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Determination of Heavy Metals [Cu, Zn] Pollution in Lake Water During Festival Seasons Using Analytical Techniques

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Abstract

Monitoring and assessment of water has become an environmental issue and is of great concern due to its contamination by mankind. Water is basic to life and health of all living beings. Most of the fresh water bodies all over the world are getting polluted thus decreasing the availability of fresh water. The area of the study, selected to estimate the levels of water pollution is the Waral Devi lake of Bhiwandi city, District Thane, (Mumbai-Agra Highway), Maharashtra, India. This lake receives domestic raw sewage from surrounding habitation and activities like washing of cattle, bathing, religious activities like idol immersion etc. which results in high concentration of harmful chemicals entering the lake. Concentration of heavy metal like Copper and Zinc were studied during Ganesh festival using standard methods.

Water samples were collected from Waral Devi Lake, Bhiwandi city. Certain physical, chemical parameters were measured. The amount of Copper, Zinc in the water samples was estimated before, during and after idol immersion by spectroscopic method. It was found that the concentration of the heavy metals in the lake water substantially increased after the religious activities like idol immersion. This heavy metal has a marked effect on the aquatic flora and fauna which through bio magnification enter the food chain and ultimately affect the human beings as well.

Keywords: - water, pollution, heavy metal, festival, Spectrophotometry

1 .Introduction

To study the extent of Zinc and Copper metal pollution in surface water, we have selected the Waral Devi Lake, Dhamankarnaka Bhiwandi. Aim of the present research work is to analyze the lake water to determine the Zn and Cu contents. Immersion of idols is an anthropogenic activity which is responsible for adding pollution load in the lake. The idols are made up of clay, hay, cloth, paper, wood, bamboo, thermocol, adhesive material, paints, colored pigments etc(1,2).

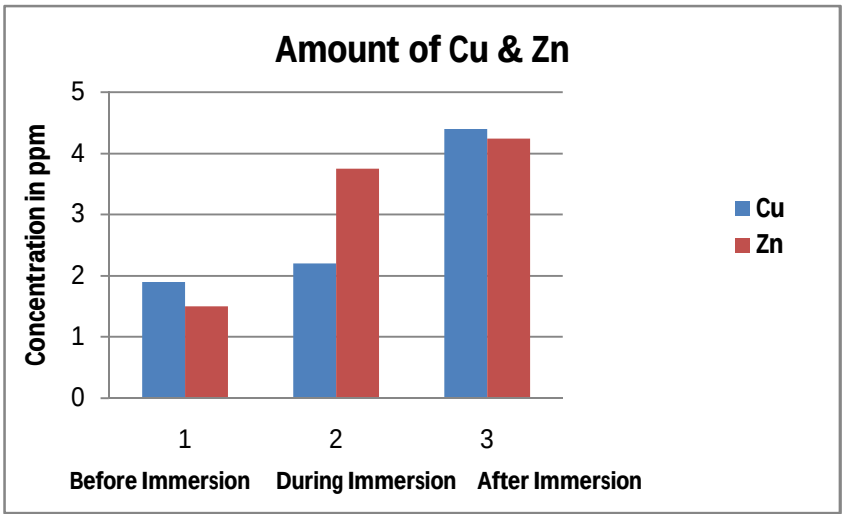
2 .Materials & Methods

Water of Waral Devi Lake is used for drinking purposes and the local inhabitants use it for fishing and other recreational activities. The study period of festival was divided into three parts based on Idol Immersion before, during and after Immersion, from August2013 to September2013 (1,2,9). The water samples were collected (9).Certain physical and chemical parameters were determined .pH is determined using pH meter(Model EQ-614),For heavy metal analysis, spectrophotometric method was used (ELICO UV Visible Spectrophotometer SL 159)(9,10)

3 .Observations

3.1 Determination of Cu and Zn

Sr.No	Concentration in ppm	OD (Cu)	OD (Zn)
01	Blank	0.00	0.00
02	10.0	0.779	1.158
03	15.0	1.504	1.250
04	20.0	1.833	1.297
05	Sample before Immersion	0.010 (1.90 ppm)	0.005 (1.500 ppm)
06	Sample during Immersion	0.020 (2.20 ppm)	0.067 (3.750 ppm)
07	Sample after Immersion	0.120 (4.40 ppm)	0.082 (4.250 ppm)



According to National drinking water regulation (Drinking Water Standards), the permissible limit for Copper in drinking water is 1.0 mg/L. According to WHO (World Health Organisation), the permissible limit for Copper in drinking water is 2.0mg/lit. The MCLG (maximum contaminant level Goal) for Copper is 1.3ppm. Many species of freshwater plants and animals die within 96 hours at waterborne concentrations of 5.0 to 9.8 ppb (4,5).Sublethal effects to fish and the aquatic food chain can occur at less than 9 ppb Cu (3,5). The concentration of Cu is greater than the permissible limit set by Drinking Water Standards but before immersion it is less, during and after immersion it is more than the WHO standard value.

According to National drinking water regulation (Drinking Water Standards), the permissible limit for Zinc in drinking water is 5.0 mg/L. According to WHO (World Health Organization), the permissible limit for Zinc in drinking water is 3.0mg/lit and according to national irrigation water quality programme guidline,the toxic threshold level in fish is (20.0 mg/Kg dw) and in plant less than (300.0mg/Kg dw)(8).

The MCLG (maximum contaminant level Goal) for Zinc is 5.0 ppm. Significant adverse effect were observed in the most sensitive fish species at waterborne Zinc concentration of 10.0ppm (8)

Before immersion the concentration of Zn in lake water is found out to be in normal range ,but during and after immersion it exceeds the value set by WHO or nearly become equal to the Drinking Water Standard value which is toxic (7)

4. Result and Discussion

Table 4.1 .Parameters of water samples collected.

Sr. No.	Physical and chemical parameters of water	Before idol immersion	During Idol Immersions	After Idol Immersions
1	Colour	Light Yellow	Very Light Yellow	Very Light Yellowish green
2	pH	8.18	7.67	7.09
3	Cu	1.90ppm	2.20ppm	4.400ppm
4	Zn	1.500ppm	3.750ppm	4.250ppm

5. Conclusion

The heavy metal load in the reservoir indicates the heavy metal toxicity which varies at different festival conditions. Most of the heavy metals, if present beyond permissible limits in water are toxic to human beings, aquatic flora and fauna. Cu is present in relatively higher concentrations as compared to their permissible limits(set by National drinking water regulation (Drinking Water Standards and EPA).But

before immersion the amount of Cu is nearly equal to the permissible limit set by WHO but during and after immersion it exceed the standard value. Before immersion amount of Zn is less than the permissible limit but during and after immersion it become nearly equal to the permissible limit set by National drinking water regulation (Drinking Water Standards).Before immersion amount of Zn is less than the permissible limit but during and after immersion it exceeds the permissible limit set by WHO(4,5,8)

As the Waral Devi lake is also used for fishing purposes, it is quite evident that these heavy metals may enter the food chain, and thus through bio magnifications enter the human body as well. Periodical monitoring of the water quality is thus required to assess the condition of water body and immediate steps should be taken to check the anthropogenic activity around the lake. (1, 6)

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