212.7	180
9	Calcium	mg/l	75	100	80
10	Nitrite	mg/l	0	0	0
11	Nitrate	mg/l	0	0	0
12	Ammonia	mg/l	1.22	1.22	1.22
13	Phosphate	mg/l	0	0	0
14	Phosphorus	mg/l	0	0	0
15	Dissolved oxygen	mg/l	5.2	4.5	4

Table 3: Monsoon season water quality analysis of Medchal Lake

S.No	Parameter	Units	Location 1	Location 2	Location 3
1	Surface Temperature	°C	25.1	26.4	26.5
2	Atmospheric temperature	°C	28.4	30.1	31
3	pH		8.35	8.53	8.45
4	Conductivity	µS/cm	0.57	0.64	0.6
5	Total dissolved solids	mg/l	288	323	300
6	Total hardness	mg/l	200	210	200
7	Total alkalinity	mg/l	190	120	180
8	Chloride	mg/l	100	100	100
9	Calcium	mg/l	90	95	90
10	Nitrite	mg/l	0	0	0
11	Nitrate	mg/l	0	0	0
12	Ammonia	mg/l	1.57	0.84	1.5
13	Phosphate	mg/l	0.2	0	0
14	Phosphorus	mg/l	0	0	0

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15	Dissolved oxygen	mg/l	4.4	6.8	5

Table 4: Mean value of the three seasons

s.no		Winter	Monsoon	Summer		
	Parametar	Mean	Mean	Mean	Desirable limit	Remarks
1	Temparatue(Surface)	22.7	26.6	30.3	25	Exceeds the limit
2	Temparature (Atmospheric)	21.0	25.0	36.0		
3	pH	8.1	8.5	8.5	6.5 – 8.5	Within the limit
4	Electronic Conductivity	0.5	0.6	0.7	0.7 mg/l	Less than the limit
5	Total dissolved solids	268.0	325.3	351.7	500 mg/l	Within the limit
6	Total Hardness	110.0	143.0	200.0	300 mg/l	Within the limit
7	Total alkalinity	146.0	171.0	225.0	600 mg/l	Within the limit
8	Chloride	55.0	73.3	189.9	250 mg/l	Within the limit
9	Calcium	88.3	61.7	85.0	75 mg/l	Exceeds the limit
10	Nitrites	0.0	2.2	0.0	10 mg/l	Within the limit
11	Nitrates	0.0	3.0	0.0	10 mg/l	Within the limit
12	Ammonia	0.3	1.4	1.2	5 mg/l	Within the limit
13	Phosphate	0.0	0.2	0.0	1 mg/l	Within the limit
14	Phosphorus	0.0	0.0	0.0	0.1 mg/l	Within the limit
15	Dissolved Oxygen	5.7	1.6	4.57	6.5 -8 mg/l	Less than the limit

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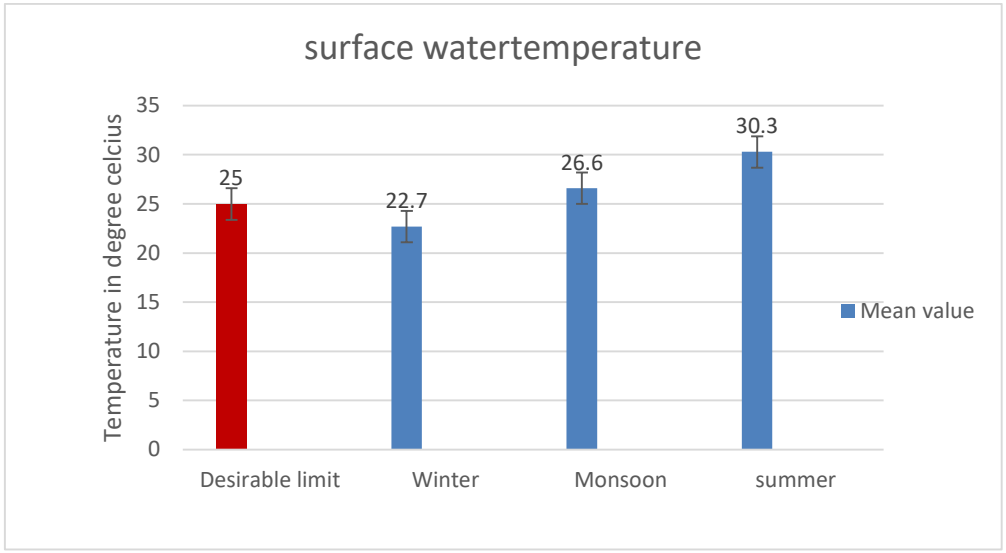

Figure 1: Surface water temperature in Medchal Lake

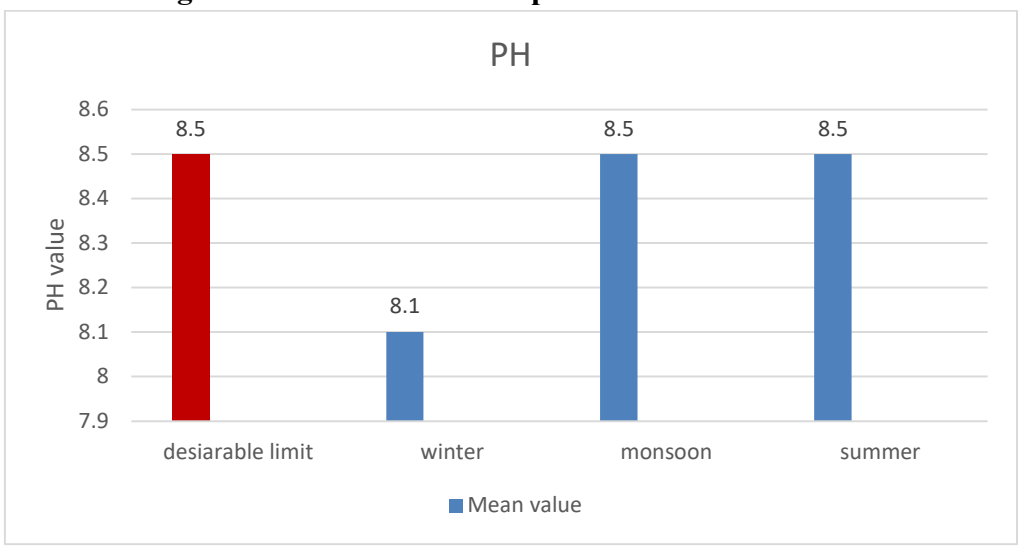

Figure 2: PH in Medchal Lake

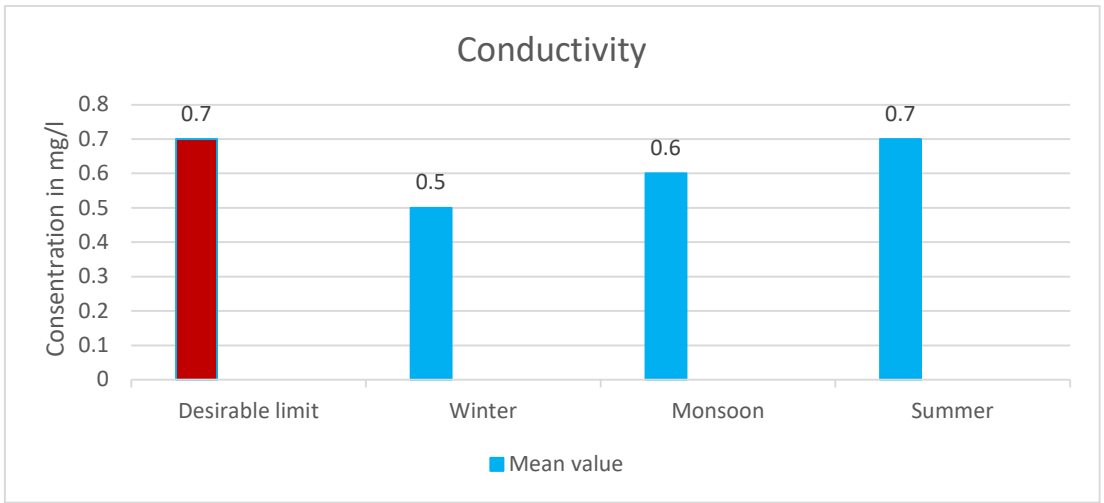

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Figure 3: Conductivity in Medchal Lake

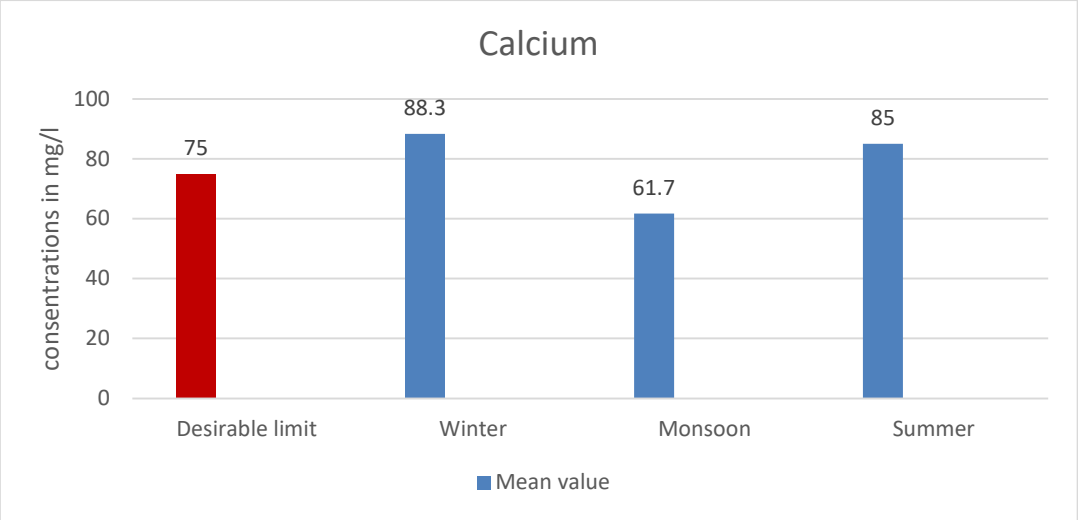

Figure 4: Calcium in Medchal Lake

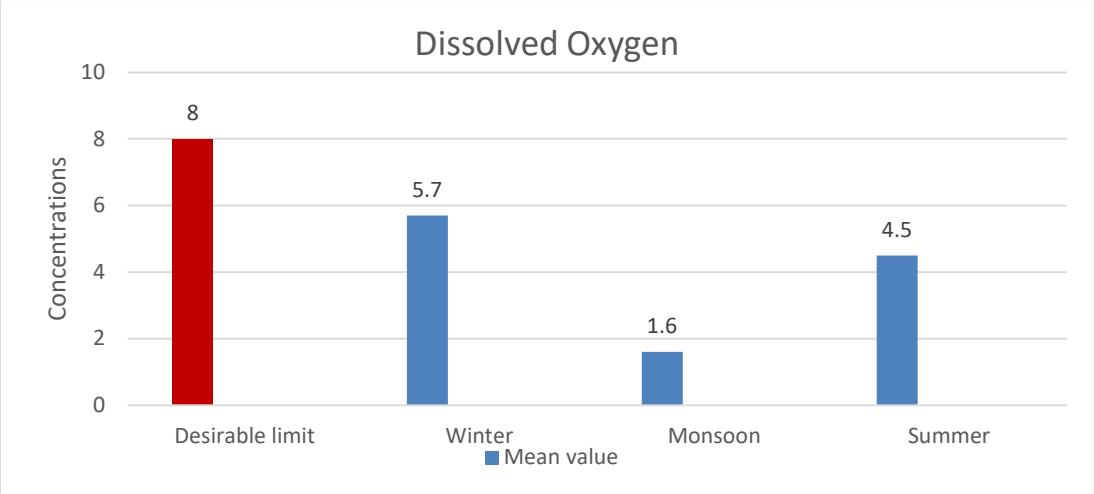

Figure 5: Dissolved Oxygen in Medchal Lake

a. The measurement of temperature is important for the survival of aquatic organisms. The study reveals that the surface temperatures were slightly higher than the desirable limits during monsoon and summer as shown in the table 4, figure1. Water temperature influences the aquatic weeds and algal blooms and also aquatic insects.(Zafer,1968)
b. The study reveals that pH is slightly lower during winter season as shown in table 4, figure 2. Alter in pH can effect growth of planktons in water.(chisty,2002)
c. The conductivity of water is low during winter and monsoon as show in table 4, figure 3. Conductivity values are important indicators of biological integrity, as changes in conductivity usually indicate that pollution from discharge or other sources is entering the water bodies. The survival of aquatic organisms like fishes, algae, and macrophytes is directly related to oxygen availability in water. (Mihir Pal et al., 2015)

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d. Calcium levels are higher than the desirable limit in all the three seasons as shown in table 4, figure 4. The sewage waste discharged in to the lake might be the reason for increased calcium (Uday kumar et al., 2006).
e. Dissolved oxygen levels are lower in medchal lake in all the three seasons as shown in table 4, figure 6. Dissolved oxygen is an important parameter in water quality analysis as it regulates metabolic processes of all aquatic biota. Lower DO indicates organic pollution in lake and due to this many life forms were at risk.(Bowmen et .al., 2008)
f. The remaining parameters are under the desirable limits of Indian Standard for Drinking Water – Specification, IS 10500:1991 as shown in the table 4.

V. CONCLUSION:

The Analysis of Physico-chemical parameters had indicated the wider human activity and influx of domestic waste into the lake caused to eutrification. The values of some physico-chemical parameters assessed are found to be slightly above the permissible limit prescribed by WHO for drinking water. The physico-chemical parameters show seasonal fluctuations. Above results show that Medchal lake water is facing lack of oxygen supply to maintain aerobic condition, which clearly indicates the eutrophic condition of lake water.

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