



Pelagia Research Library
Der Chemica Sinica, 2010, 1 (2): 104-109



The study of zinc metal concentration by spectrophotometric method from Godavari River at Nanded, Maharashtra

Sayed Juned A and Bhosle Arjun B

School of Earth sciences, Swami Ramanand Teerth Marathwada University,
Visnupure, Nanded 431606 (MAHARASHTRA) INDIA.

ABSTRACT

The history, culture, current and future socio-economic status and environmental sustainability of Nanded and its people is intricately linked with the river Godavari. The Godavari is primary source of water for a multitude of strategically important water uses such as drinking, fishing, industrial use, livestock and irrigation and there is a critical need to ensure the security of the Godavari River against any natural or anthropogenic threats and to develop an effective water resource system. The main sources of zinc in aquatic system are metal production unit and other industrial source. Zinc is nutritionally an essential element for humans, plants and animals. Drinking water can become a source of metal in human body and may result in deficiency or health hazards. In the present investigation the Godavari river at Nanded city is selected as study area. The water sample is collected from different point sample S_1 and S_2 for the period of Jan to December 2009. The sample is analyzed for zinc content by 'Dithiozone' method on spectrophotometer at 535 nm. In the present study the zinc content lowest in the month of August 4.4 & 4.2 mg/lit & highest in the Month of May 6.7 & 6.5 mg/lit. in S_1 and S_2 sample respectively. Investigation revealed that the zinc concentrations in river water exceed the permissible limit of WHO for both S_1 and S_2 sample.

Keywords: Godavari River, Zinc, Nanded District, Surface water, etc.

INTRODUCTION

Rivers are important resources for human civilizations as they meet water demand for various uses apart from supporting flora and fauna, improving aesthetic and landscape quality, moderating climate and providing resource for hydropower. River is a very important part of

our natural heritage. They have been widely utilized by mankind over the centuries to the extent that very few, if any, are now in a nature. One of the most significant manmade changes has been occur due to the addition of chemicals, containing a lot of heavy metals, to the waters. Such inputs to water can be derived from a verity of sources, some of them obvious, and others less so. They can be varied so that the concentrations of chemicals in water are rarely constant.

Availability of good quality water for drinking purpose is very essential for healthy human society, the greatest danger to human health from water pollution. Many rivers, stream in developing countries are heavily polluted due to industrial and sewage discharge [14].The pollution of the aquatic environment with heavy metals has become a worldwide problem during recent years, because they are indestructible and most of them have toxic effects on organisms [16]. Contaminants such as bacteria, viruses, heavy metals, nitrates and salt have found their way into water supplies as a result of inadequate treatment and disposal of waste (human and livestock), industrial discharges, and over-use of limited water resources [23].

Trace metals pollution in aqueous system can hardly be eliminated and are often recycled via physiochemical and biological processes, which continue to pose a risk of adverse effects on human health and aqueous ecosystem [12].Therefore, reaches worldwide focus their attention on quantitative investigation of the trace metals in aquatic ecosystem [6-17-24]. The demand of non-ferrous metals like zinc has increased many folds in recent past. On the other hand the pollution effect caused due to heavy metals, like Zinc is increased in its concentration. Elevated levels of trace metals in natural water systems and can derived from a number of sources and can pose a severe threat to the local aquatic environment [7].

The present study was therefore undertaken to determine the concentration of heavy metal i.e. zinc at two sampling station along the route of Asarjan and Vazirabad which has both upstream and downstream position for Godavari river in relation to Nanded. The metal concentrations in the river were correlated with potential anthropogenic sources. Zinc plays a very important role in plant nutrition it being a component of a number of metallo-enzymes. Zinc is an essential beneficial element for human being but their salts produce undesirable taste to water. It is discharged into sewage and soil from pharmaceutical, paints, pigment, several insecticides and cosmetic industries [3].

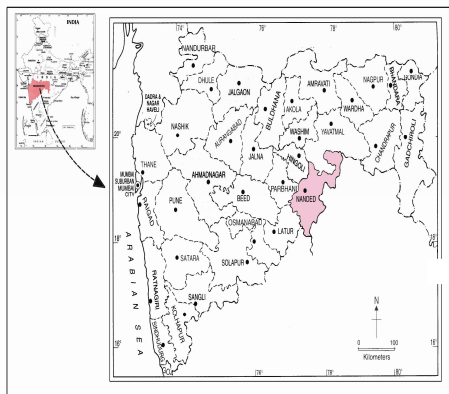
Although Zn has been found to have low toxicity to man, prolonged consumption of large doses can result in some health complications such as fatigue, dizziness, and neutropenia [11]. Organic compounds are known to play an important role in various geochemical processes, such as solubility, mobility, concentration and accumulation of metals [19].

Study Area

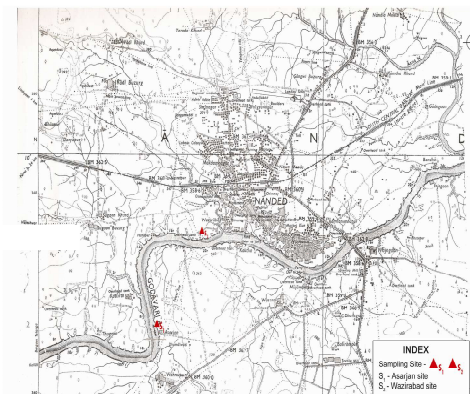
The river Godavari emerges from “Trymbakshwar” near Nashik of Maharashtra, India. The river Godavari is also known as “Dakshin Gangotri”.The river flows from Trymbakshwar and travel to southern Maharashtra and reaches Nanded. It then touches eastern Maharashtra and enters in to Andhra Pradesh finally it opens in Bay of Bengal. The river Godavari covers the total area of 1465 km from its point of emergence to the Bay of Bengal. It has a Catchments area of 3, 12,812 Sq.kms of which 69.3% lies in Maharashtra.

Nanded is a second largest city in Marathwada region. It is easternmost district of Marathwada region of Maharashtra. It lies between Latitude N 18⁰16' and Longitude 76⁰55'.

Map:



Map-1 showing location of Maharashtra in India
District sampling show in Nanded city.



Map-2 Location of Study area with water sampling
Stations of Godavari river Nanded.

MATERIALS AND METHODS

Water sample:

Two surface water samples were collected from Godavari River station situated in Nanded District, from January to December 2009. Water sample were placed in polyethylene bottles, which were previously acid-washed and rinsed with portions of distilled water and water sample. The water samples were filtered immediately using 0.45 micron filter paper and filtrates acidification to pH 2 in order to keep the metal in solution. All samples were in a dark and cool environment.

Measurement and Analysis:

The metal analysis was performed according to standard method [2] and using U.V. Double Beam Spectroscopy. All solution were prepare with deionized water. Stock solution of a metal, containing 1000 mg of zinc used for the preparation of the standards for the calibration curve. The analysis has been used in the past to identify these metals. The method used is 'Dithiozone method' and the content measured at 535 nm finally the results were expressed in mg/L.

The temperature was measured by using mercury thermometer on the spots. And also the pH was measured by pH meter was calibrated by 4.0 and 9.2 buffer solutions. The principal is at alkaline pH zinc combine with dithiozone to form a red color complex which can be extracted by carbon tetrachloride and measured spectrophotometrically at 535 nm.

RESULT AND DISUSSION

The Map1 which showing location of Maharashtra state in India and also show the Nanded city in Maharashtra state which is financially main and second one largest city in Marathwada

region in Maharashtra state. The Map2 which describes the sample site location of Godavari river in Nanded city. The sample site S₁ is the Asarjan area and S₂ sample site is Vazirabad area. In the research work we described about the month wise concentration of Zinc, pH and Temperature and the correlation with pH. Table 1 presents the mean concentration of heavy metal Zn in the from Godavari river in Nanded, Maharashtra from two sites in the Godavari river. Map1 shows the sampling area in the Godavari River. Zinc concentrations were found in the range 4.2-6.37 mg/lit.

This report presents results from the analysis of Zinc metals in surface water from Godavari river in Nanded, Maharashtra. The temperature of the sample ranged from 24.3⁰ to 27.4⁰C and pH are found that of the river water slightly varies in studied locations. This variation is due to change in alkalinity of water sample. The pH value ranges from 7.2 to 7.9 units. In the present study the lowest concentration of zinc in S₁ and S₂ samples are observed is 4.4mg/lit and 4.2mg/lit in month of October respectively. While the highest concentration was found in the month of May i.e. 6.7mg/lit for S₁ and for S₂ sample is 6.3mg/lit. If we see the one year average value of the zinc that range is (5.23)2.5 to 3.6mg/lit.

Table 1: The values of selected trace metals from sampling site-1 and sampling site-2 during year 2009.

Months	pH		Temp.°C		Zinc mg/L	
	S ₁	S ₂	S ₁	S ₂	S ₁	S ₂
January	7.4	7.4	26	26	5.7	5.5
February	7.5	7.5	25	26	5.6	4.9
March	7.4	7.5	28	27	5.1	5.1
April	7.5	7.6	28	28	4.8	4.9
May	7.7	7.8	26	28	6.7	6.5
June	7.9	7.8	27	27	6.2	5.9
July	7.5	7.5	26	26	5.8	5.5
August	7.4	7.4	25	25	5.3	4.9
September	7.5	7.5	24	24	4.8	4.5
October	7.5	7.5	23	23	4.4	4.2
November	7.2	7.3	22	22	4.6	5.0
December	7.4	7.4	22	22	4.8	4.9

All the values are in mg/L except pH & Temp.

Many heavy metals constituent less than 0.01% of organism and since capability for measuring metals beyond ppm, can't estimated and they can change chemical environments. The role of metals in health and disease are the areas of metal deficiencies, therefore it is necessary to determine the heavy metals in water used for drinking, irrigation and other purposes [22]. The lowest pH value was always observed in monsoon at all four locations which may be due to the dilution effect. [13].

He observed the river water exhibited a slightly alkaline pH apparently increased along the downstream due to the tidal effect of Bay of Bengal [15]. He believed the pH of a water body is very important in determination of water quality since it affects other chemical reactions such as solubility and metal toxicity [5]. The pH of the water under study in the year is within the permissible limit (WHO standard of 6.50-8.50) [9].

While zinc levels in drinking water from Xian, China have been reported as 21.84 µg/l [10], zinc concentration of drinking water sample from Tehran, Iran, and were he found to be 220 µg/l [1]. He reported that the concentration were high in rainy season and low in summer season in Mandakini river at Chitrakoot [4].

The symptoms that an acute oral Zn dose may include: tachycardia, vascular shock, dyspeptic nausea, vomiting, diarrhea, pancreatic is and damage of hepatic parenchyma [20]. He reported that the highest concentrations of Zinc at Palta may be due to the discharge of heavy metal loaded industrial waste water [21]. The amount of zinc showed highest in permission and low in post-monsoon because of the seasonal changes will founded [18].

Heavy metal pollution affects not only the health of the aquatic ecosystem, but also public health as a result of bioaccumulation in the food chain. Our results showed that the concentrations of the metals detected in the water samples of Godavari were all above the permissible limits. These results, however, serve as baseline data against which future impact assessments will be evaluated.

CONCLUSION

The variations in the concentration of selected heavy metal from Godavari river water were investigated. The major source of pollution is industrial wastewater; domestic and agricultural runoff. This simultaneous study was carried out to provide information on zinc metal concentrations in the Godavari River. The lack of trend in the spatial distribution of the zinc in the Godavari River indicates random distribution from diverse sources municipal liquid and solid wastes, industrial wastewater, agricultural runoff, atmospheric fallout, soil washing inputs and geological weathering.

High concentrations of Zn may have a detrimental effect on the health of the urban and rural community and the use of the river water, which use to the untreated Godavari river water directly for domestic and agricultural purposes. Therefore, to continue to protect both aquatic life and public health in the Godavari River and its surrounding area, it is suggested that the murch of depositing municipal liquid and solid wastes into the Godavari River without prior treatment should be stopped. The river started changes in aquatic environment which may bring about a reduction in the diversity of aquatic life possible it may destroy the balance of life in the river.

REFERENCES

- [1] Y.Amini, M.H. HO Sseini, A. Mor Sali. *Microchim. Acta.* **2004**, 146, 67.
- [2] APHA. Standard methods for the examination of water and waste water. 16th ed.American Public Health Association, New York **1992**.

- [3] J. Cook. *Int. J. Env. Studies.* **1976**, 9:253-366.
- [4] S.L. Dwiedi, V. Pathak. *IJEP* **2008**, (2):137-144.
- [5] S.O. Fakayode. Impact Assessment of Industrial Effluent on Water Quality of the Receiving ALaro River in Ibadan, Nigeria. *Ajeam-Ragee.* **2005**, Volume 10, 1-13.
- [6] A. Farkas, C. Erratico, L. Vigano. *Chemosphere.* **2007**, 68:761.
(doi:10.1016/j.chemosphere.2006.12.099).
- [7] U. Forstrier, G.T.W. Wiltmann. *Metal pollution in the aquatic environment.* Springer Berlin, **1981**.
- [8] A. K. Gomez, A. A Gomez, S. Adhikari, L. Ghosh, S. Ayyappan. *International Journal of Environment Science and Technology.* **2006**, 3(3), 289–296.
- [9] Guideline for Drinking Water, World Health Organisation. **1993**, Geneva, Vol. 1, pp 52-82.
- [10] Y. Guo, B. Din, Y. Liu, X. Chang, G S. Men, TI Anm. *Anal. Chim. Acta.* **2004**, 504, 319.
- [11] R. Hess, B. Schmid. *J. Paediatr. Haematol /Oncol.* **2002**, 24 582-584.
- [12] Ip CCM, Li XD, G. Zhang, OWH. Wai, Li YS. *Environ Pollut* **2007**, 147:311-323. doi: 10.1016/j.envpol.2006.06.028.
- [13] D. Johan, Hem. *Study and interpretation of the chemical characteristics of natural water,* Scientific Publishers, Jodhpur, India. **1991**.
- [14] S.B. Jonnaladda, G. Mhere. *Water Research.* **2001**, 35, 2371-2376.
- [15] D. Kar, P. Sur, S.K. Mandal, T. Saha, R. K. Kole. *Int. J. Environ. Sci.Tech.* **2008**, 5 (1), 119-124.
- [16] G.B. MacFarlane, M. D Burchett, *Vierh Aquatic Botanic.* **2000**, 68: 45-49.
- [17] S. Oliveres-Rieumont, D. de la Rose, L. Lima, DW. Graham, K. D Alessandro, J. Borroto, F. Martinez, J. Sanchez. *Water Res.* **2005**, 39:3945-3953. doi:10.1016/j.watres.2005.07.011.
- [18] N.S. Rajukar, S.M. Pangavhan, S.F. Patil. *IJEP.* **2003**, 23(3):266-273.
- [19] M.A. Rashid, J.D. Leonard. *Chem. Geol.* **1967**, 1:89-97.
- [20] M. Salgueiro, J. Zubillaga, M. Lysionek, A. Sarabia, M.I. Caro, R. J. Paoli. *Nutr. Res.* **2000**, 20(5): 737-755.
- [21] B. A. Shah, A.V. Shah, N.D. Ahire. *Pollut. Res.* **2005**, 24, 415-422.
- [22] R. Shrivastava, P. Jain. *J. Ecobiol.* **1998**, 10(1):63-66.109.
- [23] Singh1, S. and Mosley, L.M., **2003.** *Pac. J. Nat. Sci.*, 21, 31-34.
- [24] Woitke, P; Wellnitz, J; Helm, D., Kube, P., Lepom, P and Litheraty, P **2003.** *Chemosphere* 51:633-642. doi:10.1016/S0045-6535 (03)00217-0