Seasonal Variations of Heavy Metal Concentrations in Lake Water

S. Ramesh Babu, M.V.Raju , P.V.V.Prasada Rao

Abstract: Water Basin or tanks are very necessary attribute of either towns or rural environment. While urban lakes are present all over the world, in a country like India, the lakes in rural areas fulfill a variety of functions; drinking, irrigation, live-stock rearing and ground water recharge. In India, several water tanks recently have been astray, because of various manmade movements and the many of remain water tanks are degraded day by day. Many areas of water tanks in the world getting polluted by dumping and discharge of various kinds of effluents, wastes, etc., without any proper treatments., all these leads to degrading the quality of water and leads to changes in environmental conditions. For satisfactions of various water demands in local area, it is necessary to construct rainwater harvesting pits and to make channelizing of water to restore. So that, such water tanks serves many functions in a useful ways i.e. water may use for irrigation, to satisfy domestic demand and also may increase the ground water table and control of floods, etc. (Ganesan M 2008 et al, Mahapatra DM 2011 et al., Sudha M C 2013 et al.,). In this present study attempt has been made during Pre-Monsoon (April to May) and Post-Monsoon (September to October) periods to find the concentration levels of heavy metals, Arsenic (Ar), Copper (Cu), Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg), Zinc (Zn) and Boron (B). Sampling has been done by considering the inflow and the other outlet discharges, where the possibility of contaminations may enter into the water body by awning all over of the lake for taking samples, and also discussed the suitability of water for various demands, and suggested required management techniques to make water free from the contamination.

Key Words: Contamination, Drinking Water, Heavy Metals (Ar, Cu, Cd, Cr, Pb, Hg, Zn B), Lake, Pollution

I. INTRODUCTION

Public health is getting contrived by damage of plants and animal nutrition. As per studies of W.H.O about 80 percentage illnesses are due to medium of water sources. Domestic and Drinking water quality standards in many of countries are not satisfying the standards of W.H.O (Water Quality). And it was found that around 3.1 percentage deaths occur, because of unsanitary and low water quality standards (Khan N et al., 2013 and Pawari MJ et al., 2015). The problem of water pollution is complicated by the great solvent properties of water. Any usage of water may be for washing, irrigation, flushing of the sewage or domestic waste,

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cooling and industrial purposes adds some undesirable impurities to it leading to surface and groundwater pollution. All the pollutants thus ultimately seep into aquifers causing an irreparable impact on the groundwater regime (Anil K Fokmare, et al., 2002).Due to increasable utilization and combustions of fossil fuels, extractions of mine from ores , soil and sediment erosion due to landslides, surface runoff from industries, etc., leads to heavy metallic elements joins to the environment and cause contaminate the waters and may consequently affect human health by the food chains (Leung H.M , et. al .,.2016)

II. STUDY AREA DISCRIPTION

Rudraram Lake, it is the village of panchayat of rudraram, at Snaga Reddy District of Telangana State. Hyderabad. Area coordinates 17.563^0 N 78.167^0 E. Rudraram Lake, the point source observed is essentially the industries and the nonpoint source is the agricultural runoff. A point to be taken care of is that all the industries are on the elevated side and waters have natural tendency to flow towards the lake. Keeping in this

Figure 1 A. Study area location map with sampling points
Figure 1 B. Study area view of Rudraram Lake

view of the quality assessment of the lake are very importance

to satisfy the demand with respect to potability. Study area of sampling locations map and view of study area shown in following Figure 1 A and Figure 1 B

III. OBJECTIVES OF THE STUDY

➤ To report the variations

in the water quality of the selected water body, from pre-monsoon to post-monsoon seasons;

➢ To assess the water quality with respect to heavy metal concentrations levels of the selected water body with reference to their potability

➢

IV.METHODOLOGY

Samples were collected in clean cans with the capacity of two letters volume from the lake water body, covering all points of the lake and used for the estimation of concentrations of various parameters of Lead (Pb), Arsenic (Ar), Copper (Cu), Mercury (Hg), Cadmium (Cd), Zinc (Zn), Chromium (Cr), and Boron (B). The water samples were kept in laboratory at room temperature until they were used for analysis. Methods for the estimation of toxic metals parameters are shown in the Table Number 1

Table1.Estimation methods used for of Chemical Parameters of Heavy Metals

S. No.	Name of the Parameters	Method Used to Estimation
1	Copper (Cu)	By Atomic Absorption Spectrophotometer
2	Lead (Pb)	By Atomic Absorption Spectrophotometer
3	Chromium (Cr)	By Atomic Absorption Spectrophotometer
4	Nickel (Ni)	By Atomic Absorption Spectrophotometer
5	Zinc (Zn)	By Atomic Absorption Spectrophotometer
6	Boron (B)	By Atomic Absorption Spectrophotometer
7	Arsenic (Ar)	By Atomic Absorption Spectrophotometer
8	Cadmium (Cd)	By Atomic Absorption Spectrophotometer
9	Mercury(Hg)	By Atomic Absorption Spectrophotometer

V. RESUTS AND DISCUSSION

Rudraram Lake is the one of the largest wetlands of this study compared to other lake presents in surrounding region., and for the purpose of the quality assessment, six sampling stations were distributed and covering the periphery of the entire tank, and also taking considerations of the inflow and out flow of the discharges, Water quality assessment was made twice in a year 2018, considering Pre-Monsoon (April to May) and Post-Monsoon (September to October) periods. Heavy metals of Lead (Pb), Arsenic (Ar), Copper (Cu), Mercury (Hg), Cadmium (Cd), Zinc (Zn), Chromium (Cr), and Boron (B). analyzed in composite sample of the lake water and the results are furnished in Table Number 4,5. And water quality standards for drinking (Heavy metals) are shown in Table Number 3. Graphical values of various parameters concentration of the waters for the two seasons of Rudraram Lake shown in Figure 2 to Figure 6.

Table 3 Standards of Drinking Water Quality as per IS: 10500 - 2012

S.No	Name of the Parameter	IS: 10500 - 2012	
		Sensible limits (mg/l)	Acceptable limits (mg/l)
1	Copper (Cu)	0.05	1.5
2	Lead (Pb)	0.01	No relaxation
3	Chromium (Cr)	0.05	No relaxation
4	Nickel (Ni)	0.02	No relaxation
5	Zinc (Zn)	5.0	15
6	Boron (B)	0.5	No relaxation
7	Arsenic (Ar)	0.05	No relaxation
8	Cadmium (Cd)	0.003	No relaxation
9	Mercury(Hg)	0.001	No relaxation

Table 4 Heavy metals in Rudraram Lake water during Pre-Monsoon time

S. No	Name of the Parameter	Pre-Monsoon (April to May) Concentration (mg/l)						
		SW1	SW2	SW3	SW4	SW5	SW6	Avg.
1	Copper (Cu)	0.06	0.03	0.04	0.04	0.03	0.04	0.04
2	Lead (Pb)	0.009	0.007	0.010	0.006	0.009	0.007	0.008
3	Chromium(Cr)	0.28	0.24	0.21	0.27	0.24	0.26	0.25
4	Nickel (Ni)	0.05	0.02	0.02	0.04	0.03	0.02	0.03
5	Zinc (Zn)	0.35	0.38	0.29	0.32	0.33	0.37	0.34
6	Boron (B)	0.52	0.56	0.59	0.57	0.54	0.58	0.56
7	Arsenic (Ar)	0.04	0.06	0.03	0.04	0.04	0.03	0.04
8	Cadmium (Cd)	0.004	0.002	0.002	0.004	0.004	0.002	0.003
9	Mercury(Hg)	Below Detectable Level (BDL)						

Table 5 Heavy metals in Rudraram Lake water during Post-Monsoon time

| S. No	Name of the Parameter	Post-Monsoon (September to October) Concentration (mg/l)						
		SW1	SW2	SW3	SW4	SW5	SW6	Avg.
1	Copper (Cu)	0.05	0.04	0.04	0.04	0.05	0.04	0.045
2	Lead (Pb)	0.010	0.009	0.009	0.010	0.013	0.009	0.010
3	Chromium(Cr)	0.28	0.25	0.22	0.24	0.23	0.23	0.24
4	Nickel (Ni)	0.07	0.05	0.04	0.04	0.06	0.04	0.05
5	Zinc (Zn)	0.30	0.28	0.31	0.27	0.28	0.30	0.29
6	Boron (B)	0.50	0.49	0.45	0.46	0.50	0.48	0.48
7	Arsenic (Ar)	0.04	0.03	0.02	0.02	0.03	0.04	0.03
8	Cadmium (Cd)	0.004	0.002	0.002	0.002	0.004	0.004	0.003
9	Mercury(Hg)	Below Detectable Level (BDL)						
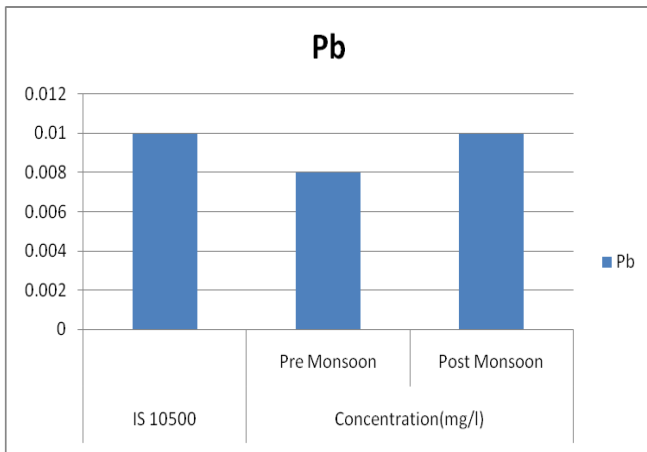
Figure 2. Periodical differences in the *Lead (Pb)* concentration of the waters for the two seasons of Rudraram Lake
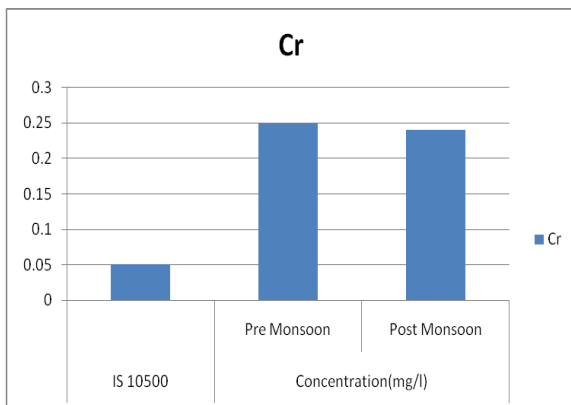

Figure 3.Seasonal variation in the *Chromium (Cr)* concentration of the waters for the two seasons of Rudraram Lake
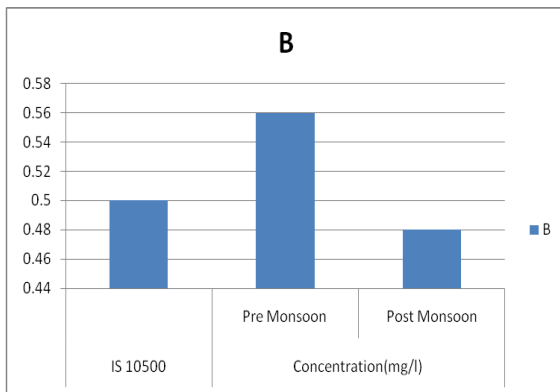

Figure 4.Periodical differences in the Nickel (Ni) concentration of the waters for the two seasons of Rudraram Lake
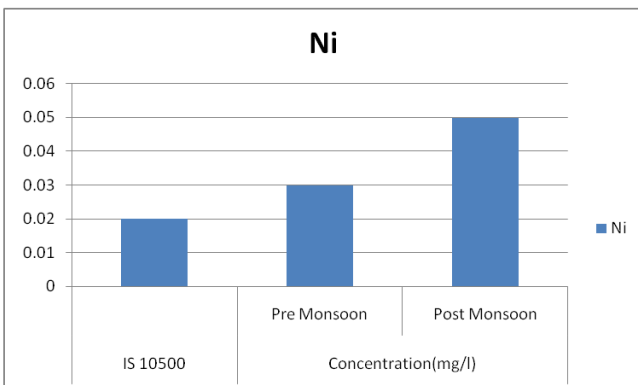

Figure 5. Periodical differences in the Zinc (Zn) concentration of the waters for the two seasons of Rudraram Lake
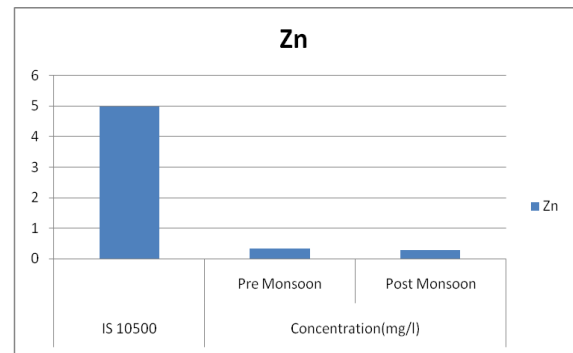

Figure 6. Periodical differences in the *Boron (B)* Concentration of the waters for the two seasons of Rudraram Lake

VI.CONCLUSIONS

The results of the Copper content of the water sample taken during pre-monsoon season is reported 0.04 mg/l and during post monsoon season reported as 0.045 mg/l. the Copper concentration of the waters were within the acceptable range (0.05 mg/l) of the drinking water specifications of IS 10500. The lead content of the water sample taken during pre-monsoon season is reported 0.008 mg/l and during post monsoon season reported as 0.01 mg/l. The Lead concentrations of the waters were within the acceptable range (0.01 mg/l) of the drinking water specifications of IS 10500. The Chromium concentration of the water sample taken during pre-monsoon season is reported 0.25 mg/l and during post monsoon season reported as 0.24 mg/l. The Chromium concentrations of the waters were not in the acceptable range (0.05 mg/l) of the drinking water specifications of IS 10500. The Nickel concentration of the water sample taken during pre- monsoon season is reported 0.03 mg/l and during post monsoon season reported as 0.05 mg/l. The Nickel concentration of the waters was not in the acceptable range (0.02 mg/l) of the drinking water specifications of IS 10500. The Zinc concentration of the water sample taken during pre- monsoon season is reported 0.34 mg/l and during post monsoon season slightly decreased to 0.29 mg/l. The Zinc concentration of the waters were well within the acceptable range (5 mg/l) of the drinking water specifications of IS 10500.The Boron concentration of the water sample taken during pre-monsoon season is reported 0.56 mg/l and during post monsoon season slightly decreased to 0.48 mg/l. The boron concentration of the pre monsoon waters were not in the acceptable range (0.5 mg/l) of the drinking water specifications of IS 10500. Remain parameters of Arsenic (Ar), Cadmium (Cd) are below permissible limit and where as Mercury (Hg) are below detectable limits. Hence, time to time quality assessment need to be done and need understand existing quality of water, that are being changed with time to time by making suitable road map for better utilization of water resources.

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