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Heavy Metals Contamination in Water Through Runoff of Hathaikheda Reservoir, Bhopal, (MP)

Ganesh Ram Namdev*, Avinash Bajpai**, Suman Malik* and A.K. Saxena**

**Department of Chemistry, Sadhu Vaswani College, Bhopal, (MP)*
***Makhanlal University, Bhopal, (MP)*
****RKDF College of Engineering, Bhopal, (MP)*

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ABSTRACT : The micronutrients were increases in the Hathaikheda reservoir last few years due to over uses of chemical fertilizers and pesticides in agriculture in surrounded catchment area of the reservoir. 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 reservoir receives a large volume of water during monsoon months through number of inlet channels which ultimately increases the micronutrients availability in the reservoir. The present study was therefore conducted to assess the impact of the micronutrients on water quality of the reservoir. The study shows that the area joining to near Anand Nagar have higher concentration of micronutrients than the reference sample station.

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

I. INTRODUCTION

Hathaikheda Reservoir like many others in the state was constructed for irrigation purpose but now it is also an important source of water supply to the industrial area of Govindpura and also being used for fish culture. Trace amount of metals are common in water and these are normally not harmful to our health, infect 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 is near Anand nagar where Chemical Fertilizers are being used and the other one is at Reference Sample station *i.e.* Centre of the Reservoir.

II. MATERIALS AND METHODS

Description of the study area

The dam was constructed in the year 1964 by damming a low-lying area. It has maximum length of 4225 meters. and maximum breadth of 2012 meters. The water spread area of the dam is 179.9 ha. at L.T.L. and 11368.76 ha. at F.T.L. The catchment area of the reservoir is 36.90 Km^2. The shallow part of the reservoir gets exposed during summer session and exposed land is used for agriculture purpose where in the farmers also use huge amount of chemical fertilizers and pesticides.

Sampling

A total of 32 water samples were collected from Two (2) sampling points in between Pre monsoon and Post monsoon months , 2010 at surface and bottom samples. Two sampling stations were identified one at near Anand Nagar (S1) where Chemical Fertilizers are being used and the other one is at Reference Sample station *i.e.* Centre of the Reservoir.

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 HNO3 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.

III. RESULTS

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

The concentration of Copper showed the highest values from near Anand nagar (S1) during Post monsoon months at bottom water and the lowest from Reference Sample station *i.e.* Centre of the Reservoir (S2) during pre monsoon months at surface water which were 0.419 mg/L and 0.014

mg/L respectively (Table 1). All areas exceeded the standard limit (0.05 mg/L) except one sample Reference Sample station *i.e.* Centre of the Reservoir (S2) during pre monsoon months at surface and bottom water .

The highest Manganese concentrations were reported from near Anand nagar (S1) during Post monsoon months at bottom water and the lowest from Reference Sample station *i.e.* Centre of the Reservoir (S2) during pre monsoon months at surface water which were 0.897 mg/L and 0.216 mg/L respectively (Table- 1). All areas exceeded the standard limit (0.1 mg/L) .

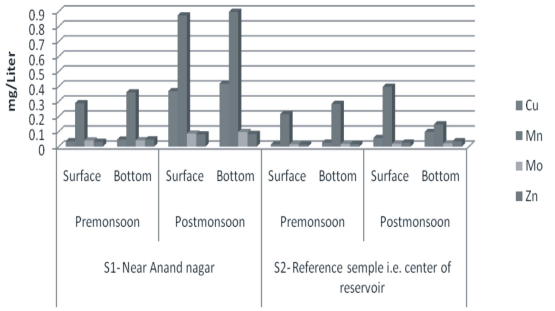
The concentration of Molybdenum exceeded the standard limit (0.01 mg/L) from near Anand nagar (S1) during Post monsoon months at bottom water and the lowest from Reference Sample station *i.e.* Centre of the Reservoir (S2) during pre monsoon months at surface water which were 0.097 mg/L and 0.016 mg/L respectively.

The concentration of Zinc in all areas within the standard limit (2.00 mg/L, Fig. 1). The highest values were recorded from near Anand nagar (S1) during Post monsoon months at bottom water and the lowest from Reference Sample station *i.e.* Centre of the Reservoir (S2) during pre monsoon months at surface water which were 0.084 mg/L and 0.014 mg/L respectively (Table 1).

Table 1: Concentration of the Heavy Metals in surface and bottom water samples from Hathaikheda Reservoir Bhopal.

Sampling station of Hathaikheda reservoir	***Season***	***Water type***	***Concentration of the heavy metals in mg/L***			
			Cu	Mn	Mo	Zn
S1-Near Anand nagar	Pre monsoon	Surface	0.036	0.289	0.041	0.031
		Bottom	0.046	0.361	0.042	0.047
	Post monsoon	Surface	0.369	0.874	0.087	0.081
		Bottom	0.419	0.897	0.097	0.084
S2-Reference sample *i.e.* center of reservoir	Pre monsoon	Surface	0.014	0.216	0.016	0.014
		Bottom	0.026	0.284	0.018	0.017
	Post monsoon	Surface	0.057	0.398	0.019	0.026
		Bottom	0.097	0.148	0.021	0.036

Figure-1 Variation in Heavy metals in water of different Stations Hathaikheda Reservoir



IV. CONCLUSION

It is very important to identify the relationship between the presence of micronutrients in drinking and irrigation water. Micronutrients such as Cupper, Manganese, Molybdenum and Zinc are needed at low levels as catalysts for enzyme activities, but higher level of these micronutrients may be hazardous due to direct and indirect reach in the human body. 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 (S1- Near Anand nagar) where chemical fertilizers are being used while other at lower concentration in sampling station (S2- Reference Sample station i.e. Centre of the Reservoir) . The concentration of Zinc in all areas within the standard limit (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 reservoir water because of chemical fertilizers.

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