(RESEARCH ARTICLE)

Determination of the level of some heavy metals from medchal lake in Telangana

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Abstract

The aim of this study is to review the research work on concentration of heavy metals in drinking water sources of Medchal Lake. Industrial effluents discharged into the environment, aquatic ecosystem pose a serious threat to our agricultural Products and health. In view of this, levels of some of the heavy metals in Medchal Lake were determined by Atomic Absorption Spectrophotometry. The results obtained show that the mean values of all heavy metals (with the exception of Zn) in water samples from the polluted areas studied were significantly higher than in the control sites, Zn, Pb, Cr, Cu, Ni, Co, Ag, Fe and Mn were determined in water samples collected from Medchal lake. The results for heavy metals analyzed indicated that they are below the limit of admissible concentrations. Although low level of heavy metals was discovered in the lake water and they are within the permissible limits.

Keywords: Heavy metals; Spectrophotometry; Industrial effluents; Atomic Absorption; Medchal lake

1. Introduction

Heavy metals are elements having atomic weight between 63.545 and 200.5g (Kennish, 1992)[1] and a specific gravity greater than four (Connel et al., 1984)[2]. The toxicity of these metals has also been demonstrated throughout history. Greek and Roman physicians diagnosed symptoms of acute lead poisoning long before toxicology became a science. In recent years, special numbers and their applications were among the in dispensable fields of many branches of science. Special numbers are frequently used in statistics methods and their applications, chemical components discussed in this study are also very common and useful areas in applied sciences. Once the heavy metals enter the food chain, they may end up accumulating in the human body (Barakat 2011) [3]. Exposure to heavy metals has been linked with developmental retardation, various cancers, kidney damage and even death (Abdulaziz and Mohammed, 1997)[4]. Heavy metals have a marked effect on the aquatic flora &fauna which through biomagnifications enters the food chain and ultimately affect the human beings as well(Ram S Lokhande et al.,2011)[5]. A legacy of incident tells us about the seriousness of high levels of exposure to some metals, especially cadmium and methyl mercury (Nriagu, 1992) [6]. In the 1950s, chronic poisoning from rice coupled with dietary deficiencies caused epidemic of kidney damage and a painful skeletal disease among middle – aged women in Japan, the itaitai disease (Gebrekidan etal.,2011)[7]. Also in Japan, mercury poisoning from fish in a polluted bay became known as Minimata disease. The need for clean water is increasing due to population growth. Issues such as climate change, misuse of water, and concentration of heavy metals in water have increased the importance of surface water used in agriculture, animal husbandry, and industry. The results of chemical analysis of surface waters create data for statistical analysis. Recent studies in this field have shown that issues such as the use of statistical methods in engineering and the interpretation of symmetric or asymmetric distributions of the obtained distributions have started to attract attention. Study on the heavy metal in aquatic ecosystems can give valuable information about the environmental condition of that ecosystem. Water and sediment of the polluted sites contains various levels of heavy metals. Measurement of heavy metals in both water and sediment

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samples can show the condition of the ecosystem regard to heavy metal pollution. (Du Plessis, 2015)[8]. On the other hand, aquatic organisms are the target of heavy metal intoxication, which accumulate large volume of heavy metals in their tissues.

Study on the heavy metal in aquatic ecosystems can give valuable information about the environmental condition of that ecosystem. Water and sediment of the polluted sites contains various levels of heavy metals. (M. Ali 2016) [9]. Measurement of heavy metals in both water and sediment samples can show the condition of the ecosystem regard to heavy metal pollution (R. S. Pandey et al., 2009) [10]. On the other hand, aquatic organisms are the target of heavy metal intoxication, which accumulate large volume of heavy metals in their tissues. Consumed by larger animals, they can transfer their heavy metals in the food chain. Thus, determination of heavy metal content in benthic organisms' tissue may be valuable.

2. Materials and methods

2.1. Description of Study Area

Medchal Lake also called as Peddacheruvu by local area peoples. Located in Medchal, is listed with the Hyderabad Metropolitan Development Authority's (HMDA) Lake Protection Committee. The lake was surveyed in 2013 and according to that report, the water spread area is about full tank level area is 356 acres and its bund length is 1,200 meters. Lake Latitude 170.251 17.0004'' N, Longitude 780.331 16.3800'' E. It is 30 km away from Secunderabad Railway Station and 45 km from the Rajiv Gandhi International Airport. The lake was once used to provide water for agriculture and allied activities and was a source of drinking water. The lake attracted migratory birds in the winter. According to locals, this is the largest lake in the mandal consisting of 18 villages including Medchal village. Hence it is popularly known as Pedda Cheruvu .It is said that it has been in existence since the Nizam's Era.

2.2. Sample Collection & Method

The method employed by Environmental Protection Agency as reported by Gregg 1998 [11], was adopted for the collection of water samples. The immediate source of water for the irrigation was used. The sources include the effluents pumped by the farmer's machines for irrigation and also from the channels leading away from the industries. The water from the control site was directly collected from the lake and then from the channels leading to the farmlands. The composite samples of water were collected inprerinsed plastic containers and mixed to make representative samples.

The EPA vigorous digestion method described by Gregg was adopted. 100ml of each of the representative water samples were transferred into Pyrex beakers containing 10ml of concentrated HNO3. The samples were boiled slowly and then evaporated on a hot plate to the lowest possible volume (about 20ml). The beakers were allowed to cool and add 5ml of Conc. HNO3 was added. Heating was continued with the addition of Conc. HNO3 as necessary until digestion was complete. The samples were evaporated again to dryness (but not baked) and the beakers were cooled, followed by the addition of 5ml of HCl solution (1:1 v/v). The solutions were then warmed and 5ml of 5M NaOH was added, then filtered. The filtrates were transferred to 100ml volumetric flasks and diluted to the mark with distilled water. These solutions were then used for the elemental analysis. Analysis of Heavy metals has been done by using Atomic absorption spectroscopy.

3. Results and Discussion

Analysis of Heavy metals such as Cadmium, Copper, Iron, Nickel, and Lead was conducted only twice in a year 2021, September and March months. Values are recorded in September month in Medchal Lake 0.25 µg/l, 3.46 µg/l, 15.62 µg/l, 0.28 µg/l, and 0.35 µg/l. These values were reported as 0.34 µg/l, 4.35 µg/l, 18.35 µg/l, 0.38 µg/l, and 0.54 µg/l respectively in March. They found heavy metals within the permissible limits. Along with heavy metals some of the micronutrients (Zn, Cu, Fe and Mn) present in pond water indicated its high nutrient value.
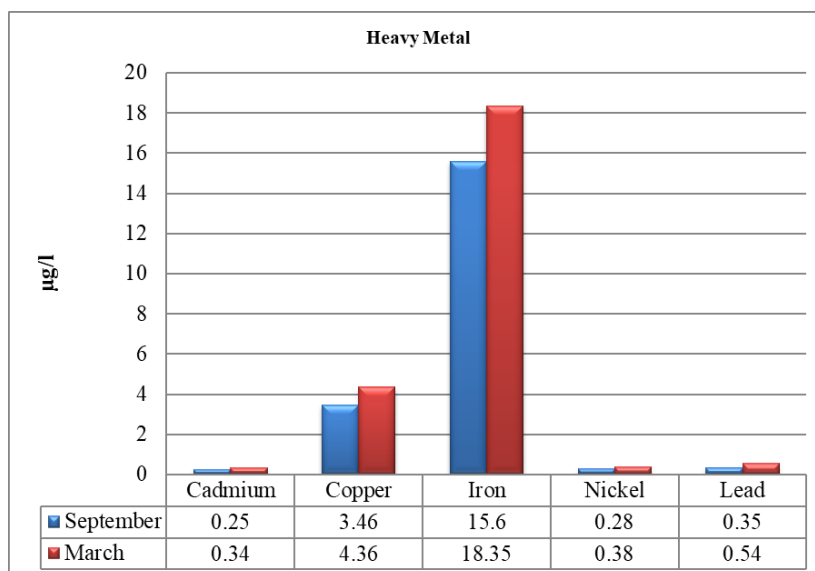
Figure 1 Graphical Data on Heavy Metal Analysis at September & March

4. Conclusion

On account of the research the drinking water samples contain metal concentration not more than the admissible. The results for heavy metals analyzed indicated that they are below the limit of admissible concentrations. Although low level of heavy metals was discovered in the lake water and they are within the permissible limits (WHO 2008) [12]. For avoid heavy metal pollution in lake water, suggestion to local people need constant monitoring of various water sources, and if the heavy metal concentration levels increase in lake water pollution signaling a major proportion of the populace are at a significant risk given the toxicity of these metals.

Compliance with ethical standards

Acknowledgments

Disclosure of conflict of interest

The authors (Dr Raju Potharaju, Prof M. Aruna) declare no conflict of interest.

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