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Assesment of heavy metal pollution in Upper and Lower lakes of Bhopal (India)

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ABSTRACT

In order to assess the water quality of Upper Lake and Lower Lake of Bhopal. With reference to toxic metal contamination, water samples were collected and studied by Atomic Absorption Spectrophotometry from above ten sampling stations. The results were compared with the tolerance limits as laid down by ISI and USPH. It was concluded that the metals (Mn, Zn, Pb, Cr, Cu) are present in water. The cause of this contamination is supposed to be the Immersion of *Taziyas* and Idols, which are painted with cheap quality dyes. Water in the present form is unpotable.

Key words: Upper Lake, Lower Lake, AAS, Metals, Taziyas and Idols.

INTRODUCTION

Toxic and heavy metals are added in aquatic system from Industrial process, rise in population, domestic sewage discharge, street dust, land run off, fossil fuel burning. Traces of heavy metals such as Mn, Cr, Cu, Pb, Zn, Cd, Ni have been identified as deletrious to aquatic ecosystem and human health.

Heavy metals have a great affinity to attack Sulphur bonds; protin, carboxylic acid and amino group there by distrupting the cell metabolism.

Heavy Metals ions precipitate the mucous secretion of the gills in fish. These precipitates occupy the interlameller spaces arresting the movement of gill filament and block their respiratory tract.

The present study has been carried out to evaluate the heavy metals in Upper Lake and Lower Lake of Bhopal.

EXPERIMENTAL

Sixteen water samples were collected from the different station of Upper and Lower Lake of Bhopal. The sample was collected during session of 2008. Sample was collected in sterilized bottles using standard method.

AAS method has been used for the determination of Heavy metals.

Observations

The results of heavy metals of Upper and Lower lakes are summarized in the following tables.

RESULTS AND DISCUSSION

The effect of this metal on the nature of water can be visualized as follows.

Mangnese

Are enters the water bodies through domestic wastes, industrial effluent and dry cell batteries. It is lethal to man in higher concentration. Its chronic exposure leads to neurological disorder. In the present study value of maganese is (0.014 to 0.092) **and** (0.018 to 0.098) ppm, (0.011 to 0.094) and (0.27 to 0.097) ppm, (0.004 to 0.093) and (0.017 to 0.096) respectively in Upper and Lower Lake in summer, rainy, winter season.

Which is found in permissible limit (0.10 to 0.50) ppm?

Chromium

Are added in water through various industrial process such as electroplating, metal pickling, leather tanning and from paints, dyes, explosive, paper and ceramics. Chromates are used for corrosion control in cooling water. Chromium exists in hexavalent and trivalent forms, the later being rare in occurance Chromium components are carcinogenic in nature. It is a toxic contaminate which gets accumulated in edible parts of plants and there by enter the human food chain. Accumulatin of Chromium in plants makes the plants material unsuitable for human consumption and animal fodder. Chromate poisning causer skin disorder and liver damage. Present data indicates Cr is nil at all station of upper and lower lake in summer and found (0.001 to 0.038) ppm and (0.013 to 0.043)ppm, (0.004 to 0.048)ppm in upper and lower lake at rainy and winter season respectively.Which is lower to tolerance limits of drinking water (5.0ppm).

Copper

Rarely occurs in natural water, determination of Copper in industrial water is necessary to moniter corrosion of Copper, Copper alloy fitting and tubes. Ammonia (10 mg/l) along with D.O. causes significant Cu dissolution. It is also aqutely harmful to fish and its adverse effects depend on the hardness of water.

In the present study Copper is nil in Upper Lake and (0.011 to 0.048)in Lower Lake at summer season. In rainy season it is nil in both station. In winter season Copper is nil in some station but (0.001 to 0.031) and (0.013 to 0.049) ppm in Upper and Lower Lake.

This values is in tolerance limit for drinking (0.2ppm)

Lead

Mine water, electroplating wastes, corrosion products and waste contamination contribute lead to raw water supplies. Since lead is a cumulative poison, its determination in potable water is important. About 60% of lead retained in the body enters the bone affecting & metabolic activities. Lead reaches water bodies from air and rocks. It enters food chain. Lead poisning includes reduction in haemoglobin, Kidney damage, mental retardation, abnormal pregnancy etc. chronic lead poisning symptoms include gestro intestinal stress, lead palsy which includes neuromuscular symptoms like fatigue, weakness, muscular antropy, paralysis etc. and CNS syndrome which may include delirium, convulsions, coma and finally death. The present study shows values of lead is (0.012 to 0.029ppm) and nil, (0.011-0.098) and (0.002-0.048ppm), nil and (0.006-0.021ppm)in upper and lower lake at summer, rainy, winter season respectively. But tolerance limit for drinking water is 5.0 ppm.

Zinc

Causes vomiting and renal damage. 1 ppm of Ni, Pb, Zn are extremely dangerous to aquatic animals. In present study values of Zinc is (0.004-0.174) and (0.038-0.559)ppm, (0.087-0.668) and (0.003-0.151)ppm, (0.122-0.411) and (0.004-0.2260ppm in upper and lower lake at summer, rainy, winter season respectively. Its tolerance limit is 5.0ppm for drinking water.

Cadmium

Industrial effluents and wastes from textiles, printing, electroplating, chemical industries and lead mines contribute cadmium in water. Cadmiumoccours in water as suspended particals of hydroxides, oxides, silicates, sulphates etc. Cadmium accumulates in there forms in liver and kidney of man and cause hypertention,

Minimum & maximum concentrations of heavy metals, Upper & Lower lakes

(Summer Season)

Heavy Metal	Upper Lake		Lower Lake	
	Min. (mg/L)	**Max. (mg/L)**	**Min. (mg/L)**	**Max. (mg/L)**
Mn	0.014 U7 (S), U8 (S), U9 (S)	0.092 UC (M)	0.018 LB- (M)	0.098 L7 (B)
Cr	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Cu	Nil At all station	Nil At all station	0.011 LB (M)	0.048 LE (M)
Pb	0.012 U1 (B)	0.029 U11 (S)	Nil At all station	Nil At all station
Zn	0.004 U11 (B)	0.174 U5 (B)	0.038 L7 (B)	0.559 L6 (B)
Cd	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Ni	Nil At all station	Nil At all station	Nil At all station	Nil At all station

Minimum & maximum concentrations of heavy metals, Upper & Lower lakes

(Rainy Season)

Heavy Metal	Upper Lake		Lower Lake	
	Min. (mg/L)	**Max. (mg/L)**	**Min. (mg/L)**	**Max. (mg/L)**
Mn	Nil, 0.011 UB (B)	0.094 U11 (S)	0.027 LB (B)	0.097 LC (B)
Ni	Nil At all station	Nil At all station	Nil, 0.005 LB (M)	0.118 L4 (S)
Cr	Nil, 0.001, U2 (B), U6(S), U9(B), U10(S), U11 (S), U15 (S), UA (M)	0.038 U3 (B)	0.013 LC (B)	0.043 LB (S)
Cu	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Pb	0.011 U10 (B)	0.098 U6 (S)	Nil, 0.002 L3 (B)	0.048 LC (S)
Zn	0.087 U10 (S)	0.668 U15 (B)	Nil, 0.003 L7 (S)	0.151 L3 (B)
Cd	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Co	Nil At all station	Nil At all station	Nil At all station	Nil At all station

Minimum & maximum concentrations of heavy metals, Upper & Lower lakes

(Winter Season)

Heavy Metal	Upper Lake		Lower Lake	
	Min. (mg/L)	**Max. (mg/L)**	**Min. (mg/L)**	**Max. (mg/L)**
Mn	Nil, 0.004 UB (S)	0.093 U7 (B)	0.017 LB (M)	0.098 L3(B), LC (B)
Ni	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Cr	0.018 U4 (S)	0.048 U5 (S), U9 (B)	Nil, 0.004 LE (S)	0.048 LA (S), LC (S)
Cu	Nil, 0.001 U2 (B), U7(B)	0.031 UC (B)	0.013 L2 (S)	0.049 L7 (S&B), LC (B)
Pb	Nil At all station	Nil At all station	Nil, 0.006 LE (M)	0.021 LE (B)
Zn	0.122 U4 (S)	0.411 UA (S)	Nil, 0.004 L3 (S)	0.226 L3 (B)
Cd	Nil At all station	Nil At all station	Nil At all station	Nil At all station
Co	Nil At all station	Nil At all station	Nil At all station	Nil At all station

U- Upper Lake, S- surface level, B- bottom, C-center, M-middle, No. 1 to 15 - different sampling stations

emphesema, kidney stones, kidney damage, suppression of bone marrow causing anemia, spontaneous bone fractures due to weakening of bones.

Cadmium is toxic to living organism even in low concentration of <1 mg/L.

In present study values of Cadmium is nil in all station of upper and lower lake at summer, rainy, winter season.

Nickel

Is strong source of cancer for man. Its tolerance limits in drinking water is 0.5ppm.

In present study values of Ni is nil in all station of upper and lower lake at summer, rainy, winter season.

CONCLUSION

It was concluded that the metals (Mn, Zn, Pb, Cr, Cu) present in water. The cause of this contamination is supposed to be the Immersion of Taziyas and Idols. Which are painted with cheap quality dyes. Domestic sewage it also partly responcible.

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