

Study of Physicochemical Activity of Jal Mahal Lake

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Abstract: *The Jal mahal or “Mansagar” lake, which situated to the north of Jaipur city is a very renowned ecologically important Wetland Site. Due to the Inflow of Waste Water pollution problems preside in the Lake with severe contamination. All this leads to the alteration of the various Physico Chemical Parameters of the water body as well as the accumulation of the heavy metals resulting in the various phenomenon like Eutrophication of the water body. The Physico - Chemical study conducted about Water pH, Alkalinity, Chloride (Salinity), Hardness, D. O.*

Keywords: Physico Chemical Parameters, pH, Alkalinity, Chloride (Salinity), Hardness, D. O

1. Introduction

Water is the main constituent of earth's streams, lakes and oceans and it is the fluids of most living organisms. It refers to the liquid state of that substance that prevails at standard ambient temperature and pressure; but it often refers also to its solid state (ice) or its gaseous state (steam or water vapour). It also occurs in nature as snow, glaciers, ice packs and icebergs, clouds, fog, dew, aquifers, and atmospheric humidity. Safe drinking water is essential to humans and other life forms even though it provides no calories or organic nutrients. Access to safe drinking water has improved over the last decades in almost every part of the world, but approximately one billion people still lack access to safe water and over 2.5 billion lack accesses to adequate sanitation regenerated and five nesting islands created to attract migratory. It has been reported that the Jal Mahal Lake water was most polluted due to high pH, hardness, alkalinity, free Carbon dioxide and Zinc content and a low level of dissolved oxygen Srivastava et al., (2003).

The lake, situated to the north of Jaipur city lies between Amer, the historic city and Jaipur, the provincial headquarters of Rajasthan state. In recent years, with the urbanisation of Jaipur city and areas surrounding the lake, the ecological system of the lake and its vicinity deteriorated drastically. It became heavily silted thereby reducing the surface area of the lake. The present investigation deals with analysis of physico - chemical parameter of lake Jal Mahal for four months to check out the water quality as well as pollution status of these water bodies.

2. Materials and Methods

In the Jal Mahal Lake the study area were explored to select the water sampling stations. These were marked by placing wooden poles. Minimum of two stations were marked in each water body for seasonal study and one for annual study. The study elaborated covering following aspect:

- Fifteen days analysis for four months of physiochemical parameters of water of lake Jal Mahal
- Primary production of lake Jal Mahal

This work was done during the month of November, 2020 to February, 2021 for seasonal study in above mentioned lake,

February 2021 respectively to seasonal water bodies for annual study. Sampling was initiated from November 2020 and completed in last February 2021. For the purpose of estimating the physicochemical properties of water, parameters such as pH, dissolved oxygen, alkalinity, chlorides, total hardness have been undertaken. Here we will discuss on pH, dissolved oxygen and Hardness. The physico - chemical estimations have been done after APHA (1989) and Pandey and Sharma (2003).



Figure1: Jal Mahal during the study period



Figure 2: Image showing samples collection in a bottle during the study period

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3. Result and Discussion

pH

pH is an important chemical factor influencing biological activities and trophic status of a water body. Although, tropical water acts as a strong buffer which is resulting into neutral or little alkaline pH of these water bodies. In the present study the value of pH ranged from a minimum of 8.4 during December, 2020 to a maximum of 10.5 in January 2021. This is in accordance with earlier work by Wetzel (1975) who reported that the value of pH ranges from 8 to 9 in Indian waters.

Total alkalinity

Present study Jal mahal Lake showed a minimum value of 248 ppm and maximum of 357 ppm total alkalinity in November 2020 and February 2021, respectively. Alkalinity is a measure of the capacity of water to absorb hydrogen ions. It can also be explained as a capacity to neutralize a strong acid and is characterized by the presence of hydroxyl ions which combine with hydrogen ions. It is the sum total of carbonate and bicarbonate alkalinity. Trivedy and Goel (1986) stated that alkalinity in itself is not harmful to human beings, however, waters with less than 100 mg/l alkalinity is desirable for domestic use.

Dissolved oxygen

It is an important limnological parameter indicating level of water quality and organic production in the lake (Wetzel, 1983). As it is a vital biochemical parameter, its deficiency in water body is known to cause mortality of fishes and other aquatic animals. Further, it affects the solubility and availability of many nutrients and therefore the productivity of aquatic ecosystem (Wetzel, 2001). In the present study the value of DO ranged from a minimum of 3.4 during January, 2021 to a maximum of 3.7 in November, 2020 and

February, 2021. This can be due to higher rate of decomposition of organic matter and limited flow of water, leading to consumption of O₂ from water (Jameel 1998).

Chloride

During present investigation the average value recorded was highest in 142.08 mg/l (Table 1). Studies on pollution of river it has been revealed that the chloride values ranged between 1218 to 4490 mg/l (Jacob et al., 1999). While assessing Salim Ali lake, Moradabad, Thorat and Sultana (2000) found chloride values to range from 32 to 42 mg/l. Ranu (2001) reported low to very high values of chloride content (23.03 to 2671.15 mg/l) in Bandi river system. In IJalmahl lake. Chisty (2002) noted the values of chloride to fluctuate between 66.82 to 563.33 ppm in several water bodies of Berach river system. Vijaylaxmi (2003) observed the chloride values between 4.14 to 31.49 and 6.22 to 23.21 ppm in two dry bundhs in Udaipur.

Hardness

Hardness of water is mainly due to cations of calcium and magnesium and anions like carbonate, bicarbonate and sulphates, as calcium and magnesium make bonds with carbonates and bicarbonates. Waters with hardness up to 75 mg/l are termed soft waters while the waters with hardness of more than 300 mg/l are considered hard. As mentioned in Table 1, highest average value of hardness 358 was noted in during February, 2021 while lowest in November and January 2020, 2021 respectively. Hardness below 300 mg/l is considered potable but beyond this limits cause gastro - intestinal irritation (ICMR 1975). Normal water hardness does not pose any direct health problems. It has been stated by Mohanta and Patra (2000) stated that addition of sewage, detergents and large scale human use might cause elevation of hardness of water.

Table 1: Monthly variation in various physico - chemical parameters of Lake Jal Mahal, Jaipur (Rajasthan)

Parameters	November		December		January		February		Recommending Agency
pH	8.4	9.2	9.1	8.5	10.5	9.4	9.2	8.5	ICMR
Alkalinity (mg/l)	248	259	264	269.2	280	304.2	337	357	ICMR
Chloride (mg/l)	117.31	122.23	126.22	129.13	132.44	136.26	138.72	142.08	ICMR
Dissolved oxygen (mg/l)	3.7	3.8	3.6	3.8	3.4	3.8	3.7	3.8	WHO
Hardness (mg/l)	380	398	382	328	300	322	310	358	ICMR

Table 2: Month wise variation in Gross Primary Production, Net Primary Production and Respiration during the study periods

S. No.	Months	GPP (mgc/m ² /hr)	NPP (mgc/m ² /hr)	Respiration (mgc/m ² /hr)
1	November (1 st day and after 15 th day)	402.32	275.33	288.25
		436.41	208.30	240.16
2	December (1 st day and after 15 th day)	462.12	261.28	272.24
		453.10	247.38	282.76
3	January (1 st day and after 15 th day)	498.32	245.63	284.89
		465.65	228.85	258.80
4	February (1 st day and after 15 th day)	392.32	269.55	278.77
		382.30	257.35	282.35

During the present investigation trophic status of lake is indicated by Gross primary production (GPP). The highest GPP as 498.32 was noticed during January, 2021 whereas minimum 382.30 was noted during February, 2021. However, reported Gross primary production was high in all the months which indicated by Eutrophication. Maximum and minimum values of Net Primary Production (NPP) was

analysed as same periods of time. Respiration was varied from 240.16 to 288.25.

Gross primary production and Net Primary Production showed the negative relation with nitrate and phosphate which indicated that higher concentration of these nutrients limits the primary production of the lake Jal Mahal.

However, GPP significantly (<0.001) correlated with NPP. The GPP and NPP were showed positive correlation with pH.

4. Conclusion

The above studied Physico Chemical Parameters of Water of "ManSagar Lake" (Jalmahal) clearly depicts the ongoing contamination and deteriorating. On the basis of values of different parameters, water of Lake Jal Mahal was highly polluted and dangerous to aquatic fauna and flora as well as for other animals. This would be also helpful to improve water quality conditions as nutrients would be channelized in to productive food chains leading to high fish production. This would be also helpful to improve water quality conditions as nutrients would be channelized in to productive food chains leading to high fish production.

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