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Study of heavy metal contamination in *Halali Dam* water of Vidisha District near Bhopal (M.P.) India with reference to human health

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ABSTRACT

The most common and widespread danger, associated with Halali Dam water is contamintaion of heavy metal by sewage and other organic matters or excrements water of *Halali* reservoir is used for drinking as well as irrigational purpose, its water is polluted by man made activities e.g. sewage disposal industrial and natural contaminants mixes into water heavy metals viz. Cu Mn, Ni, Zn, Pb and Cd were analysed to evaluate the water quality index of *Halali* reservoir, contaminated heavy metals and sediments analysed on Perkin-Elmer Atomic absorption spectrophotometer (AAS). Model (2380). Water samples acidified on 2.0 pH with HNO_3. In the present study Cu, Fe, Mn, Ni, Zn, Pb and Cd heavy metals are found in the range of 0.048-7.8, 0.020-0.64, 0.60-0.24, 0.08-0.98, 0.030-1.96, 0.18-0.98 and 0.008-5.78 ppm respectively. Silt Sediments has higher conentration of heavy metals.

INTRODUCITON

Water in nature contains a number of impurities in varying amounts. The run-off water goes into *Halali Dam* has large number of pollutants including bacteria. Halali river near Bhopal M.P. flows through several villages of Bhopal, Raisen and Vidisha districts and ended in the Samrat Ashok Sagar Dam known as *Halali Dam i.e.* situated in vidisha district. The *Parta-Nallah* is the cheif source of this dam, Partra nallah carries urban and domestic sewage and effluents of industries. Heavy metals concentration is direct measurements of pollution and related to human health. This Study has been carried out during 2005-06 will help to plan for drinking and irrigational water supply schemes in sustainable development of Madhya Pradesh and to see the suitability of surface reservoir water.

The biological decomposition of organic matter consume all the dissolved oxygen (D.O) which can not be made up. As a result of oxygen depletion, anaerabic biological population dominate with the result of precipitation of heavy metal ions as sulphides which settle at the bottom of reservoir pollution in surface and groundwater system though human activities and natural process may enter into water reservoir. Bhopal, the capital of Madhya Pradesh, is territorially the largest state of India witnessed the world's worst industrial disaster *i.e.* leakage of methyl isocyanate (MIC) gas from Uninon Caribaide factory on 3rd December 1984. That directly or indirectly affected the water resources by spreads through air to all over state created global pollution.

The rainwater, which is orginally pure, also absorb various gases, dust and other impurities when it move on the grounds and agriculture land futher carry silts organic inpurities. The study will help the authorities for plainning of drinking as well as irrigation supply schemes in coastal catchments are of Bhopal district of M.P for sustainable development. Inappropriate disposal and accidental release into environment toxic and hazardous substances form chemical and industrial activities have created serious environmental public health problems all over the world.

The heavy metal pollution of *Halali Dam* water is mainly due to effuents of Patra nallalh and

effluents of industries situated nearly the river. The low concentration of heavy metals is due to mixing and dispersion effect of fresh water that flows down in the stream

The *Patra nallah* and *Ganiyari* river are two main streams adjoins into dam. *Patra nallah* is main source of heavy metal pollution and contamination as it contains urban and domestics sewage and effluents of industries *e.g.* Harshal Paper and Board mill, New Bhopal Textile Hill, Glue factory, Slaughter houses andother small scale and cottage industries, of Bhopal city form Balampur Village.

MATERIAL AND METHODS

In the present study eight sampling stations are chosen at different places of the *Halali* reservoir nearby villages, bathing and washing places in different seasons. The methods for water analysis used as prescribed by APHA (1985) and NEERI (1986). Water samples are acidified 2 or 3 times and evaporated up to dryness and dissolbed in HNO3 and samples then used to perking Elmer, AAS with air -acetylene flame to detect the trace elements at different wavelength fo light and width of specified solution and slit. The instrument is calibrated for each metal to be analysed, with known solution and programing aspirate the pretrated sample to the flame. Set zero with double distilled water before each detection, results are displayed in µgm/L from which the actual concentration in the water sample can be calculated and total metal content of the water samples can be obtained in (ppm.)

The Sampling Stations are

1. EAST of the Halali Dam
2. DWD Guest House Irrigation Deptt.
3. Near Shahpur Village
4. Kurana Village
5. Kirat Nagar
6. After Kurana Village
7. West of Halali Dam
8. The Halali Dam

RESULTS AND DISCUSSION

Heavy metals, possible the most persistent of the environments pose a threats to the aquatic species and have detrimental effect on aquatic organisms and they reach higher trophic levels through food chain may adversely affect the entire ecosystem in the food chains especially, those terminating in the human beings are of renewed interest, largely due to several instance of human intoxication as have occurred with Hg, Cd and Pb, Zn Pb and Cd metals in air, soil and water have been reported more than the natural concentration in urban areas especially. Those which are highly industrialized (forstner and wittman, 1979).

The results of the present study are summarized in Tabel - 1 as A, B,C silt-rediments sewage disposal points and sewage confluence points respectively.

Copper

Copper is ubiquitous in the environment and hence it is frequently present in reservoir water. Large doses of copper irritates the stomach (Ross, 1955). ISI (1983) has prescribed limit of 0.05 mg/L for copper. In the present study copper present in the range of 1.44-7.8 , 0.06-3.6 and 0.090.-2.94 ppm is silt sediments, near sewage disposal and sewage confluence points respectively wel within the premissible limit. Copper is essential components of key metalloenzyme that maintains the vascular and nervous system. Deficiency of copper causes livestock's disease, excessive accumulation of copper in tissue occurs in Wilson's disease, causes neurological dysfunction and progessive cirrhosis.

Iron

Iron may be present in surface water in varying amounts from 0.5 to 100ppm (Ernst, 1991), ISI (1983) and WHO (1984) have set a desirable limit of 1.0mg/L for drinking purpose. In the present study iron found in the range of 0.02 - 0.64, 0.026-0.34 and 0.018-0.024 ppm in silt sediments, near sewage disposal point and sewage confluence points repectively. Lower values of 0.020 ppm at SS8, SS7 and SS8 while the higher values recorded at SS2, SS3 and SS1.

Manganese

Manganese is an essential element, which does not oocur naturally as a metal but is found in various salts and minerals and found in various salts and minerals frequently is association with iron compounds. Mn is a vital nutrient for both platns and animals. The deficiently state of Mn has not been found in human, it's deficiency is characterized by defective growth bone abnormalities and reproductive dysfunction. The concentration of Mn recorded maximum of 1.24, 0.98, 0.88 ppm and minimum values of 0.60, 0.09 and 0.090 ppm in Halali Dam silt-sediments near sewage disposal land near sewage confluence points respectively. A concentration of 0.1mg/L has

Table - 1: Study of heavy metals in *Halali* reservoir 2005-06

Sampling Stations	Cu	Fe	Mn	Ni	Zn	Pb	Cd
A= Conc. of heavy metals in *Halali* silt - sediments sampling metals in mg/m³ during 2005-06							
1.	7.2**	0.60	0.78	0.05	8.88**	0.68	5.74**
2.	4.2	0.64**	0.60*	0.08	8.0	0.29	3.00*
3.	3.0	0.48	1.24**	0.06	4.2	0.38	1.24*
4.	1.46*	0.08	BDL	BDL	2.8*	0.26	Nf
5.	6.4	0.028	1.20	0.09	6.2	0.28	BDL
6.	6.6	0.030	NF	0.09	6.6	0.70**	2.8
7.	5.94	0.029	0.84	0.098	5.4	0.56	3.6
8.	7.42	0.20*	0.89	BDL	5.2	0.48	3.8
B= Heavy metals near sewage disposal point							
1.	3.6**	0.04	0.16	0.06*	0.60	0.19*	0.20
2.	1.34	0.04	BDL	0.08	0.60	nf	BDL
3.	0.68	0.34**	0.90**	0.05	0.75	0.20	0.85
4.	1.14	0.025	0.85	0.08	0.06*	0.30	0.88**
5.	0.18	0.024	0.44	0.07	1.28	BDL	0.43
6.	0.06	0.030	0.48	BDL	3.48**	nf	0.48
7.	0.08	0.026*	nf	1.09**	2.00	.036**	Nf
8.	0.06*	0.026	0.09*	0.08	1.24	0.33	0.09
C= Heav metals near sewage confluence point							
1.	2.54	0.042**	0.16	0.066	0.60	BDL	0.13
2.	2.48	0.026	BDL	0.090*	0.64	0.18	BDL
3.	2.34	0.019	0.88**	nf	0.07*	0.15*	0.86**
4.	2.90**	0.028	0.72	0.080	0.08	Nf	0.40
5.	1.62	0.030	0.48	nf	2.42	0.30	0.44
6.	1.75	0.024	nf	BDL	3.90**	0.28	BDL
7.	0.38	0.023	BDL	0.08*	1.22	0.48**	nf
8.	0.09*	0.018*	0.09*	0.082	1.18	0.33	0.08*

nf = not found, BDL = Below detection limit, *= minimum,
**= maximum values TLV mg/m³ = Cu = 0.2, Zn = 1.0, Mn = 5.0, Fe=1.0

been recommended as desirable limit and 0.3 mg/l as the maximum permissible limit for drinking water (BIS, 1991). The presence of Mn beyond the permissible limit for imparts alien taste to water. It also has adverse effect on domestics uses and water supply structures. Higher concentration may be attributed to the reducing conditions of the water and dissoltuion of Mn bearing salts from the soil strata.

Nickel

In trace level is essential to human nutrition and no poisoning is known in this range. Certain Ni-compounds have carciongenic effects on animals, however, solubel comounds ar not currently regarded as human or animal carcinogens. Zinc is an essential for normal function is all forms of life. It is present in all over 160enzymes and bound with RNA. It is essentioal dietary mineral zinc deficiency is associated with impaired growth parakeratosis (a thickened scaly skin), failure of exposure to zinc can occur from drinking water and liquids stored in galvanized metal containers. Typical symptoms include chills, fever coughing & headache maximum permissible limi for Zinc is 5.0 mg/L (IsL 10500, 1983. Goel *et al.,*) noted distribution of trace elements in groundwater ranged from 20 to 860 mg/L fish production found reduce elements in groundwater ranged from to Zn concentration of 8.84" ppm.

In the present study, copper showed significant (+) ve correlation with silica (r=0.93 p=0.1), fluoride (r=06, p = 0.1) iron (r=0.95, p=01.),

Mn (r=0.59, p=0.1), total hardness (r=0.76, p =0.1), and (-) ve with sulphate (r=0.05, p=0.1).

Lead is mainly found due to petroleum gases as diesel fuel is mainly used in agricultural tractor, Jeep and though battery and service Stations of vehicle. Pb in this study ranged from 0.18-0.06 ppm while the cadmium is in the range of 0.003-0.068 ppm.

Cadmium is non-essential & unbeneficial element known to have high toxic potential. The cadmium concentration in the study area varies form 1.1-3.9, 0.012-0.018 and 0.02-0.03 ppm at a,b,c, points. Desirable limit for cadmium is 0.01 mg/L. Beyond this limit, water becomes toxic. cadmium can cause bronchitis, anemia and renal stone formation in animals.

Heavy metal pollution in aquatic system is more affectedly reflect by high concentration in sediments than in waters. The solubility of trace of heavy metals may ne greatly altered by the dissolved Matter (Morel *et al*., 1973).

The reservoir or drinking water is contaminated with Cd by industrial discharges and leaches from landfills areas. Drinking water & irrigational water of the reservoir is suitable for all purposes. The findings are similar with those of kataria (1994), 1995, 1995 & 2004, R.D. Kaplary *et al*. (2003) as srikanth *et al.,* (1993)

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REFERENCES

1. APHA, Standard methods for the examination of water and waste water APHA, AWWA WPCF, New York (1986).
2. BIS. Specification for drinking water IS: 10500:1991 Bureau of Indian standards New Delhi (1991).
(a) IS : Indian standard Specification for drinking water, ISI, New Delhi IS : 10500(1983)
3. EPA (Environment Protection Agency). Ambient water quality criteria for zinc, publicatoin 440/5-80-79 EPA (1980).
4. Ernst, M- Metal and their compounds in the environment, VCH, wein heim. 894-1332 (1991).
5. Forstner, W. and wittman, G.T.W, Metal pollution in the aquatic enviroments, springer-verlag, New York (1979).
6. Kataria, H.C :Heavy metals contamination and pollution in Betwa River, *IJEP* **15**(1): 34-38 (1994).
7. Kataria, H.C : Analysis of Trace elements in Lower Lake water of Bhopal, *Orient. J. Chem*., **11**(3) 288-289 (1995).
8. Kataria, H.C : Heavy metal water pollution of Pipariya Township of Madhya Pradesh. *J. Freshwater Biol.* **8**(2) : 105-107 (1995).
9. Kataria, H.C : Analytical study of trace elements in ground water of Bhopal. *I. J. Env. Prot.* **24**(12) : 894-896. (2004).
10. NEERI Manual on water and waste and waste analysis. National Environmental Engineering Research Institute, Nagpur. 340 (1986).
11. Morel, f. Mc Duff, RE. And morgam, JJ, Trace metals and metal organic interaction in natural water, *Ann Arbor. Sci Publ.* Inc Michigan (1973).
12. R.D.Kaplary *et al*. Trace elements on groundwater of Tuppa Area New named, Maharashtra, *Poll, Res.* **22**(4) : 95-599 (2003)
13. Ross Sl Lancet, 11,87 e.f. Holaen., WS, 1970 (1995).
14. R.K. Sharma Hydro-chemical analysis of Halai river with speical reference to seasonal fluctuation. *Ph.D. thesis,* Barkatullah University, Bhopal (1994).
15. Srikanth, R.A., Madhumohan Rao, C.H. Sharavan Kumar and Anees Khanum Pb. Calcium Ni & Mn Contamination of groundwater around Hussein Sugar lake Hyderabad. *Bull. Env. Contam. Toxicology* **50**(1): 138-143 (1993).
16. Vinikour, W.S, Goldstein R.M. and Anderson R.V. Bio conentration patterns of Zn, Cu, Cd and Lead in Selected fish species from the fox River, Illinios, byll *Environcontam., Toxicol.* **24**, 727-734 (1980).
17. Warrant- viseman Jr, and Mark J. Hammer, Water Supply and pollution control 4thed. Harpner and Row, Public Inc. 220-223 (1985).
18. WHO (World Health Organization) Guidelines for drinking water quality. **1:** (1984)
19. WHO Geochemical Environments Trace Elements and Cardiovasucalr Diseases Bull., 47 (1972).