



RESEARCH ARTICLE

ANALYTICAL CHEMISTRY

**STUDIES ON ACCUMULATION OF MICRONUTRIENTS THROUGH RUNOFF IN A POTABLE WATER RESOURCE, BHOPAL (M.P.)****Ganesh Ram Namdev\*, Avinash Bajpai<sup>1</sup> AND Suman Malik<sup>2</sup>**Dept.of chemistry Sadhu Vaswani college Bhopal, <sup>1</sup>Makhanlal University Bhopal,India<sup>2</sup>Head of Dept.of chemistry Sadhu Vaswani college Bhopal,India.**Ganesh Ram Namdev**

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**ABSTRACT**

Micronutrients play major role in determining the biological processes of a Lake ecosystem. The availability of micronutrients especially Zn , Cu, Mo and Mn in a water body is largely governed by the characteristics of its catchment Apart from the soil characteristics of the catchment area, the availability of nutrients also depend on the agricultural practices. The Upper Lake of Bhopal , which is known as the life line of the city has a mixed catchment consist both rural as well as urban. The lake receives a large volume of water during monsoon months through number of inlet channels which ultimately increases the nutrients availability in the lake. The present study was, therefore, conducted to assess the impact of the micronutrients on water quality of the lake. The study shows that the area adjoining to Gurabishan khedi have higher concentration of micronutrients than other place.

## KEY WORDS

Heavy metal, Chemical fertilizer , Organic fertilizer, Atomic Absorption Spectrophotometer .

## INTRODUCTION

Upper Lake is a man made reservoir constructed in 11<sup>th</sup> century by King Raja Bhoj by constructing an earthen dam across the River Kolans. The catchment area of upper lake is extended up to 361 sq km while water spread area is restricted to 31Km<sup>2</sup>.The major portion of the upper lake catchment area is surrounded by 54 villages and mainly occupied by agricultural land. Under the present study, the surface water drainage flowing through the target villages has been studied and compared with the chemical fertilizer dominant agriculture area. The southwest and northwest part of the lake are the major catchment areas which inflow the water during monsoon season. This area is mainly covered under the agricultural activities. There is an increase in micronutrients in the lake since few years due to over use of chemical fertilizers and pesticides in agriculture. Trace amount of metals are common in water and these are normally not harmful to our health, infact some metals are essential to sustain life. Calcium, Magnesium, Potassium and Sodium must be present for normal body functions. For this purpose two sampling stations were identified one at Gourabishenkhedhi village where Chemical Fertilizers are being used and the other at Barkheda nathu village where Organic Fertilizers are being used .

## MATERIALS AND METHODS

### Description of the study area

This study was conducted along Upper Lake . The catchment area of upper lake is extended up to 361 sq km while water spread area is restricted to 31 sq km. The southwest and northwest part of the lake are the major catchment area which inflow the water during monsoon season. This area is mainly covered under the agricultural activities .

### Sampling

A total of 32 water samples were collected from Two (2) sampling points in between Pre monsoon and Post monsoon months during the year 2010 at surface and bottom samples. Two sampling stations were identified one at Goura bishenkhedhi village (S1) where Chemical Fertilizers are being used and the other at Barkheda nathu village (S2) where Organic Fertilizers are being used.

### Collection of water samples

Water samples were collected using 500 ml plastic bottles. The sampling bottles for heavy metal determination were pre-soaked overnight with 10% HCl and rinsed with distilled water and rinsed using Lake water before sample collection. Preservation of water samples was done by adding 2 drops of concentrated HNO<sub>3</sub> to each water sample before storage below 4°C, until analyzed.

### Analytical methods

Analysis of heavy metals in water samples was done using Perking Elmer Analyst 100 Atomic Absorption Spectrophotometer equipped with Perking Elmer HGA 850 Graphite Furnace and Perking Elmer AS 800 Auto sampler with a computer interface for operation and readings display, Varian Spectra AAS with SpectrAA55.

## RESULTS

Water quality standards and guidelines corresponding to the Indian Standards (IS), Indian Council for Medical Research (ICMR), United States Environmental Protection Agency (USEPA), Food and Agricultural Organization (FAO), World Health Organization (WHO), Central Pollution Control Board (CPCB) have been compared with results.

The concentration of Copper showed the highest values from near Gorabisan Kkedi village (S1) during Post monsoon months at surface



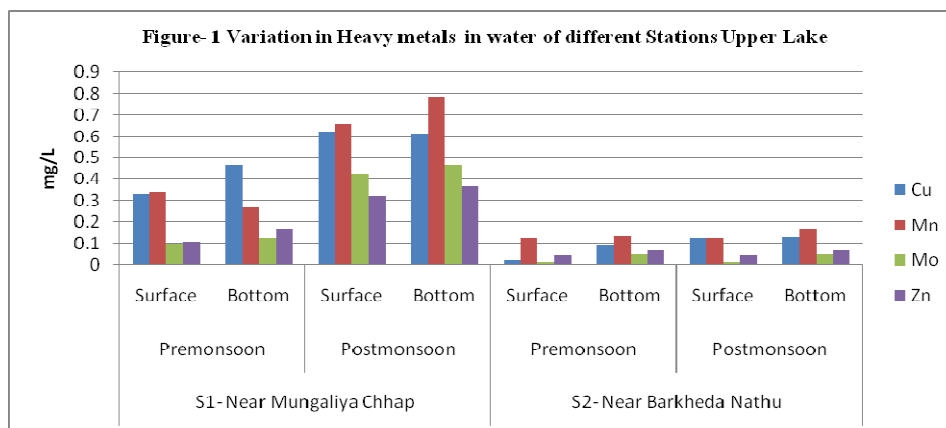
water and the lowest from near Barkheda Nathu village (S2) during pre monsoon months at surface water which were 0.624 mg/L and 0.021 mg/L respectively (Table- 1). All areas exceeded the standard limit (0.05 mg/L) except one sample near Barkheda Nathu village (S2) during pre monsoon months at surface water .

The highest concentration of Manganese was reported from near Gorabisan Kkedi village (S1) during Post monsoon months at bottom water and the lowest from near Barkheda Nathu village (S2) during pre monsoon months at surface water which were 0.785 mg/L and 0.127 mg/L respectively (Table- 1). All areas exceeded the standard limit (0.1 mg/L) .

The concentration of Molybdenum exceeded the standard limit (0.01 mg/L) from near Gorabisan Kkedi village (S1) during Post monsoon months at bottom water and the lowest from near Barkheda Nathu village (S2) during pre monsoon months at surface water which were 0.469 mg/L and 0.12 mg/L respectively (Table- 1). The concentration of Zinc in all areas within the standard limit (2.00 mg/L, Figure- 1) . The highest values were recorded from near Gorabisan Kkedi village (S1) during Post monsoon months at bottom water and the lowest from near Barkheda Nathu village (S2) during pre monsoon months at surface water which were 0.365 mg/L and 0.044 mg/L respectively (Table- 1) .

**Table-1**  
**Concentration of the Heavy Metals in surface and bottom water samples**  
**From Upper Lake Bhopal**

Sampling stations of Upper Lake	Season	water type	Concentration of the heavy metals in mg/L			
			Cu	Mn	Mo	Zn
S1- Near Mungaliya Chhap	Pre monsoon	Surface	0.331	0.341	0.101	0.111
		Bottom	0.469	0.269	0.127	0.164
	Post monsoon	Surface	0.624	0.658	0.429	0.323
		Bottom	0.611	0.785	0.469	0.365
S2- Near Barkheda Nathu	Pre monsoon	Surface	0.021	0.127	0.012	0.044
		Bottom	0.096	0.136	0.046	0.068
	Post monsoon	Surface	0.126	0.128	0.015	0.045
		Bottom	0.131	0.169	0.048	0.071





## CONCLUSION

The micronutrients such as Copper, Manganese, Molybdenum and Zinc are needed as catalysts for enzyme activities at low levels, but higher level of these micronutrients may be hazardous. Much precaution has to be taken especially on the use of water from Upper lake as it may pose risks to the users. Upper Lake is mainly used as a major source of water for drinking and irrigation. Variations in heavy metal concentrations in water is a consequence of a wide range of use of Chemical Fertilizers in catchment area activities near the Lake. The results showed that higher concentration of micronutrients were observed in sampling station (S<sub>1</sub> – Near Gorabisan khedi village) where chemical fertilizers are being used

while lower concentration in sampling station (S<sub>2</sub>- Near Barkheda nathu) where organic fertilizers are being used. The concentration of Zinc is within the standard limit in all areas (2.00 mg/L, Figure- 1). Thus, the present study recommends the use of organic fertilizer in place of chemical fertilizer which would not only improve the soil fertility but also help in reducing the micronutrients of lake water because of chemical fertilizers.

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