Available online at www.scientiaresearchlibrary.com

Scientia Research Library ISSN 2348-0416
USA CODEN: JASRHB

Journal of Applied Science And Research, 2014, 2 (6):86-95

(*http://www.scientiaresearchlibrary.com/arhcive.php*)

STUDY OF SOME HEAVY METALS CONTENT IN MANJARA RIVER AT BILOLI TALUKA IN NANDED DISTRICT, MAHARASHTRA

Nitin M. Sahajrao & Rajkumar G. Pawale[*]
Yeshwant Mahavidyalaya, Nanded (M.S)
[*]*Indira Gandhi (sr.) College CIDCO, Nanded (M.S)*

ABSTRACT
Water is one of the most important constituent of life support system. It is an essential constituent to all living beings. Rivers are the natural resources of fresh water but it get polluted by natural as will as human activities. The objective of this research was to investigate the concentration of heavy metal contamination in Manjara River at Biloli Taluka, district Nanded, Maharashtra state of India was studied during the period of January 2012 to December 2012. In this study, metals such as Fe, Zn, Cu and Mn in the river water were determined using UV-VIS Double beam spectrophotometer with the help of standard procedure and compared with different standards.

Key words: Manjara River water, Permissible limits, Iron, Zinc, Manganese and Copper, UV-Double Beam Spectrophotometer.

INTRODUCTION

Water is essential resource for sustainable life and environment and also important constituent of life support system. It is indeed a wonderful chemical medium which has unique properties of dissolving and carrying is suspension a huge varieties of chemicals thus it can get contaminated easily. Natural surface water bodies often have impurities from various sources. The impurities may be suspended particles, colloidal materials and may also be dissolved cationic and anionic substance. The various kinds of natural and manmade activities like industrial, domestic, agricultural and other may causes day by day water pollution problem particularly in fresh water system (Santra, 2005).

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. Major lakes, rivers, reservoirs are getting polluted by various ways and there by posing threat to the survivability of the life systems on these diverse water bodies. The trace pollutants are the contaminants that occur in minute quantities.

Measurement of Temperature is an important parameter required to get an idea of self purification of rivers, reservoirs and control of treatment plant. It is the important factor for calculating the solubility of oxygen and the carbon dioxide, bicarbonate and carbonate equilibrium. The temperature of drinking water has an influence on its taste. Estimation of metals in potable water, domestic waste water, and industrial effluent is very important because some metals are essential where as others may adversely affect water consumers, wastewater treatment systems or the biological systems of water bodies. Some metals may be either beneficial or toxic depending on their concentrations (NEERI).

Among the inorganic contaminants of the river water, heavy metals are getting importance for their non-degradable nature and often accumulate through tropic level causing a deleterious biological effect (Kar et al., 2008)

Copper, iron, manganese, molybdenum, selenium, and zinc are needed at low levels as catalysts for enzyme activities. Trace metal ions have important roles in a wide spectrum of life functions. The determination of trace metal ions is becoming increasingly important because of the increased interest in environmental sampling of water, soil, plants, etc. Some of the trace metals are essential micronutrients for organisms and plants. However, they are toxic at higher levels (*Patil et al. 2013*).

The metals classified as heavy metals include: Cu, Co, Cr, Cd, Fe, Zn, Pb, Sn, Hg, Mn, Ni, Mo, V, W. Within the group of heavy metals one can distinguish both the elements essential for living organisms (microelements) and the elements whose physiological role is unknown, and thus they are “inactive” towards plants, animals and people. The metals serving as microelements in living organisms usually occur in trace amounts that are precisely defined for each species. Both their deficiency and excess badly affect living organisms. The sources of anthropogenic contamination or pollution of the environment by heavy metals include different branches of industry, the power industry, transport, municipal waste management, waste dumping sites, fertilizers and waste used to fertilize soil. The heavy metals from these sources are dispersed in the environment and they contaminate soil, water and air. They also (directly or indirectly through plants) get into human and animal bodies (Szyczewski et al, 2009)

The iron exposure to the atmosphere, however, the ferrous iron oxidizes to ferric iron, giving an objectionable reddish-brown colour to the water. Iron promotes the growth of “iron bacteria”, which derive their energy from the oxidation of ferrous iron to ferric iron and in the process deposit a slimy coating on the piping. At levels above 0.3 mg/l, iron stains laundry and plumbing fixtures. There is usually no noticeable taste at iron concentrations below 0.3 mg/l, although turbidity and colour may develop. No health-based guideline value is proposed for iron (WHO, 2011). The primary concern about **Iron** in drinking water is its objectionable taste. The taste of iron can be easily detected at 1.8 mg/L in drinking water. The drinking water guideline of 0.3 mg/L is based on these aesthetic considerations rather than health concerns. Acute exposure to iron is characterized by vomiting, gastrointestinal bleeding, pneumonities, convulsions, coma and jaundice (Bhosle, 2002).

Zinc forms 0.004% of the earth’s crust, it occurs as sulphide, carbonate, oxide and silicate minerals in nature is an essential nutrient for the normal functioning of the cells including protein synthesis, carbohydrate metabolism, cell growth and cell division. The smelting of zinc ores is the main source of pollution from zinc. Municipal refuse, automobiles, and agricultural use of pesticides and fungicides containing $ZnSO_4$ are the additional sources of environmental pollution due to zinc. The deficiency syndromes manifest itself by retardation of growth, anorexia, lesions of the skin and appendages, impaired development and function of reproductive organs. Zinc at about 40 ppm levels in water may impart a metallic taste. (Dara, 2002).

Manganese is an essential trace element for plant as well as animals and human, occurs in the cell all living animals it is also required for the photosynthetic oxygen evolution it also appears to play an important role in several metabolic processes such as bone growth, glucose tolerance, reproduction and development of inner ear. The importance of manganese in living system, though known to be very considerable, remains poorly explored in many areas (Bhosle, 2001). At levels exceeding 0.1 mg/l, manganese in water supplies causes an undesirable taste in beverages and stains sanitary ware and laundry. The presence of manganese in drinking-water, like that of iron, may lead to the accumulation of deposits in the distribution system. Concentrations below 0.1 mg/l are usually acceptable to consumers. Even at a concentration of 0.2 mg/l, manganese will often form a coating on pipes, which may slough off as a black precipitate. The health-based value of 0.4 mg/l for manganese is higher than this acceptability threshold of 0.1 mg/l (WHO, 2011)

Copper in a drinking-water supply usually arises from the corrosive action of water leaching copper from copper pipes in buildings. High levels of dissolved oxygen have been shown to accelerate copper corrosion in some cases. (WHO, 2011). **Copper** is a chalcophile element which mostly found in sulfide deposits along with Pb, Cd, and Zn. Water pollution due to copper also results from the discharge of mine tailing, disposal of fly ash and disposal of municipal and industrial wastes. Copper is essential for the normal biological activities of amino-oxidase and tyrosinase enzymes. The former is involved in the formation of easting and collagen both of which are important protein. Water at intakes sufficient to induce chronic copper poisoning in man is unlikely. Wilson’s disease arises from metabolic defects involving absorbed copper (Dara 2002).

Regarding this investigate the surface water of River Manjara at Biloli in Nanded district, Maharashtra, considering the variation in heavy metal content and also to evaluate the status of the river water quality with respect to drinking and domestic and agricultural irrigation purposes.

MATERIALS AND METHODS

STUDY AREA

The Manjra River is a tributary of the river Godavari. It passes through the states of Maharashtra, Karnataka and Andhra Pradesh. It originates in the Balaghat range of hills at an altitude of 823 metres (2,700 ft) and empties into the Godavari River. It has a total catchment area of 30,844 square kilometres. The present study of river water is carried out from the Manjara River at the Biloli Taluka of Nanded district Maharashtra state. It is situated at Southern east of Maharashtra, India. Biloli is located at 18°46′N 77°44′E18.77°N 77.73°E. It has an average elevation of 347 metres.

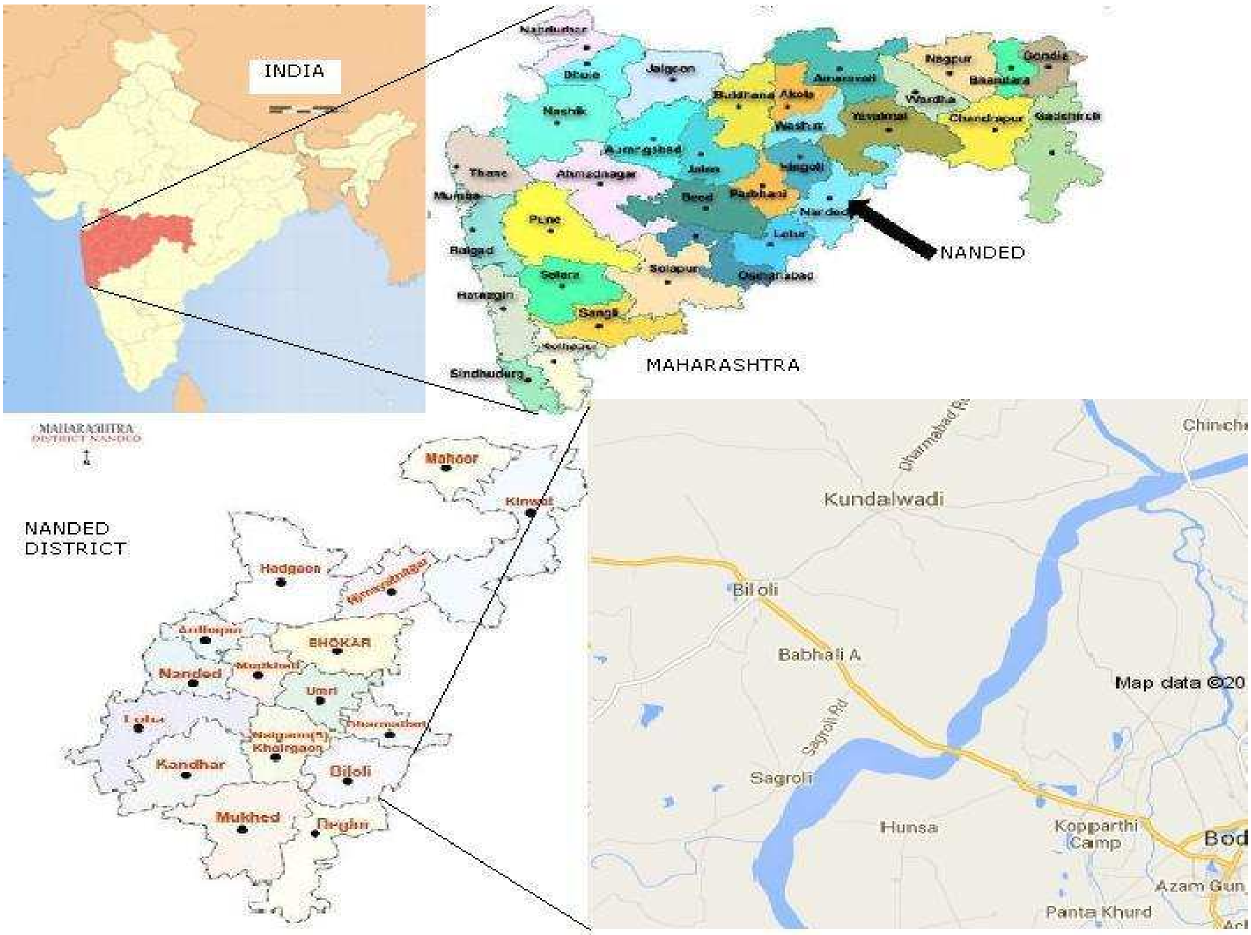


Figure No. 1. Location of Manjara River Near at Biloli in Maharashtra, India

Material and Methodology:

The present study work has been carried out for the systematic analysis of some trace metals from the Manjara River at Biloli. The water samples were collected from three different sampling sites Near at Sagroli, Yesgi, and Ganjgaon Villages as named S1, S2 and S3 respectively. The samples were collected in a clean polythene can, these water containers were cleaned properly before use. The pH and Temperature of all the water samples were noted immediately at the time of sampling. The heavy metals were determined as per the standard methods by APHA and NEERI, on UV-VIS double beam spectrophotometer into laboratory.

Table No. 1 Monthly Variations of Heavy metal from Manjara River during Jan –Dec 2012

Month	pH			Temperature			Fe		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
January	6.9	**6.8**	7.1	23.1	24.2	23	0.40	0.38	0.38

February	7.1	7.2	7.2	24.5	24	24	0.47	0.43	0.45
March	7.6	7.6	7.5	25	24.7	24.5	0.42	0.45	0.50
April	7.4	7.3	7.5	25.2	26	25.6	0.54	0.51	0.53
May	8.0	8.2	**8.1**	**26.5**	**26.6**	**27**	**0.57**	**0.55**	**0.58**
June	7.3	7.5	7.3	26.3	26.1	26.3	0.45	0.47	0.42
July	7.7	7.6	7.5	26	26.2	25.9	0.30	0.33	0.29
August	7.9	7.9	7.9	24.7	25	25	0.25	0.29	**0.21**
September	7.4	7.6	**7.8**	24.2	24	23.8	**0.21**	**0.25**	0.24
October	7.7	7.4	7.5	24	23.5	23.6	0.27	0.32	0.28
November	7.5	7.7	7.6	25.3	25.4	24.8	0.33	0.35	0.32
December	7.4	7.6	7.4	23.7	24.3	24.1	0.37	0.33	0.33

Table No. 2 Monthly Variations of Heavy metal from Manjara River during Jan-Dec.2012

Month	Zn			Mn			Cu		
	S1	S2	S3	S1	S2	S3	S1	S2	S3
January	0.69	0.65	0.67	0.033	0.031	0.037	0.024	0.022	0.019
February	0.73	0.70	0.72	0.035	0.032	0.031	0.022	0.020	0.021
March	0.78	0.74	0.76	0.040	0.037	0.041	0.026	0.024	0.025
April	0.80	**0.79**	0.78	0.046	0.042	0.041	0.025	0.028	0.027
May	**0.82**	0.77	**0.81**	**0.053**	**0.051**	**0.055**	**0.030**	0**.030**	**0.029**
June	0.76	0.72	0.70	0.035	0.038	0.040	0.022	0.026	0.025
July	0.61	0.59	0.62	0.027	0.031	0.029	0.018	0.020	0.019

August	**0.52**	**0.50**	**0.49**	0.024	0.025	0.026	**0.013**	0.016	**0.014**
September	0.57	0.56	0.53	**0.020**	**0.020**	**0.021**	0.023	**0.015**	0.027
October	0.62	0.65	0.57	0.031	0.026	0.031	0.029	0.028	0.026
November	0.72	0.71	0.64	0.040	0.033	0.038	0.024	0.026	0.024
December	0.70	0.73	0.68	0.036	0.037	0.033	0.022	0.023	0.021

All the values are expressed in mg/L except pH and Temperature

RESULTS AND DISCUSSION

In the present study the water quality of the River water with the special reference to the Heavy metals mainly selected the some trace element for this study such as Fe, Zn, Mn and Cu along with pH and Temperature of the surface water of Manjara River in Biloli Taluka, Nanded district, from the three sites of the river. The data of the study is presented in Table No. 1 & 2 and Graphically it presented in Figure No. 1,2,3,4,5,and 6 as pH, Temperature, Fe, Zn, Mn, and Cu respectively..

At site 1, the highest temperature 26.5 was found in the month of May and minimum 23.1 in January. At site 2, the highest temperature was 26.6 in the month of May and minimum 24.0 in month of February. And at site 3, the maximum temperature was 27 in the month of May and minimum 23.0 January. Temperature changes considerably depending upon the season, solar radiation and other climatic conditions, temperature is co-related with atmospheric temperature (Dhakane, 2012).

In this study the recorded pH values from Manjara River were Minimum pH 6.9 in the month of January and Maximum pH 8.0 in the month of May. The Minimum pH 6.8 in the month of January and Maximum pH 8.2 in the month of May and the minimum pH 7.1 in the month of January and Maximum pH 8.1 in the month of May were found at site 1, site 2 and site 3 respectively. The pH values were mostly found well within the permissible limit i.e. 6.5 to 8.5 which prescribed by WHO and IS standards.

In the entire study concentration of Iron were found Minimum 0.21mg/l and maximum 0.57mg/l in the month of September and May respectively at site 1. At site 2, the lowest concentration 0.25mg/l and highest concentration 0.55mg/l in the month of September and May respectively and at site 3, the lowest concentration 0.21mg/l in the month of August and highest concentration 0.58mg/l in the month of May. Shrinivasarao et al in his study for the assessment of water quality of Godavari River at Nanded, Maharashtra and Rajahmundry, Andra Pradesh, India, recorded the concentration Iron ranges from 0.85mg/l to 6.6mg/l at Nanded and 0.14mg/l to 0.61mg/l at Rajahmundry. Lokhande (2014) observed the iron ranges between 0.0254 to 0.0537 mg/l at site I, 0.254 to 0.478 mg/l at site II and 0.233 to 0.465 mg/l at site III respectively. The average range of fe in Godavri river water ranges from 0.233 to 0.537 mg/l. The minimum value of fe recorded in the month of August and maximum value in the month of Feburary. (Kar et al., 2008), in Ganga river surface water they recorded the seasonal average concentrations of Iron were 0.353-2.345 mg/l in west

Bengal. Mane et al (2013) determined the Iron concentration the minimum iron concentration 0.07 mg/L was recorded in the month of Sept 2009 at site S1, while the maximum iron concentration 0.36 mg/L was recorded in the month of May 2010. The water quality of Noyyal River the values of iron were between 0.1 to 0.34 mg/L. at S10 high iron value of 0.34 mg/L was observed. Iron is essential nutrition to the human health. (Mariraj, 2013). The surface water samples from Warri river were recorded, Iron (Fe) had values that ranged between 0.03mg/l and 5.02 mg/l, (Macdonald, 2011)

The concentration of Zinc in the river water were minimum 0.52mg/l in the month of August and maximum 0.82 mg/l in the month of May at site 1. At the site 2, the lowest concentration 0.50mg/l in the month of August and highest 0.79mg/l in the month of May was found and at the site 3, the lowest concentration 0.49mg/l in the month of August and highest 0.81mg/l in the month of May. Mane et al (2013) analyzed water sample from Manjara dam, Maharashtra the minimum zinc concentration 0.87 mg/L was recorded in the month of Sept 2009 at site S1, while the maximum Zinc concentration 1.48 mg/L was recorded in the month of May 2010 in his two year study. Singh et al (2012) recorded the seasonal variation of Zinc in Ganga river water ranged between ND to 0.87 mg/l. (Kar et al., 2008), recorded the seasonal average concentrations of Zinc were 0.042-0.111mg/l in Ganga river surface, west Bengal. Lokhande (2014) observed that the concentration of Zinc in the Godavari river water at Nanded ranges between 0.60 to 0.83mg/l at site-I, 0.58 to 0.72 mg/l at site- II and 0.52 to 0.77 mg/l at site III respectively. The average range of Zn in Godavari river water ranges from 0.52 to 0.83 mg/l. The maximum concentration of zn in the month of July and maximum in the month of April while working on determination of heavy metals from Godavri river water at Nanded, Maharashtra, India.

Where the Manganese concentration were recorded in Manjara River at site 1, the minimum 0.020mg/l in the month of September and maximum 0.053mg/l in the month of May. At site 2, the minimum 0.020mg/l in the month of September and maximum 0.051mg/l in the month of May and at the sampling site 3, the lowest concentration 0.021mg/l in the month of September and highest concentration 0.055mg/l in the month of May were recorded in the present study. The surface water samples from Warri River the Manganese (Mn) recorded values of between 0.02 mg/l to 0.68 mg/l (Macdonald, 2011). (Kar et al., 2008), recorded the seasonal average concentrations of Manganese were 0.085-0.712mg/l in Ganga river surface, west Bengal. Mahadev (2010), stated Manganese concentration between 0.366 to 0.943mg/l from Cauvery River water in Karnataka. Bhosle (2001) recorded the concentration of manganese between 0.17 to 3.38mg/l in water of river Godavari at Nanded, Maharashtra.

In the present study the Copper also investigated at site 1, the highest 0.030mg/l in the month of May and lowest concentration 0.013mg/l in the month of August. At the sampling site 2, highest 0.030mg/l in the month of May and lowest concentration 0.015mg/l in the month of September and at the site 3, highest 0.029mg/l in the month of May and lowest concentration 0.014mg/l in the month of August were recorded in this study in this year. (Kar et al., 2008), recorded the seasonal average concentrations of Copper were 0.003-0.008mg/l in Ganga river surface, west Bengal. Singh et al (2012) recorded the seasonal variation of Copper in Ganga River water ranged between ND to 0.12 mg/l. The surface water samples from Warri River, Nigeria the range of values of Copper (Cu): 0.0 mg/l to 0.26 mg/l (Macdonald, 2011). Mahadev (2010), stated copper concentration between 0.06 to 0.094mg/l from Cauvery River water in Karnataka.

In the present investigation of the water quality with special reference to the heavy metals all The values were the influence of seasonal change on the chemical parameters was prominent during monsoon season Due to dilution effect of rain and mixing of fresh water. Jaya Rathore (2011), (Kar et al., 2008)

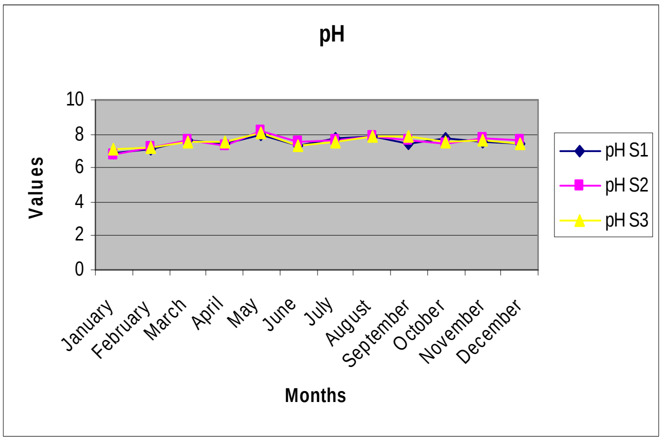
CONCLUSION

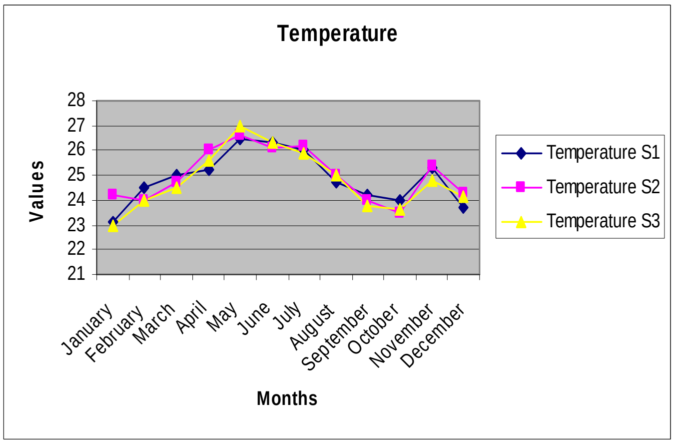
The variation of the concentration of the heavy metals selected for the present study from the Manjara river at Biloli taluka, district Nanded it observed that the concentration of heavy metals was higher in summer season and lower in the rainy season due to the dilution effect of rain water and surface water runoff and it shows the following order Zn > Fe > Mn > Cu. Of the heavy metals from the present investigation.

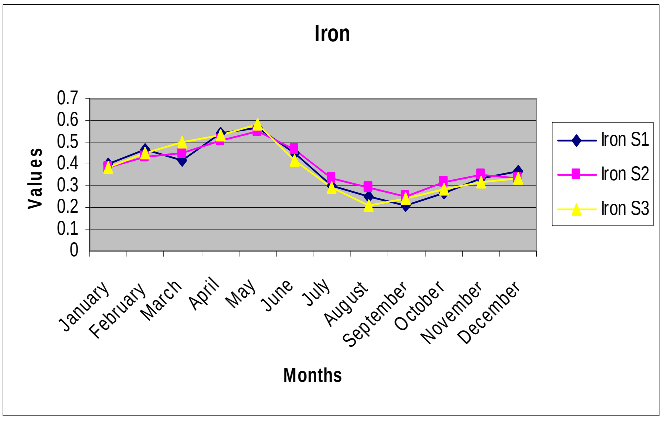
ACKNOWLEDGEMENT

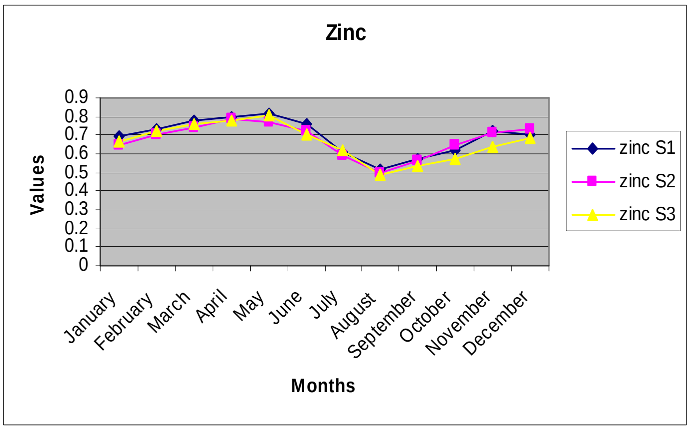
We are thankful to the Yeshwant Mahavidyalaya, Nanded for providing laboratory and library facilities. The first author grateful to University Grant Commission for the award of Maulana Azad National Fellowship for Ph.D. work.

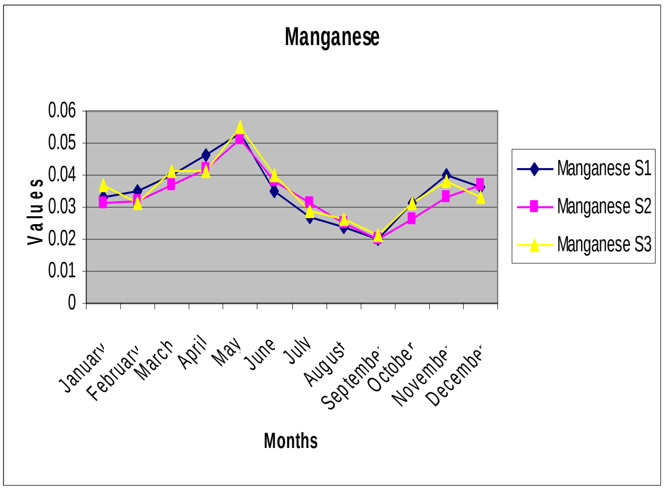
GRAPHS

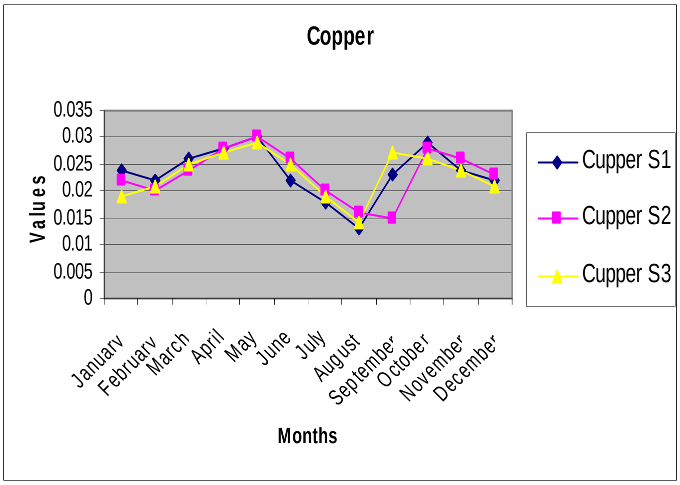












Graphic presentation of the parameters of the selected water samples.

REFERENCES

[1]. A Manual of water and waste water analysis, National Environmental Engineering Research Institute (NEERI), Nagpur.

[2]. APHA, Standard Methods for the Examination of Water and Wastewater. American Public Health Association 20th edition, Washington. D.C. **1998**.

[3]. B.K. Sharma and H. Kaur, Environmental Chemistry, 3rd Edition, Goel Publishing House, Meerut (U.P), India.

[4]. Bhosle, A.B.(**2001**), The occurrence and ecological impact of manganese in water of river Godavari at Nanded, Maaharashtra, J.Aqua.Biol.Vol. 16(1), 2001: 53-56.

[5]. Bhosle, A.B., (**2002**), The iron content in the River Godavari at Nanded and its impact on river ecology. J. Ecotoxicol. Environ. Monit, 12 (3): 193-199.

[6]. Dr. K.R. Dhakane, Prof. C.K.Rokade (**2012**), Seasonal Temperature variation and their influence on the level of pH, Hardness, dissolved oxygen and carbon dioxide in Godavari River water at pravara sangam near new as, Dist. Ahmednagar, Maharashtra. *PDFARDIJ [PRINT] 2012, 5(7) ;(P) 44 – 48,* ISSN: 2249-8346

[7]. D. Kar; P. Sur; S. K. Mandal; T. Saha; R.K. Kole (**2008**), Assessment of heavy metal pollution in surface water., Int. J. Environ. Sci. Tech., 5 (1), 119-124, Winter 2008 ISSN: 1735-1472

[8]. *J. Mahadev and Siamak Gholami* (**2010**), Heavy metal analysis of Cauvery River water Around KRS Dam Karnataka, India. J. Adv. Lab. Res. Biol. Vol.-I, Issue I | July-2010

[9]. Jaya Rathore (**2011**), Assessment of water quality of River Bandi affected by textile dyeing and printing effluents, Pali, Western Rajasthan, India., *International Journal of Environmental Sciences Volume 2 No.2, 2011*, ISSN 0976 – 4402

[10]. Lokhande, M.V. (**2014**) Determination of heavy metals from Godavri river water at Nanded, Maharashtra, India. Journal of Pharmactical Biology, 4 (1): 26-30pp.

[11]. Macdonald Daniel Wogu, Christopher Ehighaukuo Okaka (**2011**), Pollution studies on Nigerian rivers: heavy metals in surface water of Warri River, Delta State, Journal of Biodiversity and Environmental Sciences (JBES) ISSN: 2220-6663 (Print) 2222-3045 (Online) Vol. 1, No. 3, p. 7-12, 2011.

[12]. Mariraj Mohan S. and Vanalakshmi P (**2013**), Assessment of water quality in Noyyal River through water quality index, International Journal of Water Resources and Environmental Engineering Vol. 5(1), pp. 35-48, January 2013, ISSN 1991-637X.

[13]. P. C.Mane, D. D. Kadam and R.D.Chaudhari (**2013**), Status of some traces metals in water samples from Manjara Dam of Maharashtra, India. *Int.J.Curr.Microbiol.App.Sci* (2013) 2(10): 516-523, *ISSN: 2319-7706*
[14]. P. Szyczewski, J. Siepak, P. Niedzielski, T. Sobczyński (**2009**), Research on Heavy Metals in Poland, *Polish J. of Environ. Stud. Vol. 18, No. 5 (2009), 755-768*
[15]. Patil P. N., Deshmukh R. N. and Sawant D. V. (**2013**), Trace Metals in Water - Health Effects and Analysis, *Int. J. Res. Chem. Environ. Vol.3 Issue 1 January 2013(1-9,* ISSN 2248-9649
[16]. S. C. Santra, Environmental Science, New central book agency (P) Ltd. Kolkata, India.**2005**
[17]. S. S. Dara, Environmental Chemistry and pollution Control, 5th Revised Edition, S. Chand and Company LTD, New Delhi, **2002**.
[18]. Shrinivasarao V. Khan A.M., Murthy.Y.L.N. Viplavaprasad U. and Machiraj V.S (**2008**), Assessment of Water Quality of Godavari River at Nanded Maharashtra and Rajahmundry, Andhra Pradesh, India. Res. J. Chem. Environ. Vol.12(1) March(2008).
[19]. Singh Leena , Choudhary S. K., Singh P. K.(**2012**), Status of Heavy Metal Concentration in Water and Sediment of River Ganga at Selected Sites in the Middle Ganga Plain. Int. J. Res. Chem. Environ. Vol.2 Issue 4 Oct. 2012(236-243).
[20]. WHO (**2011**), Guidelines for drinking-water quality - 4th ed. World Health Organization.