International Journal of Advances in Engineering and Management (IJAEM)
Volume 6, Issue 02 Feb 2024, pp: 588-591 www.ijaem.net ISSN: 2395-5252

A Study on the Presence of Heavy Metal Pollutants in the Water of River Kaliyasot Bhopal (M.P.)

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Date of Submission: 28-02-2024 Date of Acceptance: 08-03-2024

ABSTRACT: Now a day's environmental pollution has become a major and burning problem all around the world. Our country is facing many problems but the problem of availability of clean drinking water is becoming more and more serious day by day because of fast growth in industrialization, urbanization, agricultural activities, mining, use of modern techniques and some religious practices etc which causes many harmful alterations in the nature. All these human activities add up injurious heavy metals into the ecosystem. Microelement such as Manganese, Chromium, Copper, Lead, Zinc, Cadmium, Nickel have been indentifies as inimical to human health and aquatic ecosystem.

Keywords: Environmental problem, industrialization, anthropogenic activities, and heavy metals.

I. INTRODUCTION:

Being the world we inherit this day is what our ancestors left on us; the future generations would inherit the heritage we leave for them. Water is supreme most need for life on earth. Water is ideal liquid, without it life is impossible. Water "The Concoction of Life" is cladding a severe ultimatum due to heavy pollution. Due to unplanned and intensive industrialization and urbanization all water resources have been come to a point of crisis because of it, the requirement of water from micro-organism to man (all forms of living organisms) is a consequential problem today[1,2]. The present research concern here isabout pollution of water in river Kaliyasot, Bhopal "City of Lakes" which is the capital city of Madhya Pradesh. The Kaliyasot river appears from the famous Kaliyasot Dam as its over flow. River flows in south-east direction and joins the river Betwa near Shiv Temple of Bhojpur[3]. Its length is approx 29 km. Bhopal's one and only national park (VanViharNational Park) is situated in its catchment area. The river Kaliyasot has a negative impact on its water quality due to various anthropogenic activities, developmental practices, and unplanned extended townships around it[4].

Photo showing Kaliyasot river under environmental stress

During festive times like Ganesh Chaturthi, Navratris and Muhurram every year, idols are being immersed in Kaliyasot River which is also one of the main causes of heavy metal pollution in the river[5]. Sindhoor which contains heavy metal like Lead and Chromium are very toxic even in minute traces for human beings[6].

Heavy metals are toxic chemicals which affect all forms of life constitute an important group of environmentally hazardous substances. Water bodies play a conclusive role in bio-geochemical cycles on earth so that they are significant part of biosphere. They give habitat, shelter, and food for biodiversity. Many heavy

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metals are donated by corrosion of metal pipes. During rainy season run-off waters from surroundings rich in heavy metals like Copper, Chromium etc. Automobiles released Lead into atmosphere find its way in the run-off water[7].Different activities by man may induce alteration in sensitive water sources, ecological conditions, and ecosystem of many water bodies in countries, are destroying as a result of population explosion, intensive agricultural practices, change in land use pattern and increase industrialization are affecting natural condition of water bodies[8,9]. In this way water pollution refers "ANYTHING OTHER THAN TWO ATOMS OF HYDROGEN AND ONE ATOM OF OXYGEN IS A WATER CONTAMINANT".

II. MATERIALS AND METHOD:

Kaliyasot River exposed to extensive anthropogenic stress, collect heavy inputs of domestic waste and sewage. 5 sampling sites were selected for this work. The samples were collected on 27.08.2022 in the month of august in rainy season and subjected to analysis following the procedures prescribed by APHA (1995). Physical parameters like temperature, pH and selective heavy metals were analyzed. For testing the presence of heavy metals, the samples were preserved by adding 5 ml of concentrated nitric acid in 1 litre of sample to maintain the pH below 4.0.Following the procedure suggested by Agemia and chau[10]. The collected samples than filtered through Whatmann filter paper no. 40 and the filtrate used for analysis in the atomic absorption spectrometer (Perkin Elmer Analyst 100). At the time of sampling the samples are acidified as per standards, international method reference given byAPHA[11].

III. RESULTS AND DISCUSSION:

The color of water found to be green because of algae and aggregation of nutrients, untreated sewage, and eutrophication, having foul smell in summer. The water color turns muddy in rains and the intensity of odor disappears gradually. The green color of water is due to the floating green algae in the surface waters. High productivity rates are related with fertile or green color or large algal bloom during summer months. The foul smell is because of the decomposition of organic matters in the water.

Table showing Quantitative analysis of some heavy metals at different selected sites of river Kaliyasot

Sno	Heavy Metal	UNIT	AT ROAD BRIDGE SARVADHAM KOLAR ROAD BHOPAL SITE I	AT ROAD BRIDGE DANISH KUNJ BHOPAL SITE II	AT ROAD BRIDGE SALAIYA BHOPAL SITE III	AT ROAD BRIDGE MANDIDEEP BHOPAL SITE IV	BEFORE CONFLUENCE WITH RIVER BETWA SITE V
1	Copper	mg/L	1.93	0.64	0.19	0.07	0.36
2	Cadmium	mg/L	ND	ND	ND	ND	ND
3	Manganese	mg/L	0.1	ND	ND	0.05	0.01
4	Chromium	mg/L	0.05	0.04	0.02	0.02	0.03
5	Nickel	mg/L	ND	ND	ND	ND	ND
6	Iron	mg/L	0.62	0.26	0.52	0.08	0.21
7	Zinc	mg/L	0.62	0.2	0.21	0.03	0.11

Temperature is one of the physical limiting factors in the aquatic ecosystem. It maintains solubility of gases, salts, and behavioral characteristics of organisms. The temperature found is between 23 °C to 23.1 °C at different sites. Not much alterations is seen at various sites during the work. Heavy metal load in the water and sediment was also announced in surface water sources polluted due to raw sewage discharge[12,13,14,15]. For controlling biological growth in reservoirs and distribution pipes copper salts are used in water supply system. Copper containing pipelines and fittings, municipal waste and sewage are the principal manmade sources of copper contamination in the water sources. Large amount of copper in drinking water are toxic, the USPH limit (United States Public Health Service 1962) in drinking water is set as 1.0 mg/L.

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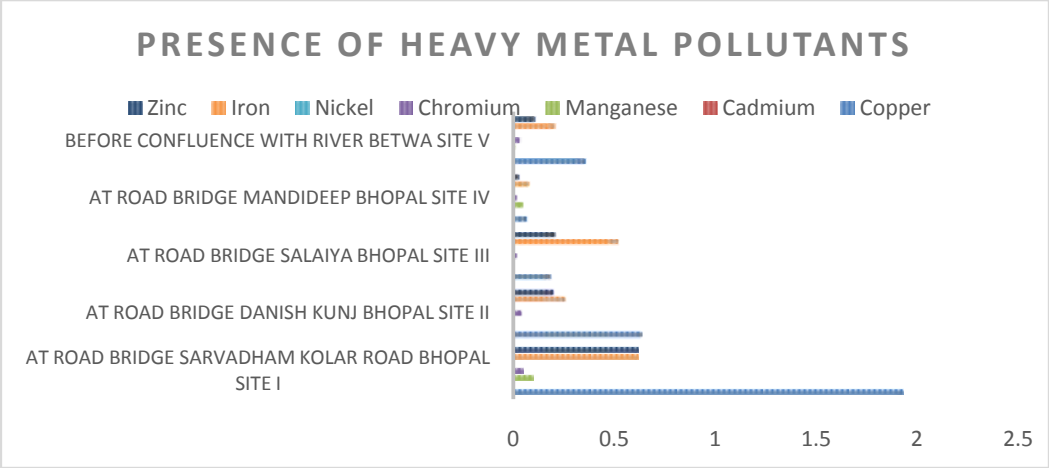
Maximum concentration is 1.93 mg/L at site I whereas minimum 0.07 mg/L at site IV.Copper being highly toxic to most invertebrates, fishes, and aquatic plants than any other heavymetal except Mercury. Excess presence of copper in water reduces growth and reproduction in plants and animals. The chronic levels of copper is 0.02 – 0.2 mg/L[16,17]. Copper is toxic for organisms when its rate of absorption is greater than its rate of excretion. It results in bioaccumulation and biomagnifications in higher trophic levels.During the research work in the month of rainy season Cadmium is not detected at any site selected for the work. Higher value may be obtained in the month of September and October after the idol immersion activity, as the most of the load of dissolved paints and pigments used for making idols. There are few noted incidents of Cadmium toxicity in man due to contaminated fish consumption. Cadmium is less toxic to plants than Copper.Manganese despite of the fact that is not toxic heavy metal, it gives offensive and firm stains to laundry. The maximum permissible limit of manganese is 0.05 mg/L according to international standards for drinking water. The maximum level reported at site I is 0.10 mg/L and minimum is 0.01 at site V.Compounds of Chromium used as mordents, pigments, dyes in the textiles and tanning agents in the leather. Presence of Chromium in water bodies is due to anthropogenic sources like municipal wastage, laundry chemicals, paints, leather, road run-off, radiations, brake wires and corrosion of bushings etc. The permissible limit for Chromium in drinking water according toUSPH standard is 0.05 mg/L[18].Maximum0.05 mg/L at site I and minimum value 0.02 at site III and IV wereobserved. Higher levels of heavy metals obtained in summer because of high rate of evaporation, results in increasing concentration in the water. During and after rainy season the concentration of heavy metal gradually decreases[19].



Nickel is not detected during the work period in any of the sampling sites of Kaliyasot River. Deficiency of iron causes anemia in man. Hence its good level presence is necessary. During the work maximum level of iron is detected 0.62 mg/L at site I and minimum 0.08 at site IV. Zinc is an important metal necessary for the activity of more than 300 enzymes that aid in digestion, metabolism, nerve function and many other processes, and also important for the development and function of immune cells. Zinc is considered to be relatively nontoxic but it extreme high amount causes nausea, vomiting, epigastric pain, lethargy and fatigue in man. Maximum value obtained is 0.62 mg/Lat site I and minimum is 0.03 mg/L at site IV during the research work.

IV. CONCLUSION:

Loading of heavy metal in the reservoir depicts the heavy metal toxicity of the water source which changes sharply at different sampling sites. Most of the heavy metal leave deep impact if they present beyond their permissible limits in water or toxic to aquatic flora, fauna, and human beings. Present research work shows that Kaliyasot river of Bhopal is polluted with heavy metals due to unplanned industrialization, untreated sewage and urbanization and its water is not suitable for drinking purposes and can only be used for irrigation prospective. Regular monitoring of water quality is mandatory to assess the condition of surface water of the river and immediate steps should be taken to check the anthropogenic activities in the river's catchment area. This will be helpful in saving the Kaliyasot River from heavy metal pollution.

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