EUROPEAN ACADEMIC RESEARCH
Vol. II, Issue 12/ March 2015

Impact Factor: 3.1 (UIF)
DRJI Value: 5.9 (B+)

ISSN 2286-4822
www.euacademic.org

Heavy Metal Analyses of Godavari River Water, (Maharashtra), India

I.B. GHORADE
V.R. THAKUR
S.S. PATIL
Dept. of Environmental Science
Dr. Babasaheb Ambedkar Marathwada University
Aurangabad (M. S), India

Abstract:

Water pollution by heavy metals is directly or indirectly altered by human activities. Large drinking water sources namely rivers, dams and lakes are contaminated with heavy metals pollutant from various sources, more than 2000 chemical contaminants have been identified in drinking water, many of which are pharmacologically active, and several of them are either carcinogenic or mutagenic.

Out of 105 elements discovered and confirmed so far, over 65 are metals. Owing to their high thermal and electrical conductivity, high density, high melting and boiling points, malleability, ductility and other distinctly useful properties, metals find extensive use in human civilization. The fresh water ecosystem occupies a very small area in comparison to marine ecosystem. Now a day's degradation of these fresh water resources due to water pollution has become a serious problem for entire world. The effect of heavy metal on fresh water ecosystem has become global concern. These metals are persistent and once released the environment for a prolonged period. These heavy metals are well known pollutants, which are often encountered in many ponds, Lakes, rivers and dams of India and the most important aquatic fauna being subjected to stress caused by these heavy metals.

The indiscriminate release of liquid waste of organic and inorganic nature changes physico-chemical characteristics of water and causes hazard to flora and fauna including important member of food chain of man and aquatic ecosystem. Hence the present study during the year 2011 to 2012 is aimed to investigate some of the

important heavy metals contents such as Iron (Fe), Copper (Cu), Chromium (Cr), Zinc (Zn) Lead (Pb) and Cadmium (Cd) of the Godavari river water.

Key words: Godavari River, Heavy metals, Ecosystem, Pollutants, Degradation and Environment.

Introduction:

Water pollution by heavy metals is directly or indirectly altered by human activities. Large drinking water sources namely rivers, dams and lakes are contaminated with heavy metals pollutant from various sources, more than 2000 chemical contaminants have been identified in drinking water, many of which are pharmacologically active, and several of them are either carcinogenic or mutagenic (Kelkar, et al., 2001). According survey report of ATSDR (2001a) 70% of the available water in India is polluted by heavy metals and other chemicals. Out of 105 elements discovered and confirmed so far, over 65 are metals. Owing to their high thermal and electrical conductivity, high density, high melting and boiling points, malleability, ductility and other distinctly useful properties, metals find extensive use in human civilization. According to a rough estimate, 0.5 million tones of Zn and 310 million tones of Cu have been mined so far, used for domestic and industrial purposes and thus dispersed in to biosphere (Das, 2002; Patil S.S. et.al 2014). The effect of heavy metal on fresh water ecosystem has become global concern. These metals are persistent and once released the environment for a prolonged period (Matkar, 2008; Ghorade, 2013). These heavy metals are well known pollutants, which are often encountered in many ponds, Lakes, rivers and dams of India and the most important aquatic fauna being subjected to stress caused by these heavy metals (Lohar, 2000). The problem of water pollution by trace metal is now well known to be crucial all over the world and

especially in a developing country like India, everybody is facing the problem of ever widening threat of water pollution due to modern technology, industrialization and civilization (Ghorade, 20013). Industrial effluents contributing to aquatic contamination contain very toxic substances. No doubt, presence of pollutants degrades the water quality and impairs its utility for drinking purpose and other aquatic animals, which serves as food for human being (Matkar, 2008; Ghorade, 2013). The indiscriminate release of liquid waste of organic and inorganic nature changes physico-chemical characteristics of water and causes hazard to flora and fauna including important member of food chain of man and aquatic ecosystem. Hence the present study is aimed to investigate some of the important heavy metals contents such as Iron (Fe), Copper (Cu), Chromium (Cr), Zinc (Zn) Lead (Pb) and Cadmium (Cd) of the Godavari river water.

Material and Methods:

For analyses of heavy metals in water, samples were collected from the Godavari river water in three different seasons. Water samples were collected in plastic containers, which were thoroughly cleaned with nitric acid and rinsed several time with distilled water. Analysis was carried out to determine the concentration of various metals like Iron, Copper, Chromium, Lead, Cadmium and Zinc by using atomic absorption spectrophotometer (AAS) (Alan Walsh, 1950's). As it is the most versatile instrumental technique for the quantitative determination of trace metal in liquids. (Willard, et al., 1986). This method provides a fetal metal content of the sample and is independent of the molecular from of the metal in the liquid. Versatility of AAS can be realized from the fact that 70 elements, including most of the common rare earth metals, have been determined by it in concentration that range from trace to macro quantities, in the presence of other elements.

Analyses of heavy metals such as Iron (Fe), Copper (Cu), Chromium (Cr), Lead (Pb), Cadmium (Cd) and Zinc (Zn) were carried out in the present work.

Result and Discussion:

In the study areas following heavy metals in the river water were analyzed in ppb unit and results obtained are given **[Table No.1-3 and Fig.No. 1-6].**

Iron (Fe):

The concentration of Iron in ppb level during the year 2011-12 was varied from 0.60 (S2) to 0.79 (S7) in summer, from 0.53 (S6) to 0.73 (S9) in monsoon and from 0.49 (S8) to 0.64 (S12) in winter season. High concentrations of iron generally cause inky flavour, bitter and astringent taste (Hassan, 2012). It can also discolour clothes, plumbing fixtures and cause scaling which encrusts pipes.

Copper (Cu):

The concentration of copper in ppb level during the year 2011-12 was varied from 0.51 (S7) to 0.68 (S11) in summer, from 0.44 (S2) to 0.63 (S9) in monsoon and from 0.48 (S2) to 0.68 (S11) in winter season High level of copper can cause harmful effect such as irritation of nose, mouth and eyes, nausea, vomiting, diarrhea, lesions in Gastro Intestinal Tract (GIT).In the study area in the months of monsoon the victims of above diseases have been recorded in the primary health centers.

Chromium (Cr)

The concentration of chromium in ppb level during the year 2011-12 was varied from 1.17 (S5) to 1.43 (S7) in summer, from 3.49 (S1) to 4.21 (S11) in monsoon and from 1.11 (S3) to 1.60 (S11) in winter season. The major sources of chromium are the electroplating and metal finishing industries and publicly

owned treatment plants relatively minor sources (other than localized contamination) are iron and steel foundries, inorganic chemical plants, tanneries, textile manufacturing, and runoff from urban and residential areas.

Zinc (Zn):

The concentration of Zinc in ppb level during the year 2011-12 was varied from 1.41 (S4) to 1.81 (S5) in summer, from 1.03 (S4) to 1.23 (S10) in monsoon and from 0.58 (S3) to 0.81 (S11) in winter season. The zinc content was higher in summer. In summer, the water volume of the river was reduced substantially, it is likely that the heavy metal concentration increases with the anthropogenic input or it may be due to the natural and anthropogenic activities, agricultural runoff, domestic activities, wastewater discharges, effluent discharges and another non-point sources opened into water bodies.

Lead (Pb):

The variation of Lead metal in ppb level during the year 2011-12 was varied from 11.62 (S2) to 14.98 (S11) in summer, from 12.95 (S12) to 19.20 (S7) in monsoon and from 11.19 (S8) to 17.20 (S7) in winter season. The lead concentration was increased and by excess released free metal ions into the water bodies from kitchen utensils and solubility of old paintwork from building during acidic wet deposition.

Cadmium (Cd):

The variation of Cadmium metal in ppb level during during the year 2011-12 was varied from 1.30 (S1) to 2.29 (S12) in summer, from 1.59 (S2) to 2.43 (S12) in monsoon and from 1.90 (S5) to 2.33 (S10) in winter season. The possible sources of cadmium in river water system are contributed by domestic wastewater released from residential area, impetuously use of pesticides, fertilizers used in palm oil estates along the rivers

bank and local air pollution caused by open burning (Schroeder et.al.,1965).

Table No. 1: Seasonal Variations in Heavy Metals of the Godavari River water in Summer season during the year 2011-12.

Station No.	Iron in ppb	Copper in ppb	Chromium in ppb	Zinc in ppb	Lead in ppb	Cadmium in ppb
S1	0.63	0.61	1.23	1.50	14.50	2.24
S2	0.60	0.55	1.21	1.43	11.62	1.35
S3	0.61	0.63	1.39	1.45	12.25	1.72
S4	0.78	0.60	1.23	1.41	14.51	2.20
S5	0.71	0.58	1.17	1.81	13.68	1.72
S6	0.76	0.55	1.19	1.61	14.15	1.82
S7	0.79	0.51	1.43	1.60	14.95	2.17
S8	0.64	0.60	1.35	1.58	13.20	2.09
S9	0.61	0.56	1.30	1.70	11.80	1.95
S10	0.68	0.55	1.21	1.77	13.10	1.80
S11	0.71	0.68	1.38	1.59	14.98	1.30
S12	0.77	0.61	1.28	1.81	12.10	2.29

S= Station

Table No. 2: Seasonal Variations in Heavy Metals of the Godavari River water in Monsoon season during the year 2011-12.

Station No.	Iron in ppb	Copper in ppb	Chromium in ppb	Zinc in ppb	Lead in ppb	Cadmium in ppb
S1	0.65	0.62	3.49	1.10	14.10	1.98
S2	0.64	0.44	4.10	1.06	13.59	1.59
S3	0.59	0.55	3.69	1.09	13.92	1.98
S4	0.65	0.48	4.14	1.03	14.61	2.40
S5	0.61	0.59	3.82	1.06	13.33	2.23
S6	0.53	0.52	3.85	1.15	14.92	2.26
S7	0.58	0.51	3.50	1.11	19.20	1.95
S8	0.67	0.51	4.15	1.20	18.95	1.80
S9	0.73	0.63	3.60	1.04	16.50	2.37
S10	0.69	0.56	3.80	1.23	13.25	2.40
S11	0.72	0.59	4.21	1.17	19.19	2.10
S12	0.52	0.62	4.11	1.09	12.95	2.43

S= Station

Table No. 3: Seasonal Variations in Heavy Metals of the Godavari River water in Winter season during the year 2011-12.

Station No.	Iron in ppb	Copper in ppb	Chromium in ppb	Zinc in ppb	Lead in ppb	Cadmium in ppb
S1	0.64	0.53	1.33	0.70	13.20	2.11
S2	0.54	0.48	1.17	0.60	12.51	2.03
S3	0.56	0.64	1.11	0.58	13.29	2.09

S4	0.60	0.54	1.20	0.70	16.10	2.11
S5	0.58	0.56	1.41	0.65	14.41	1.90
S6	0.52	0.63	1.33	0.80	15.75	1.95
S7	0.56	0.55	1.40	0.59	17.20	2.17
S8	0.49	0.65	1.32	0.71	11.19	2.25
S9	0.50	0.49	1.31	0.68	13.29	2.15
S10	0.60	0.50	1.56	0.75	16.73	2.33
S11	0.63	0.68	1.60	0.81	17.10	2.27
S12	0.61	0.61	1.19	0.79	16.10	1.98

S= Station

Fig. No1 : Seasonal variations in Iron (ppb) content of Godavari River water at different stations during the year 2011-12

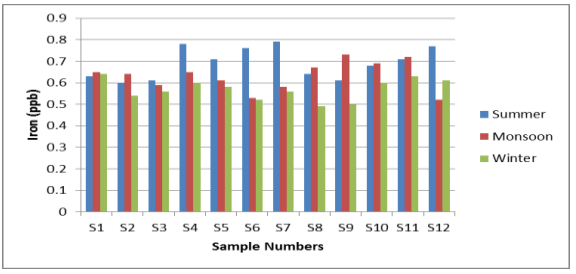


Fig. No. 2: Seasonal variations in Copper (ppb) content of Godavari River water at different stations during the year 2011-12

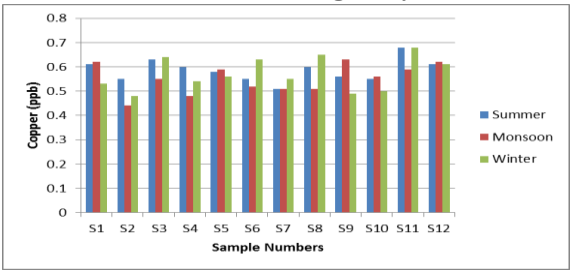


Fig. No. 3: Seasonal variations in Chromium (ppb) content of Godavari River water at different stations during the year 2011-12

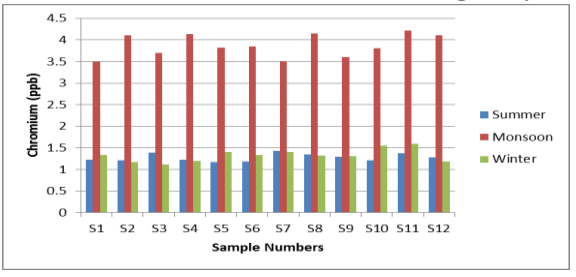


Fig. No. 4: Seasonal variations in Zinc (ppb) content of Godavari River water at different stations during the year 2011-12

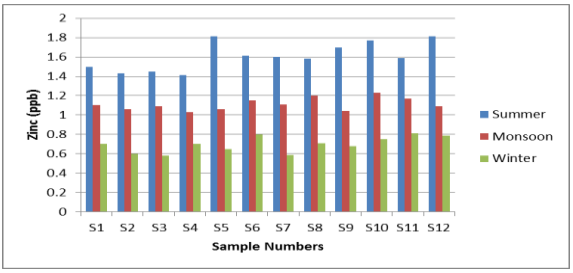


Fig. No. 5: Seasonal variations in Lead (ppb) content of Godavari River water at different stations during the year 2011-12

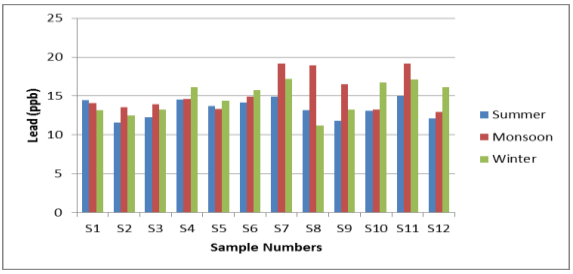
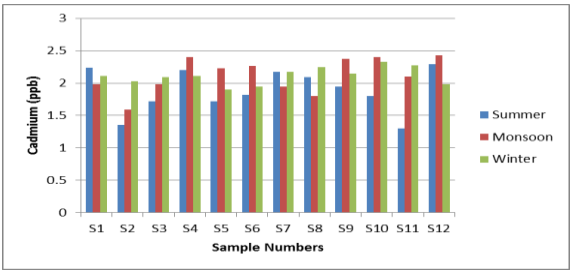


Fig. No. 6: Seasonal variations in Cadmium (ppb) content of Godavari River water at different stations during the year 2011-12



Conclusion:

The conservation of river is in the interest of man as it's ecological, cultural and tourist value is immense. This study will help in understanding the amount of toxic compounds (heavy metals) being received in the river and its biological magnification in animals, particularly those at the lower level of food chain. This study will also help to make aware those

local people or adjacent farmers for proper management of waste disposal and also to minimize use of synthetic inputs. The study indicated that increase in toxic waste day by day in river produced biological magnification in food chain, which is a challenge to scientists, policy makers, administrators and all those involved in the conservation of the environment.

REFERENCES:

Agency for Toxic Substances and Disease Registry, (ATSDR) (2001a): Draft Toxicological profile for Manganese, U.S. Department of Health and Human Services, *Public Health Service, Atlanta,* GA, 449.

Das. S.D. (2002). A text book of Environmental chemistry and pollution control measures. IIIrd ediation. *S. Chand Publication*: 22-23.

Ghorade, I.B. (2013). Ecosustainability Assessment of Godavari river water for sustainable Utilization, Ph.D. Thesis, Dr. B.A.M. University, Aurangabad.

Goyal Mamta, Dhar D.N. and D.C. Rupainwar (2006). An Assessment of Ground Water Pollution and its Chemical Quality in Some Parts of Unnao District. *Indian Journal of Environmental Protection*. 26 (2): P 116-124.

Hassan, A.A.S. (2012). Ground water quality of Aurangabad Industrial Area. Ph.D. Thesis Dr. B.A.M. University, Aurangabad

Kelkar, P.S., S.P. Pande., and M.Z. Hassn (2001): Status of industrial pollution sources in Damodar river basin. Proceddings of RAWM (*IAEM) National conference on Recent Advances in Waste management*: 20-22.

Lohar P.S. (2000). Comparative toxicology of four heavy metals in freshwater fishes. *J. of Aqua. Bio.,* 15 (1 & 2): 95-98.

Matkar, R.R. (2008). Eco-Sutainability Assessment of Godavari river water at Jaikwadi Dam supplied to Aurangabad City. Ph.D. Thesis Dr. B.A.M.University, Aurangabad.

Patil S.S., Thakur V.R., and Ghorade. I. B. (2014): Analysis of heavy metals in Jaikwadi Dam water, Maharashtra (INDIA). – IMPACT: International Journal of Research in Applied, Natural and Social Sciences (IMPACT: IJRANSS) Vol.2 (5) 2014. Pp 69-74.

Schroeder, H. A. (1965): Cadmium as a factor in hypertension. *Journal of Chronic Diseases,* 18; 647-656.

Willard, H.H, L.L, Merrytt, J.A Dean, and F.A Settle (1986). Instrumental methods of analysis (C.B.S) Publishers and Distributors, New Delhi. Pp. 140-145.