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Metal Contents in Water of Ambazari Lake and Nearby Water Sources

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Concentration of metals Cd, Fe, Al, Co, Mn, Pb, Zn, Cu, Cr, Na and K in water from Ambazari lake situated at Wadi-Nagpur MIDC area are studied in this paper. To compare the level of these metals, the samples were collected from nearby sources. Also samples were studied from Futala lake which is about 2–3 km away from Ambazari, Nagpur and having no industry in its catchment area.

INTRODUCTION

Water pollution in India has now reached a crisis point. Almost every river in India is polluted to a considerable extent. As assessed by the scientists of the NEERI, Nagpur, about 70% water is polluted[1].

Several research groups in different parts of India have studied the presence of toxic and trace metal ions in drinking water. Water has properties of dissolving and carrying in solution a variety of chemicals and other matters contaminating the water resources. The water once polluted becomes a direct threat to the existence of all livings beings. Estimation of concentration of metals in water is extremely important for proper assessment of the associated hazards.

Water pollution occurs due to the presence of dissolved inorganic matters, organic matters such as proteins, fats, carbohydrates and other substances found in domestic and industrial waters, and physical factors such as turbidity, colour, temperature of effluent, associated radioactivity, etc. During processing in industry, the formation of alkalis, acids, salts and other chemicals leads to pollution. These chemicals are responsible for the corrosion of metals and are toxic to aquatic life and the microorganisms, which self-purify the stream of water into which the effluents are thrown. These chemicals are discharged by various industries like pulp-of-paper, tanneries, textiles, coke-ovens, etc. Free chlorine, ammonia, hydrogen sulphide, salts of metals like Cr, Ni, Zn, Cd, Cu, Ag etc. are normally discharged by industries like metal plating, alkali producing, PVC, fertilizer, etc.

Ambazari lake in Nagpur is very close to the Hingna-Wadi MIDC area and has very large catchment area covering various industries. Hence, to see the level of contamination of metal ions in Ambazari lake due to industrial area around it, a study of concentration of metals in water samples from Ambazari lake and sources around it has been carried out. To compare the level of contamination, samples from Futala lake and wells were studied.

EXPERIMENTAL

Water samples from following sites were collected in plastic bottles in two lots, 1st in Dec. 1997 and 2nd in Feb. 1998.

Site **(A) In and around Ambazari lake**

1. Ambazari South-east (overflow)
2. Ambazari West
3. Ambazari well at South
4. Tube-well in Jaltarang colony 200 feet deep
5. Ambazari water treated at MIDC
6. Well of Dr. Shobhane, Trimurty Nagar
7. Community well at Trimurty Nagar.

Site **[B] Futala lake which is at a distance of 2–3 km from Ambazari**

1. Futala South-east
2. Futala North-east
3. Tube-well near Futala
4. Community well near Futala.

Concentrations of elements present in the samples were studied using double beam AAS (GBC 932, Australia) available at Regional Sophisticated Instrumentation Centre, Nagpur University Campus, Nagpur.

RESULTS AND DISCUSSION

The concentration of Cd, Fe, Al, Co, Mn, Pb, Zn, Cu, Cr, Na and K in all the samples studied by AAS is shown in Table-1. Last column of this table shows the limit values as defined in WHO, ISI, etc. Level of Cd is not lower than WHO limit in all the three samples of Ambazari lake. However, the Cd level is low in water from tube well at Jaltarang colony, treated Ambazari water at MIDC, well of Dr. Shobhane and community well at Trimurty Nagar. This indicates that Cd is not being percolated from Ambazari lake to nearby sources of water and the Ambazari water is likely to cause Cd poisoning.

Concentrations of Fe, Mn, Pb, Zn, Cu, Na and K in all the samples are within safe limits defined by WHO or ISI, whereas concentrations of Al and Cr in all the water samples from Ambazari sites are close to the limit values.

Thus, as far as the pollution due to Fe, Mn, Pb, Zn, Cu, Na, K, Al and Cr is concerned, the water from the sources mentioned in Table-1 is safe for use. However, the raw water from Ambazari lake needs COD, BOD and other bacterial and pathogenic investigation.

Comparison of Tables 1 and 2 indicates that the metals in general are more in the Ambazari lake than in the Futala lake. This difference is due to the fact that many industries and University laboratories lie in the catchment area of Ambazari lake, whereas, catchment area of Futala lake is free from industrial area. But the storage capacity and the catchment area of Futala lake is inadequate to use it as a regular water source for massive use.

There is a scope for increasing the catchment area of Ambazari lake. The entire

TABLE-1

S. No.	Element	Site Around Ambazari lake Period	Ambazari overflow	Ambazari West	Well inside lake	Tubewell Jaltarang	Treated at MIDC	Shobhane well	T.N well	Natural Mineral Water Limits Ref. 3, 4	Limit valure WHO Ref. 2
1.	Cd	Dec. 97	0.02	0.02	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.003	0.01
		Feb. 98	0.02	0.02	0.03	< 0.01	< 0.01	< 0.01	< 0.01		
2.	Fe	Dec. 97	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		0.3
		Feb. 98	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
3.	Al	Dec. 97	0.7	0.6	0.6	0.6	0.6	0.6	0.7		0.2
		Feb. 98	0.6	< 0.7	0.6	< 0.6	< 0.6	< 0.6	0.6		
4.	Co	Dec. 97	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
		Feb. 98	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1		
5.	Mn	Dec. 97	0.04	0.04	0.02	0.02	0.04	0.02	< 0.02	2.0	0.1
		Feb. 98	0.06	0.04	0.03	0.03	0.06	0.03	0.03		
6.	Pb	Dec. 97	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.01	0.05
		Feb. 98	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06		
7.	Zn	Dec. 97	0.018	0.018	0.022	0.030	0.017	0.035	0.038	5.0	5.0
		Feb. 98	0.017	0.021	0.019	0.025	0.021	0.034	0.035		
8.	Cu	Dec. 97	0.025	0.030	0.028	0.029	0.028	0.029	0.025	1.00	1.0
		Feb. 98	0.028	0.032	0.035	0.034	0.031	0.028	0.025	0.05	
9.	Cr	Dec. 97	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.05	
		Feb. 98	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	1.00	
10.	Na	Dec. 97	29.90	26.20	20.60	19.70	21.00	27.60	25.60	150	200
		Feb. 98	31.40	37.01	21.62	22.52	21.53	23.76	25.76		
11.	K	Dec. 97	5.49	5.02	1.53	0.50	3.04	0.59	0.18		
		Feb. 98	5.93	5.68	1.60	0.97	5.88	0.43	0.38		

area between Hingna road, Ambazari road and Amravati road can be brought under the catchment area of Ambazari. For this, digging of canals is necessary to carry out rainwater from the sides of Amravati road, Ambazari road and Hingna road to Ambazari lake. Increase in height of wall is likely to result in forming cracks in it due to pressure of water; thus water level cannot be allowed to increase beyond a certain height. A better alternative is to increase the depth of lake by way of digging and blasting the bottom.

TABLE-2

S. No.	Element	Site Futala Lake	Futala South- east	Futala North East	Tube-well	Community well
1.	Cd	Dec. 97	< 0.009	< 0.009	< 0.009	< 0.009
		Feb. 98	< 0.009	< 0.009	< 0.009	< 0.009
2.	Fe	Dec. 97	0.14	0.13	0.12	0.13
		Feb. 98	0.11	0.10	0.11	0.11
3.	Al	Dec. 97	< 0.55	< 0.55	< 0.55	< 0.55
		Feb. 98	< 0.55	< 0.55	< 0.55	< 0.55
4.	Co	Dec. 97	< 0.05	< 0.05	< 0.05	< 0.05
		Feb. 98	< 0.05	0.06	0.07	< 0.05
5.	Mn	Dec. 97	0.02	0.02	0.02	0.02
		Feb. 98	0.03	0.03	0.04	0.03
6.	Pb	Dec. 97	< 0.06	< 0.06	< 0.06	< 0.06
		Feb. 98	< 0.06	< 0.06	0.08	0.06
7.	Zn	Dec. 97	0.018	0.018	0.021	0.018
		Feb. 98	0.018	0.017	0.023	0.026
8.	Cu	Dec. 97	< 0.025	< 0.025	< 0.025	< 0.025
		Feb. 98	0.027	0.025	0.032	0.028
9.	Cr	Dec. 97	< 0.5	< 0.5	< 0.5	< 0.5
		Feb. 98	< 0.5	< 0.5	< 0.5	< 0.5
10.	Na	Dec. 97	27.7	28.2	52.6	170.9
		Feb. 98	26.8	27.3	43.5	148.6
11.	K	Dec. 97	4.64	4.11	1.50	5.22
		Feb. 98	4.84	4.66	2.23	4.29

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