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ASSESSMENT OF HEAVY METAL CONTENT IN GODAVARI RIVER WATER

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ABSTRACT

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.

KEYWORDS: 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), Lead (Pb), Cadmium (Cd), Zinc (Zn) and Fluoride (F) of the Godavari river water.

MATERIAL AND METHODS

For analysis 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, Manganese, Lead, Cadmium, Zinc and Fluoride 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), Zinc (Zn) and Fluoride (F) were carried out in the present work.

RESULTS AND DISCUSSIONS

In the study areas following heavy metals in the river water were analyzed in ppb unit and results obtained are given [Table 1 and Figure 1].

Iron (Fe)

The concentration of Iron in ppb level during the year 2010-11 was varied from 0.53 (S7) to 0.606 (S4). 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 2010-11 was varied from 0.433 (S2) to 0.57 (S11). 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 2010-11 was varied from 1.833 (S2) to 2.236 (S12). 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.

Lead (Pb)

The variation of Lead metal in ppb level during the year 2010-11 was varied from 11.646 (S1) to 16.466 (S7). 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 the year 2010-11 was varied from 1.406 (S2) to 2.18 (S12). 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).

Zinc (Zn)

The concentration of Zinc in ppb level during the year 2010-11 was varied from 0.946 (S4) to 1.133 (S11). 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.

Fluoride (F^-)

The variation of fluoride in ppb level during the year 2010-11 was varied from 0.166 (S2) to 0.25 (S6). As fluoride is naturally present in water it becomes toxic to animal and human being when present at more than 1.0 mg/l concentration in drinking water. At the level of 1.5 mg/l, molting of teeth and bones has been reported (Goyal *et. al*., 2006).

CONCLUSIONS

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.

Table 1: Variation in Heavy Metals (ppb) of the Godavari River Water 2010-11

Station No.	Iron (Fe)	Copper (Cu)	Chromium (Cr)	Lead (Pb)	Cadmium (Cd)	Zinc (Zn)	Fluoride (F)
S1	0.586	0.44	1.88	11.646	1.746	1.023	0.196
S2	0.566	0.433	1.833	12.14	1.406	0.976	0.166
S3	0.553	0.443	1.953	13.096	1.606	0.97	0.21
S4	0.606	0.466	1.866	12.183	1.793	0.946	0.266
S5	0.53	0.456	1.986	12.95	1.816	1.04	0.216
S6	0.57	0.456	1.916	14.38	1.87	1.016	0.25
S7	0.53	0.47	2.163	16.466	2.093	1.05	0.176
S8	0.58	0.486	1.986	14.04	2.106	1	0.206
S9	0.59	0.483	1.973	14.36	1.783	1.096	0.223
S10	0.576	0.563	2.17	15.78	2.143	1.016	0.21
S11	0.6	0.57	1.93	15.45	2.143	1.133	0.233
S12	0.543	0.536	2.236	14.573	2.18	1.023	0.243

* All values are in ppb

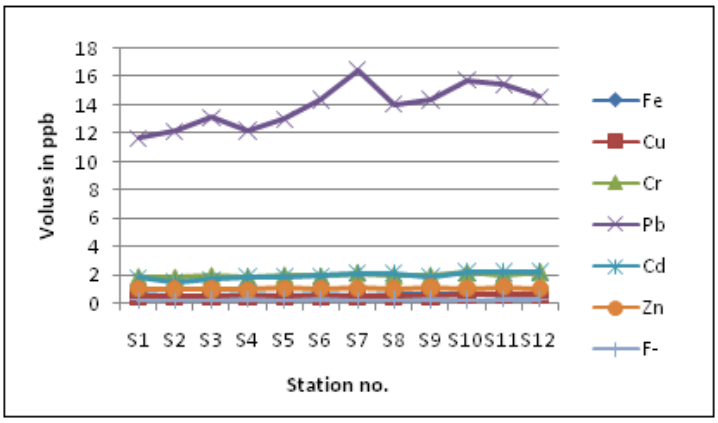

Figure 1: Variation in Heavy Metals (ppb) of the Godavari River Water 2010-11

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