International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2013): 6.14 | Impact Factor (2014): 5.611

The Study of Seasonal Variation in Copper Metal Concentration from Lendi River, District Nanded, Maharashtra, India

Bimbisar D. Waghmare, A.N. Kulkarni

Department of Fishery Science, N.E.S. Science College, Nanded (M.S.) India

Abstract: ***Lendi River is one of the tributary of river Manar, originates at Malkapur dist. Latur and joins to river Manar at Degloor, dist Nanded. Water of this Semi-perennial river is used to perform various activities such as industrial, irrigation, fisheries and human activities. Copper is an essential trace element required in small quantity (5 to 20µg/g) for carbohydrate metabolism and the functioning of more than 30 enzymes. However, copper concentrations over 20 µg/g can be toxic. Hence concentration of Copper metal was estimated from July 2010 to June 2011. Average estimated value of Copper at Station-I is 0.412 mg/l, Station.-II is 0.342 mg/l & Station-III is 0.415 mg/l. Details of estimation of Copper is discussed in the text.***

Keywords: Seasonal Variations, Copper, Lendi, River, Nanded District, Water

1. Introduction

The aquatic environment with its water quality is considered the main factor controlling the state of health and disease in both cultured and wild fishes. Pollution of aquatic environment by inorganic and organic chemicals is a major factor posing serious threat to the survival of aquatic organisms including fishes. The ultimate source of the body trace elements are generally rocks. The concentration of trace elements in rocks is varying by rock type. Sometimes, they become concentrated in soil, water, or in air taken up by plants and ingested by humans or animals. The contamination of water is directly related to the degree of contamination of environment. Rainwater collects impurities while passing through the air. Streams and rivers collect impurities from surface run off and through the discharge of sewage and industrial effluents; these are carried to the rivers, lakes or reservoirs **(Salem *et.al.*, 2000)**. Metal ions can be incorporated into food chains and concentrated in aquatic organisms to a level that affects their physiological state. Of the effective pollutants are the heavy metals which have drastic environmental impact on all organisms.

Lendi River flows in two district of Maharashtra, Latur and Nanded. It originates at village Malkapur in Taluka Udgir and Latur district. The total length of Lendi River from its origin to drain is 125 km. In Nanded District River Lendi starts near village Bamni in Mukhed taluka, and it covers total length in Nanded district is about 65 km. and a major project is under construction at Gonegao. In its course it receives a variety of domestic and agricultural waste which pollutes the river.

Extensive work on the Heavy Metals of riverine system has been carried out by several workers Viz. **Khan *et.al.*, (1981)** reported Heavy metals in water and sediments have an impact on aquatic vegetation to accumulate metals in their bodies. **Polprasert (1982)** worked on the heavy metal pollution in the Chao Phraya river's estuary. **Manga (1983)** reported that the industrial effluent input to the tributary rivers and direct discharge into the river Lagan was the most likely sources of heavy metal contamination in tidal Lagan sediments. **Ajmal *et.al.*, (1985)** investigated metal concentration in water and sediments from Delhi to Allahabad. **Datar** and **Vasistha (1990)** estimated heavy metals in water and silt sediments of Betwa river. **Ali** and **Jain (2001)** studied water quality of the Yamuna river at Delhi with reference to toxic metals during pre- and post-monsoon seasons. **Kar *et.al.*, (2008)** studied 96 surface water samples from river Ganga in West Bengal during 2004-05 for Fe, Mn, Zn, Cu, Cd, Cr, Pb and Ni. **Nair *et.al.*, (2010)** studied water quality of the Meenachil river at Kottayam for pH, Electrical conductivity and trace metals during May 2009- Sep. 2009. **Reza** and **Singh (2010)** studied heavy metals concentrations in from twelve different locations along the course of the river Brahmani and its tributaries in Angul Talcher region on summer and the winter seasons. **Lokhande *et.al.*, (2011)** recorded heavy metals from Kasardi river flowing along Taloja Industrial area of Mumbai, India. **Manoj *et.al.*, (2012)** studied heavy metals in the Subarnarekha River water at State Jharkhand (India). Reports on study of Copper metal of river Lendi are not available hence present work were under taken to study Copper metal of River Lendi.

2. Material & Methods

Water sample were collected in polythene bottles at morning hours from three stations (Mukramabad S1, Gonegao S2 & Bahegao Road S3) at regular interval of one month from July 2010 to June 2011, for the estimation of Copper, water samples brought to the laboratory. Copper was analysed by extraction method. Water samples extracted in Methyl isobutyl ketone (MIBK). MIBK layer was injected in Atomic Absorption Spectrometer with a specific lamp for copper metal. The working wave length for the Copper Cu, 232 nm **(APHA, 2000)**.

3. Results & Discussion

The use of copper to kill algae, fungi and molluscs demonstrates that it is highly toxic to aquatic organisms. In

fact, copper is one of the most toxic metals to aquatic organisms and ecosystems. It is moderately soluble in water and binds easily to sediments and organic matter. Bio-concentration, which means that the concentration of copper is higher in plants and animals than in the water or sediments in which they live, is particularly high in animals found in the sediments at the bottom of a water body and in shellfish, such as oysters, that can filter materials from large volumes of water. Algae, especially blue-green algae species, are 1,000 times more sensitive to the toxic effects of copper than are mammals. The effects of copper on aquatic organisms can be directly or indirectly lethal. Gills become frayed and lose their ability to regulate transport of salts such as sodium chloride and potassium chloride into and out of fish. These salts are important for the normal functioning of the cardiovascular and nervous systems. When the salt balance is disrupted between the body of a copper-exposed fish and the surrounding water the death of the fish can result. Copper toxicity to fish gills will be higher if the pH of the water is acidic, the water has low buffering capacity or the water is soft, i.e., has a low concentration of calcium ions. Copper also adversely affects olfaction (sense of smell) in fish. Detection of odours occurs when dissolved odorant molecules bind with olfactory receptor molecules. The direct contact of fish olfactory tissues with the surrounding water facilitates copper uptake. Copper can affect olfaction by competing with natural odorants for binding sites, by affecting activation of the olfactory receptor neurons or by affecting intracellular signalling in the neurons **(Solomon, 2009)**.

The Copper content was within the MPCB permissible limits for all the stations. Copper concentration ranged between 0.115 to 0.895 mg/L for station-I, 0.122 to 0.606 mg/L for station-II and 0.115 to 0.966 mg/L for station-III. Annual average of Copper in three stations revealed that the maximum annual average was observed (0.415mg/L) at station-III and it was minimum (0.342mg/L) at station-II (Table No. 1 & Figure No.1).

Copper concentrations of water samples of all stations are lower than MPCB recommended for best designated usages. Similar observations were made by **Asonye *et.al.*, (2007)** noted in three rivers Orionwon, Ethiope and Igbagho, Cu was not detected in any of the samples. **Kar *et.al.*, (2008)** reported in river Ganga concentrations of Cu was within the safe limit BIS, (1991). **Sanayei *et.al.*, (2009)** reported that Cu below the world river (2000) & EC standards at Zayandeh Rood river. **Batayneh (2010)** observed Cu concentrations in river Yarmouk between 0.0017 and 0.009 mg/L for the dry season and from 0.0034 to 0.0097 mg/L in wet season. Cu concentrations of water samples for both seasons were lower than the MPCL (JISM, 2008). Results of **Bouraie *et.al.*, (2010)** showed that the Cu (<0.002–0.041mg l^{-1}) concentrations in surface water of Rosetta branch were found within the permissible limits of both Egyptian law 48/1982 and FAO (1985). **Sabhapandit *et.al.*, (2010)** studied Cu concentration in river Brahmaputra and observed between (0.027mg/L – 0.038mg/L) in all sources below the permissible limit (WHO 2004). **Nair (2010)** observed Copper content between (0.03-0.35mg/L) at Meenachil river. It was within the WHO permissible limits.

Saeed *et.al.*, (2014) studied mean concentration of Cu in water and sediment samples before and after the sewage entry into the Tembi river. The results of the analysis of water and sediment samples in upstream and downstream of the river revealed that the mean concentration of copper in the downstream was higher than that of the upstream in different seasons. It is to be noted that the mean concentration of copper in downstream and upstream has increased from summer 2011 to spring 2012.

The study reveals that the water in Lendi River shows seasonal variations in Copper metal which may be attributed to the local climatic conditions and water exchange mechanism.

4. Acknowledgement

The authors are thankful to Principal, N.E.S. Science College, Nanded & Central Laboratory of S.G.B. University, Amravati for providing laboratory & library facilities. The first author is thankful to UGC for financial support and encouragement through awarding Maulana Azad National Fellowship for Minority Candidates (2009).

References

[1] **Ajmal M.M., A. Khan** and **A.A. Nomani (1985a):** Distribution of heavy metals in water and sediments of selected sites of Yamuna River. *Environmental Monitoring and assessment*, 205-214p.

[2] **APHA (2000):** (American Public Health Association Manual) *Standard Methods for Examination of Water and Waste Management*. 19^{h} edition AWWA-APCF Washington, DC 20005.

[3] **Ali I.** and **Jain C.K. (2001):** Pollution potential of toxic metals in the Yamuna River at Delhi, India. *Journal of Environmental Hydrology*, Vol. 9, 1-9p.

[4] **Asonye C.C., Okolle N.P., Okenwa E.E.** and **Lwuanyanwu U.G. (2007):** Some physico-Chemical Characteristics and Heavy Metal Profiles of Nigerian Rivers, streams and waterways. *African Journal of Biotechnology*, Vol. 6(5): 617-624p.

[5] **Batayneh Awni T. (2010):** Heavy metals in water springs of the Yarmouk basin, North Jordan and their potentiality in health risk assessment. *International Journal of the Physical Sciences*, Vol. 5(7): 997-1003p.

[6] **Bouraie M.M. El., A.A. El. Barbary, M.M. Yehia** and **E.A. Motawea (2010):** Heavy Metals Concentrations in surface River water and bed sediments at Nile Delta in Egypt. *Research Notes*, Vol. 61(1): 1-12p.

[7] **Datar M.D.** and **Vasistha R.P. (1990):** Investigation of heavy metals in water and silt sediments of Betwa River. *Indian Journal of Environmental Protection*, 10(9): 666-672p.

[8] **Khan N.A., A. Ahmad, A.A. Nomani** and **M. Ajmal (1981):** Atomic Absorption Spectrophotometric studies on commercial fertilizers as a source of Cd and Zn in soil and River water. *Environmental Pollution*, 13(2): 259-264p.

[9] **Kar D., P. Sur, S.K. Mandal, T. Saha** and **R.K. Kole (2008):** Assessment of heavy metal pollution in surface water. *International Journal of Environmental Science Technology*, 5(1): 119-124p.

[10] **Lokhande R.S., P.U. Singare** and **D.S. Pimple (2011):** Pollution in water of Kasardi River flowing along Taloja Industrial area of Mumbai, India. *World Environment*, 1(1): 6-13p.
[11] **Manga N. (1983):** Heavy metal concentration in the sediments of the tidal section of the River Lagan. *International Journal of Environmental Science*, 2: 60-64p.
[12] **Manoj Kumar., P.K. Padhy** and **S. Chaudhury (2012):** Study of heavy metal contamination of the river water through Index analysis approach and environmetrics. *Bulletin of Environment, Pharmacology and Life Sciences*, Vol. 1(10): 07-15p.
[13] **Nair S.R., S.K. Pandey, A. Sharma** and **S.S. Salim (2010):** Performance of Fisheries Co-operatives in India- An Evaluation of Primary Societies in Thane District of Maharashtra. *Journal of Fisheries Economic & Development*, Vol. XI (2): 16-27p.
[14] **Polprasert C. (1982):** Heavy metal pollution in the Chao Phraya River's estuary, Thailand. *Water Research*, 16: 775-784p.
[15] **Reza R.** and **Singh G. (2010):** Heavy metal contamination and its indexing approach for River water. *International Journal of Science Technology*, 7(4): 785-792p.
[16] **Salem H.M., Eweida A., Eweida** and **Azza Farag (2000):** Heavy Metals in Drinking Water and their Environmental Impact on Human Health. *ICEHM2000, Cairo University, Egypt*, 542- 556p.
[17] **Sanayei Y., N. Ismail** and **S.M. Talebi (2009):** Determination of Heavy Metals in Zayandeh Rood River, Isfahan-Iran. *World Applied Sciences Journal*, 6(9): 1209-1214p.
[18] **Solomon F. (2009):** Impacts of Copper on aquatic ecosystem and human health. *Environment & Communities*, 25-28p. http://go.mining.com/april09-a9
[19] **Sabhapandit P., P. Saikia** and **A. Kr. Mishra (2010):** Statistical analysis of heavy metals from water samples of Tezpur sub-division in Sonitpur district, Assam, India. *International Journal of Applied Biology and Pharmaceutical Technology*, Vol. I (3): 946-951p.
[20] **Saeed Shanbehzadeh, Marzieh Vahid Dastjerdi, Akbar Hassanzadeh,** and **Toba Kiyanizadeh (2014):** Heavy Metals in Water and Sediment: A Case Study of Tembi River. *Journal of Environmental and Public Health*, Vol. 2014, Article ID 858720, 5 pages http://dx.doi.org/10.1155/2014/858720.

Table 1: Shows Range value, Mean value & Standard Deviation of Copper metal

Stations	Range Value (mg/l)		Mean Value & Standard Deviation
	Min.	Max.	
Station-I	0.115	0.895	0.412±0.25
Station-II	0.122	0.606	0.342±0.19
Station-III	0.115	0.966	0.415±0.28

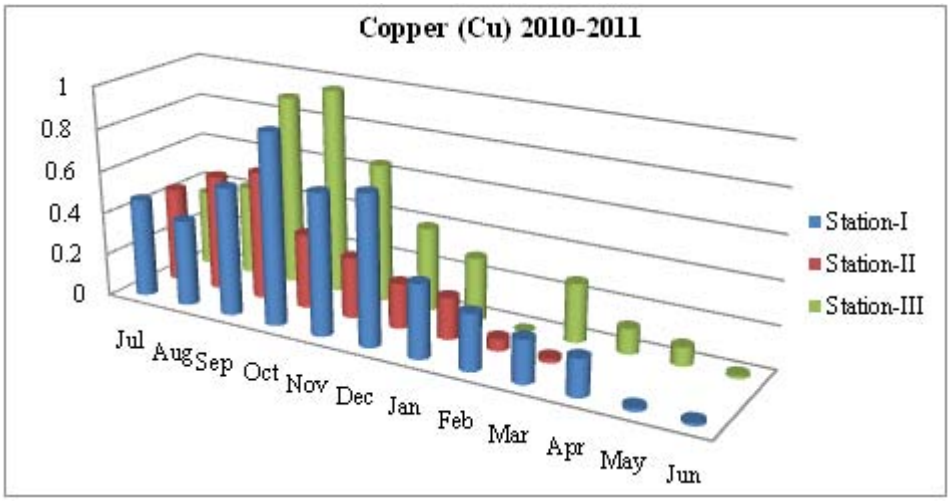

Figure 1: Shows Seasonal variations of Copper metal in Lendi River from July 2010 to June 2011