Assessment of Physicochemical Parameters of Various Lakes of Jaipur, Rajasthan, India

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***Abstract*: The present study assesses the physico chemical parameters of three lakes of Jaipur. The results revealed that the various parameters like temperature, pH, alkanity, hardness and dissolved oxygen, were found to be on the higher side at Jalmahal Lake as compared to Amer and Galta Lake. The Jalmahal lake water was highly polluted and was found to be unsuitable for drinking and propagation of wildlife and fish culture. Amer lake water was also polluted but Galta Lake was less polluted as the parameters analyzed were within the permissible limits.**

***Keywords:* Water, pollution, alkanity, hardness, dissolved oxygen, chloride, and temperature**

INTRODUCTION

Water is one of the most important natural resource available to mankind. Knowing the importance of water for sustenance of life, the need for conservation of water bodies especially the fresh water bodies is being realized everywhere in the world. This need has added significance, especially in the water stressed region such as Rajasthan. Srivastava *et al.,* (2003) 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. Study of other physiochemical properties of the Jamwa Ramgarh Lake in Jaipur revealed that the water quality is not fit for drinking without treatment. Changes in water quality were due to use of land for agriculture after water recedes in the dried up area of the wetland, waste disposal and polluting practices around the lake (Moundiotiya *et al*., 2004). The present study, deals with assessing the quality of main water bodies of Jaipur, viz: Amber Lake, Jal Mahal Lake and Galta Lake.

MATERIALS AND METHODS

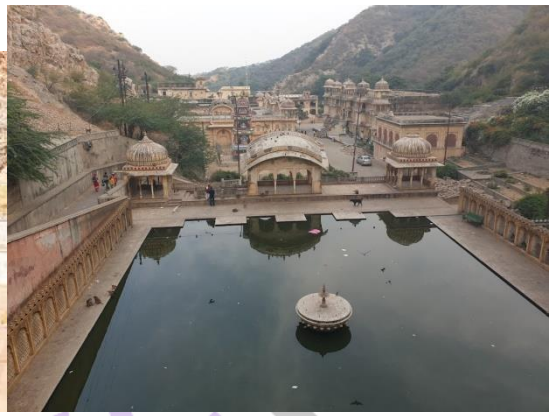
Area of study

In this study 3 main lakes of Jaipur were selected. These are:

1) Maota lake, Amber situated approx. 8 km towards north of Jaipur.
2) The Jal Mahal Lake situated 8 km north of Jaipur.
3) Galta lake situated approx. 10 km towards east of Jaipur.

Maota lake, Amber situated approx. 8 km towards north of Jaipur.


The Jal Mahal Lake situated 8 km north of Jaipur.

Galta lake situated approx. 10 km towards east of Jaipur.

Collection and Storage of Water Samples

Samples of water were collected from the three sites in Feb.2009. One liter PET (polyethylene terephthalate) bottles were used for collection of water samples from a depth of 30 cm during morning hours between 8:00- 10:00 am. The bottles were sealed with screw cap. For dissolved oxygen measurement a 30 ml capacity BOD bottle was used for the collection of water samples and the oxygen was fixed by adding $MnSO_4$ and alkaline potassium iodide at the sampling site before being carried to the laboratory. The analysis of the lake water was done as per the Standard methods for examination of water and wastewater (21^{st} edition) 2005 published by APHA and Chemical and Biological methods for water pollution Studies by Trivedi and Goel (1986). Temperature, pH, alkalinity, hardness, dissolved O_2, free CO_2, calcium and chloride were the main parameters analyzed.

RESULTS AND DISCUSSION

Temperature

In the present study the lake temperature at all the 3 sites was more or less same as compared to the normal atmospheric temperature. (Results are tabulated in Table 1).

pH

pH is one of the very factors that serve as an index for the pollution. The average pH of the 3 lake water ranged from 7.5 to 8.5. 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.

The alkaline nature of water due to high pH values can be attributed to high productivity of water as evidenced by high growth rate of algal population which utilized CO_2 through photosynthetic activity. The ideal pH range is 6.7 to 8.4 while pH below 5.0 and above 8.3 is detrimental. In the present studies the pH values were written in the ICMR Standards (7.0 to 8.5).

Table 1: Physico-chemical characteristics of the three sites thus studied

S.No.	PARAMETERS	JALMAHAL	AMER	GALTA	STANDARDS	RECOMMENDING AGENCY
1	ATMOSPHERIC TEMPERATURE	26^0C	26^0C	25^0C	23^0C	ICMR
2	pH	8.5	8.0	7.5	7-8.5	ICMR
3	ALKALINITY	460mg/l	340mg.l	100mg/l	120mg/l	ICMR
4	HARDNESS	120mg/l	106 mg/l	70mg/l	300mg/l	ICMR
5	DISSOLVED OXYGEN	4.2mg/l	5.2mg/l	6.5mg/l	5mg/l	WHO
6	CHLORIDE	63.9mg/l	71.0mg/l	21.3mg/ l	20mg/l	ICMR

Ghose and Sharma (1988) also recorded relatively high pH of water in winter months in their study of the Ganga River attributing high pH to increased primary productivity. The pH in the present study is in accordance with the findings of Singh and Ray (1995).

Total Alkalinity

The total alkalinity at the 3 sites fluctuated between 100-460 mg/l indicating that the water is hard. These results tallied with those of Maruthanyagam et al (2003). Das and Pandey (1978) opined that high alkalinity indicates pollution. Excessive alkalinity may cause eye irritation in humans and chlorosis- in plants. Alkalinity itself is not harmful to human beings; still water supply with less than 100 mg/l of alkalinity is desirable for domestic use. According to USPHA maximum permissible is 120 mg/l.

Total Hardness

The average total hardness value ranged from 70 mg/l to 120 mg/l. Kannan (1991) has classified water on the basis of hardness values in the following manner; 0-60 mg/l, soft 61-120 mg/l, moderately hard 121-160 mg/l, hard and greater than 180 mg/l very hard. The hardness at the 3 sites was within the permissible limits. 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.

Mohanta and Patra (2000) stated that addition of sewage, detergents and large scale human use might cause elevation of hardness of water.

Chloride

The average chloride values ranged from 21.3 mg/l to 63.9 mg/l. The increased concentration of chloride is considered as an indicator of eutrophication (Haynes 1963) and pollution due to sewage (Chourasia and Adoni 1985). The chloride in the 3 sites was within the acceptable limit of 20 mg/l. In natural surface water the concentration of chloride is normally low.

Dissolved Oxygen (DO)

The values of dissolved oxygen varied from 4.2 mg/l to 6.50 mg/l. These results tally with those of Rani et al., 2004, who reported lower values of DO in summer months. This can be due to higher rate of decomposition of organic matter and limited flow of water, leading to consumption of O_2 from water (Jameel 1998).

The presence of DO in water may be due to direct diffusion from air and photosynthetic activity of autotrophs. The addition of a variety of biodegradable pollutants from domestic and industrial sources stimulates the growth of microorganisms; which consume the DO of the water. DO is a good indicator of water quality and its relation to the distribution and abundance of various algal species along with the degree of pollution by organic matter and level of self-purification of water.

Conclusion

The Jalmahal lake water was most polluted and unfit for drinking and fishing and propagation of wild life. Amer lake was second most polluted water and Galta lake was least polluted as can be concluded from the above results. Lakes and Ponds are major source of Biota flourishing.

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