



## RESEARCH ARTICLE

### TOTAL HARDNESS, CALCIUM AND MAGNESIUM IN MIR ALAM LAKE, HYDERABAD, TELANGANA, INDIA

**\*Hemalatha, G. and Mary Esther Cynthia Johnson**

Limnology Laboratory, Department of Botany, Osmania University College for Women, Koti, Hyderabad 500195, Telangana, India

#### ARTICLE INFO

##### Article History:

Received 21<sup>st</sup> May, 2016  
Received in revised form  
10<sup>th</sup> June, 2016  
Accepted 15<sup>th</sup> July, 2016  
Published online 20<sup>th</sup> August, 2016

##### Key words:

Total Hardness, Calcium, Magnesium,  
Mir Alam Lake.

#### ABSTRACT

The present study focuses on physico-chemical nature of Mir Alam Lake. Water samples were collected from three sampling stations (S1, S2 & S3) and were analysed at monthly intervals for a period of one year from August 2011 – July 2012. These samples were analysed for Total Hardness, Calcium and Magnesium. The Total Hardness was 466.77mg/l, Calcium was 70.88mg/l and Magnesium was 70.45mg/l. Total Hardness of Mir Alam Lake water exceeded the permissible limits given by IS 2012 and was within permissible limits given by WHO 1985 while Calcium was within the permissible limits Magnesium exceeded the permissible limits of IS 2012 and WHO 1985. Necessary measures are to be taken to conserve the lake.

Copyright©2016, Hemalatha, G. and Mary Esther Cynthia Johnson. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

**Citation:** Hemalatha, G. and Mary Esther Cynthia Johnson, 2016. "Total hardness, calcium and magnesium in Mir Alam lake, Hyderabad, Telangana, India", *International Journal of Current Research*, 8, (08), 35736-35738.

## INTRODUCTION

Water is the essential component for survival of life on Earth. Lakes and their surroundings are unique assets, valuable ecosystems of nature and are of social, cultural and aesthetic value. The quality of surface water is largely affected by natural processes as well as anthropogenic processes. The anthropogenic discharge represents a constant polluting source whereas surface water runoff is a seasonal phenomenon largely affected by climatic conditions. Hence there is a need to conserve the lakes. Mir Alam Lake is a reservoir lake present adjacent to Nehru Zoological Park, Bahadurpura, Hyderabad, Telangana. It lies in the coordinates of 17° 21' N, 78° 26' E. It has an inflow and outflow of Musi River. Mir Alam Lake was constructed by Asaf Jah III in the year 1806 and it served as the source of drinking water for a period of 125 years. At present Mir Alam Lake water is used by surrounding areas and Nehru Zoological Park for domestic and other purposes like washing, scrubbing cleaning etc. Limnological studies were carried out by Cynthia (1980) on Banjara and Nadimi Lakes, Mohan (1980) worked on Osman Sagar and Mir Alam Lakes.

Mohan and Reddy (1986) studied Cyanophyceae of two fresh water Lakes. Sudha (1998) worked on two fresh water lakes of Hyderabad. Ruth and Johnson (2012) studied water quality in Nadimi Lake. Johnson and Ruth (2013) carried studies on Banjara Lake. Motlagh *et al.* (2013) have done ecological studies of Mir Alam Lake. Devi and Johnson (2015) worked on Ibrahimpatnam Lake for Total, Dissolved and Suspended Solids. Devi and Johnson (2015) studied the ionic composition of Ibrahimpatnam Lake. Harini and Johnson (2016) worked on Chlorides of Durgham cheruvu. Harini and Johnson (2016) worked on Total Hardness of Durgham Cheruvu. Khan *et al.* (2016) studied the water quality of Mir Alam Lake. The present investigation was carried out to study chemical parameters in Mir Alam Lake. The Total Hardness, Calcium and Magnesium were analysed at monthly intervals and also observed for Seasonal variations.

## MATERIALS AND METHODS

Surface water samples were collected from Mir Alam Lake at monthly intervals from August 2011 to July 2012. Water samples were collected in polythene cans and analyzed on the same day. Three sampling stations were selected for analysis of water. Station 1 (S1) was towards Nehru Zoological Park Arch Side, Station 2 (S2) was near Hasan Nagar and Station 3

**\*Corresponding author: Hemalatha, G.**

Limnology Laboratory, Department of Botany, Osmania University College for Women, Koti, Hyderabad 500195, Telangana, India.

(S3) was near Pahaadi Sharif Area. The water samples were analysed for Total Hardness, Calcium and Magnesium following procedures from Trivedy, Goel and Trisal (1987).

## RESULTS AND DISCUSSION

In the present study Total Hardness, Calcium and Magnesium of Mir Alam Lake was investigated. The results observed were as follows

**Table 1. Range, Average and Total Average of Total Hardness, Calcium and Magnesium in Mir Alam Lake (August 2011 – July 2012)**

S. No	Parameters	Station 1		Station 2		Station 3		Tot. Avg
		Range	Avg.	Range	Avg.	Range	Avg.	
1.	Total Hardness mg/l	446-504	480.33	418-498	461.50	400-480	458.50	466.77
2.	Calcium mg/l	56.11-106.6	78.68	54.5-89.77	70.00	68.47-81.76	63.98	70.88
3.	Magnesium mg/l	52.62-81.37	68.77	51.65-84.78	69.88	57-88.63	72.70	70.45

**Table 2. Seasonal Variations of Total Hardness, Calcium and Magnesium in Mir Alam Lake (August 2011 – July 2012)**

S. No.	Parameter	Monsoon				Winter				Summer			
		S1	S2	S3	AVG	S1	S2	S3	AVG	S1	S2	S3	AVG
1	Total Hardness mg/l	489	444	471.5	468.16	481.5	477.5	460.5	473.16	470.5	463	443.5	459
2	Calcium mg/l	73.94	66.93	61.71	67.52	77.34	72.14	72.94	74.14	84.76	70.93	57.3	70.99
3	Magnesium mg/l	74.18	75.64	77.34	75.72	69.03	68.94	67.85	68.6	63.09	65.04	73.17	67.1

**Table 3. Comparison of Mir Alam Water Parameters with IS 2012 & WHO 1985**

S. No	Parameter	Tot. Avg	IS 2012	WHO 1985
1	Total Hardness mg/l	467.77	200	500
2	Calcium mg/l	70.88	75	100
3	Magnesium mg/l	70.45	30	150

### Total Hardness

Total Hardness is caused by divalent cations such as Calcium, Magnesium and Alkaline Earth Metals. The Total Hardness is imparted by Calcium and Magnesium both expressed as Calcium Carbonates in mg/l. Carbonates and Bicarbonates of Calcium and Magnesium imparts temporary hardness to water whereas permanent hardness is imparted by Sulphates & Chlorides. Total Hardness of water at S1 ranged from 446 – 504 mg/l and averaged to 480.33 mg/l at S2 ranged from 418 – 498 mg/l and averaged to 461.50 mg/l and at S3 ranged from 400 – 480 mg/l and averaged to 458.50 mg/l (Table No. 1). Seasonal variations were observed (Table No.2) and the Total Hardness showed an Average of 468.16mg/l, 473.16mg/l and 459mg/l in Monsoon, Winter and Summer respectively. Among the three seasons Total Hardness was more in Winter. The highest values of Total Hardness were observed at S1 in Monsoon of 489mg/l, in Winter of 481.5mg/l and 470.5mg/l during Summer. The Total Average of Total Hardness in Mir Alam Lake was 466.77 mg/l which is higher than the permissible limits of IS 2012 and within permissible limits as per WHO 1985 (TableNo3). Glohmann 1986 categorised water as VERY HARD if the concentration of Total Hardness was above 180mg/l. Hence the Mir Alam Lake water is VERY HARD.

### Calcium

The presence of Calcium in water results from passage through or over deposits of Limestone, Dolomite, Gypsum and

Calcium bearing rocks. Calcium concentration ranged from 56.11 – 106.6 mg/l, 54.5 – 89.77mg/l and 68.47 – 81.76 mg/l at S1, S2 & S3 respectively with an average value of 78.68 mg/l at S1, 70mg/l at S2 and 63.98mg/l at S3 (Table No.1). Seasonal variations (Table No. 2) showed an average of 67.52mg/l, 74.14mg/l and 70.99mg/l in Monsoon, Winter and Summer respectively. The Calcium concentration was highest during Winter. Even the Calcium values were more at S1 in Monsoon, Winter and Summer.

The Total Average of Calcium in Mir Alam Lake was 70.88 mg/l which is within the permissible limits of IS 2012 and WHO 1985 (Table No.3).

### Magnesium

Magnesium concentration (Table No. 1) ranged from 52.62 – 81.37mg/l at S1, ranged from 51.65 – 84.78 mg/l at S2 and 57– 88.63 mg/l at S3. The average values were 68.77mg/l, 69.88mg/l and 72.70mg/l at S1, S2, &S3 respectively. Seasonal variation of Magnesium was observed in Mir Alam Lake. It showed an average of 75.72 mg/l in Monsoon, 68.60 mg/l in Winter and 67.1 mg/l in Summer (Table No. 2). The Magnesium concentration average value was high in Monsoon season. The highest value was observed at S3 in Monsoon, at S1 in Winter and at S3 in Summer. The Total Average of Magnesium in Mir Alam Lake was 70.45mg/l which exceeded the permissible limits of IS 2012 and is within the permissible limits of WHO 1985 standards (Table No. 3).

### Conclusion

The present study depicted that the Total Hardness in Mir Alam Lake was 466.77 mg/l which indicated Very Hard nature of water. It exceeded the permissible limits given by IS 2012 but was within the permissible limits of WHO 1985. Calcium concentration was 70.88 mg/l which was below the permissible limits of IS 2012 and WHO 1985. Magnesium in Mir Alam Lake was 70.45 mg/l which was higher than IS 2012 and within the permissible limits of WHO 1985. According to

Glohmman 1976, the Mir Alam Lake waters are Very Hard. Steps have to be taken to prevent Total Hardness in Mir Alam from becoming still more Harder.

### Acknowledgement

The first author is thankful to her guide Prof. Mary Esther Cynthia Johnson, Limnology Laboratory, Department of Botany, Osmania University College for Women, Koti, Hyderabad for constant encouragement and for her optimistic guidance. The authors acknowledge the facilities provided by The Head, Department of Botany, Osmania University College for Women, Koti, Hyderabad.

### REFERENCES

- BIS 2012 Bureau of Indian Standard 2012 Indian standard Drinking Water Specifications IS 10500, New Delhi.
- Cynthia M.E.C 1980. Ecological investigations on phytoplankton of two small lakes situated in Hyderabad development area, Ph.D. Thesis, Osmania University, Hyderabad.
- Devi R. and Johnson M.E.C. 2015. Total Dissolved and Suspended Solids of Ibrahimpatnam Lake, R. R. District.
- Devi R. and Johnson M.E.C. 2016. Ionic Composition of Ibrahimpatnam Lake, R. R. District.
- Glohmman, A Harte dae Wassers. In: Amavis R., *et al.*, ed 1976. Hardness of Drinking Water and Public Health proceedings of the European Scientific Colloquium, Luxembourg, Oxford, Pergamon Press, PP129.
- Harini T. and Johnson M.E.C. 2016. Chlorides in Durgham Cheruvu, Hyderabad. *International Journal of Current Research* Vol. 8, Issue 03, PP 28215 – 28217.
- Harini T. and Johnson M.E.C. 2016. Chlorides in Durgham Cheruvu, Hyderabad. *International Journal of Advance Research in Science and Engineering*, Vol. 5, Issue 07.
- Johnson M.E.C. and Ruth O. K . 2013. Is Lake Banjara on the Verge of Death, *Asian Journal of Science and Technology*, Vol. 4, Issue 8, PP 026 – 030.
- Khan Mohd. A. U, Rao DVSN, Khan Mohd. M, Ranjeet P. 2016. Water Quality Standards and its effects on Mir Alam Tank and Surrounding Environment, *International Journal of Research in Engineering and Technology*, Vol. 5, Issue 03.
- Mohan K. S. 1980. Limnology of Osman Sagar and Mir Alam Lake, Hyderabad, Ph. D. Thesis, Osmania University, Hyderabad.
- Mohan K. S. and Reddy N. S. 1986. Cyanophyceal of Two Fresh Water Lakes of Hyderabad. *Proc. Indian natn. Sci. Acad.* B52.5, PP 649 – 656.
- Motlagh A. H., Navatha K., Reddy P. M. 2013. Ecological Studies of Mir Alam Lake with reference to Water Quality, *Nature Environment and Pollution Technology*, Vol. 12, No.2, PP 355 – 358.
- Ruth O. K and Mary Esther Cynthia Johnson 2012. Water Quality of Nadimi Lake, Hyderabad. *J. Aqua. Biol.*, Vol. 27, 48 – 50.
- Sudha J. G. 1998 Impact of man on the ecology of two fresh water lakes of Hyderabad, Ph.D, Thesis, Osmania University, Hyderabad.
- Trivedy R. K, Goel P. K and Trishal C. L. 1987. Practical Methods in Ecology and Environmental Science Environmental Publications, Karad, India.

\*\*\*\*\*