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# Trace Metals Analysis in Godavari Riverwater, At Paithan City, Maharashtra, (India)

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**ABSTRACT:**Water from River, lakes and ponds is a significant water resource accounts for 1% of the global freshwater. Due to changing ecological conditions and extreme use of agrochemical heavy metals are being deposited in soils which are transferred to water system by leaching process. The aim of present study was to analyze the trace metal levels which deals with the study of river water. The observed average values of concentrations of trace metals Iron, Copper, Manganese, Lead, Cadmium, Zinc, Fluoride are 0.414, 0.377, 0.208, 0.385, 0.02, 0.175, 1.574 respectively. In the present research work the Atomic Absorption Spectrometer (AAS) was used for analysis of trace metals in the river water. Accurate monitoring of metal concentrations in various samples having importance in order to reduce health hazards resulting from the exposure to the toxic substances. Rivers play a major role in transporting municipal and industrial wastewater and runoff from agricultural land and mining land.

**KEYWORDS:**analysis, trace metals, river, water

## I. INTRODUCTION

Trace metals are found naturally in the surrounding and living things in minimal amounts, and are the metal subset of trace elements. Water plays crucial role domestic, industrial supply, irrigation at global level. But Increase population, industrialization and urbanization are prime causes contamination of river water. Hence it is required to protect quality of river water. According to WHO 80% of diseases are arises owing to contamination ground water[9]. According to a survey report of ATSDR (2001) almost 70% of the water available in India has been reported to be extensively contaminated by heavy metals and other harmful categories of chemicals[18]. The issues of water pollution by trace metal is now well known to be crucial all over the world and especially in a developing country like India, everybody is facing the problem of ever widening threat of water contamination due to modern technology, industrialization and civilization processes. Industrial effluents contributing to aquatic pollution contain very detrimental substances[14]. Trace metals after mixing into the aquatic systems which are bound to particulate matter, which eventually settles and becomes incorporated into the sediments. In recent years, persistence, abiotic degradation, toxicity, and bioaccumulation properties of trace metals in the ecological systems have become a topic of considerable concern. Many industries dump their untreated agricultural and chemical waste into rivers without treatment. The water from these rivers and their tributaries used to irrigate agricultural lands for crop production[6]. The work carried out by Hussain et al., (2017) shows that surface water samples from Godavari river at Paithan was analyzed quantitatively to know concentration of eight heavy metals such as arsenic, cadmium, chromium, copper, iron, lead, nickel and zinc by using atomic absorption spectrophotometer. The work carried out by maneet et al., (2013) shown that samples of water, sediment and aquatic weeds were collected at random from different areas of the dam covering all the directions. The uncontrolled release of industrial effluents, domestic sewage, agricultural runoff have resulted in the extensive pollution of water and soil with heavy metals thereby causing major hazard to flora and fauna and the aquatic ecosystem [18]. The 1987 amendments to the Clean Water Act needed States to adopt numeric criteria for toxic detrimental pollutants (designated in Section 307(a) of The Act) based on EPA Section 304(a) major criteria or other scientific data, when the release of those toxic pollutants could reasonably be expected to involve with designated uses [2][3][15]

## II. METHODOLOGY

The indiscriminate release of industrial effluents, domestic sewage, agricultural runoff results into extensive contamination of water and soil with trace metals thereby resulting into the hazard to flora and fauna and the major aquatic ecosystem [4]. For the present research paper the Atomic Absorption Spectrometer (AAS) was used for analysis of trace metals in the river water. Sampling was carried out twelve months i.e. every month at Godavari river. The sample bottles were soaked in 10% HNO<sub>3</sub> for 24 h and rinsed many times with double-distilled water (DW) prior to use. Water samples (500 mL) were carefully collected and immediately acidified with 2-mL ultrapure nitric acid and 2-mL HCl for arsenic to lower the pH to 2. The samples thus preserved were stored at 4 degree Celsius in sampling kits and brought to the laboratory for trace metal analysis. In the lab, water samples were filtered through 0.45 mm membrane filter. Samples were collected in every month. All glassware and other containers were cleaned with deionized water prior to use. Trace metal estimation was carried out by using Atomic Absorption Spectrometer (AAS) [4].

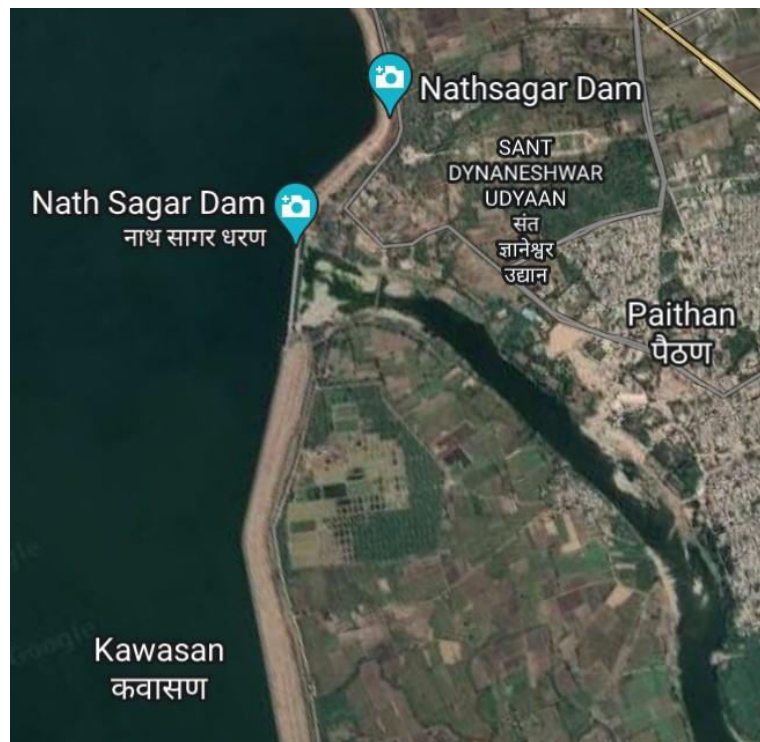


Fig.1. Map showing Godavari river

## III. RESULTS AND DISCUSSION

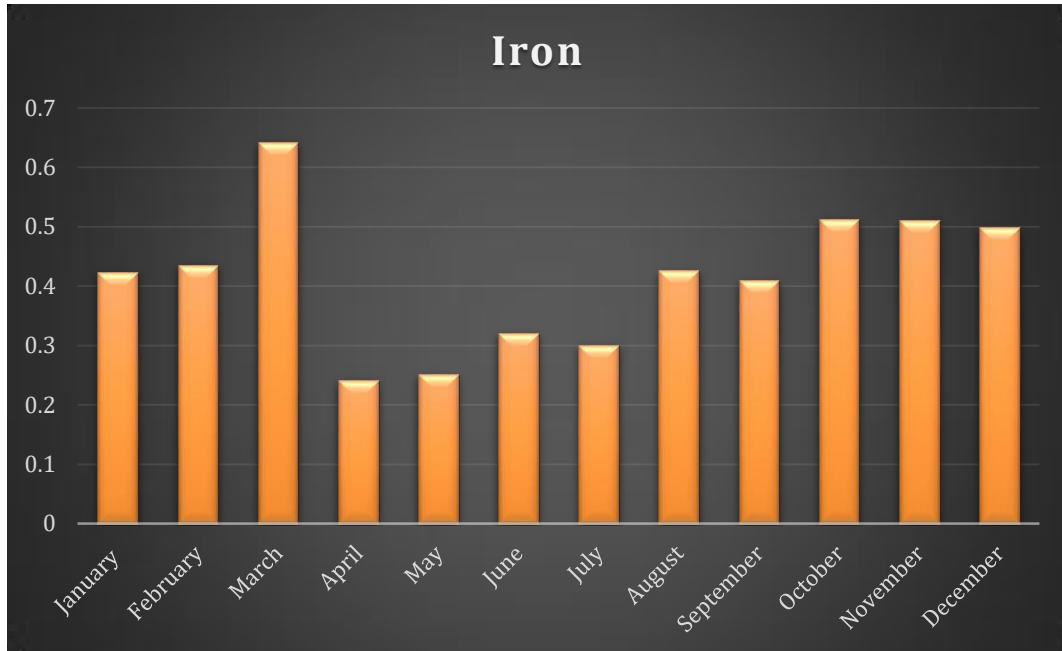
There is a need for biological monitoring studies to estimate the toxic concentrations of various chemical compounds so that certain preventive measure can be adopted to ensure the safety of the environment [14]. In the table 1. Seasonal average of the observed trace metals have been tabulated. Metals like iron, copper, manganese, lead, cadmium, zinc and fluoride have been estimated. Their average trace metals, maximum values and minimum values are also given in the table.

Table 1. Monthly average of trace metals

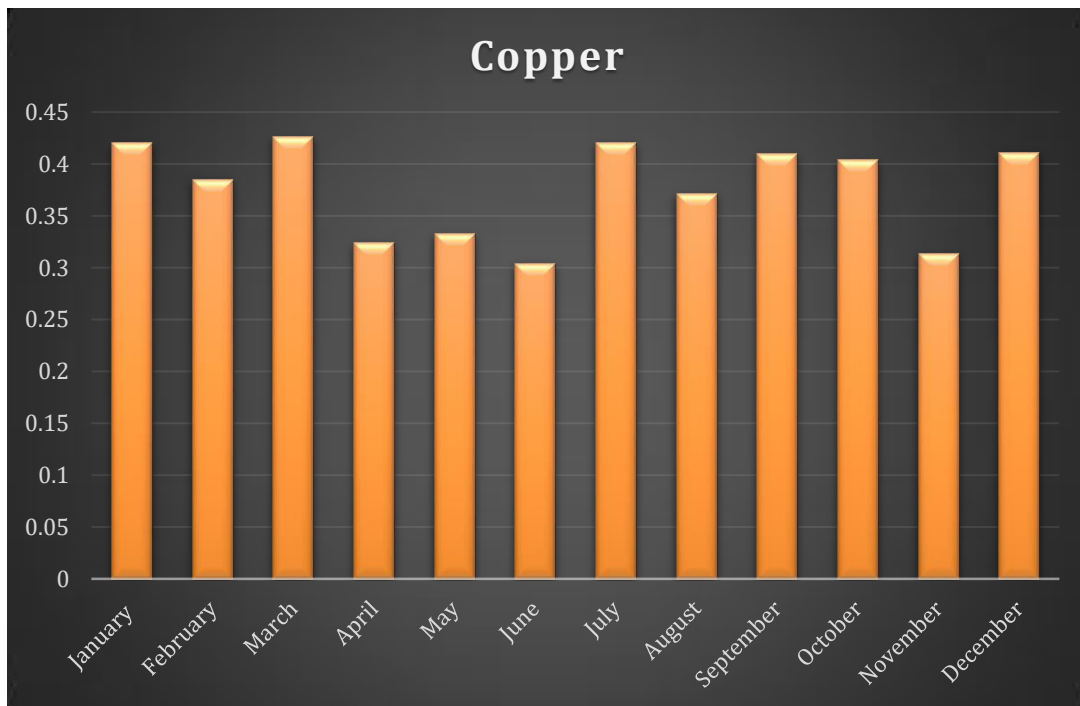
Station No.	Iron (Fe)	Copper (Cu)	Manganese (Mn)	Lead (Pb)	Cadmium (Cd)	Zinc (Zn)	Fluoride (F)
January	0.423	0.421	0.218	0.404	0.023	0.185	1.611
February	0.435	0.385	0.226	0.391	0.014	0.178	1.548
March	0.642	0.426	0.244	0.371	0.015	0.181	1.641
April	0.241	0.325	0.171	0.357	0.018	0.168	1.492
May	0.251	0.333	0.172	0.394	0.016	0.172	1.522
June	0.321	0.304	0.200	0.381	0.017	0.182	1.671
July	0.301	0.421	0.197	0.352	0.012	0.169	1.531
August	0.426	0.372	0.205	0.411	0.023	0.161	1.662
September	0.410	0.41	0.212	0.411	0.028	0.172	1.578
October	0.513	0.404	0.202	0.374	0.023	0.178	1.536
November	0.510	0.314	0.245	0.412	0.025	0.180	1.521
December	0.498	0.411	0.212	0.364	0.025	0.172	1.575
<b>Average</b>	0.414	0.377	0.208	0.385	0.020	0.175	1.574
Max.	0.513	0.426	0.245	0.411	0.028	0.185	1.662
Min.	0.241	0.304	0.171	0.352	0.012	0.161	1.492

The results shows that, these parameters are monthly varied and are found to depend on environmental and other factors [1][10][13].

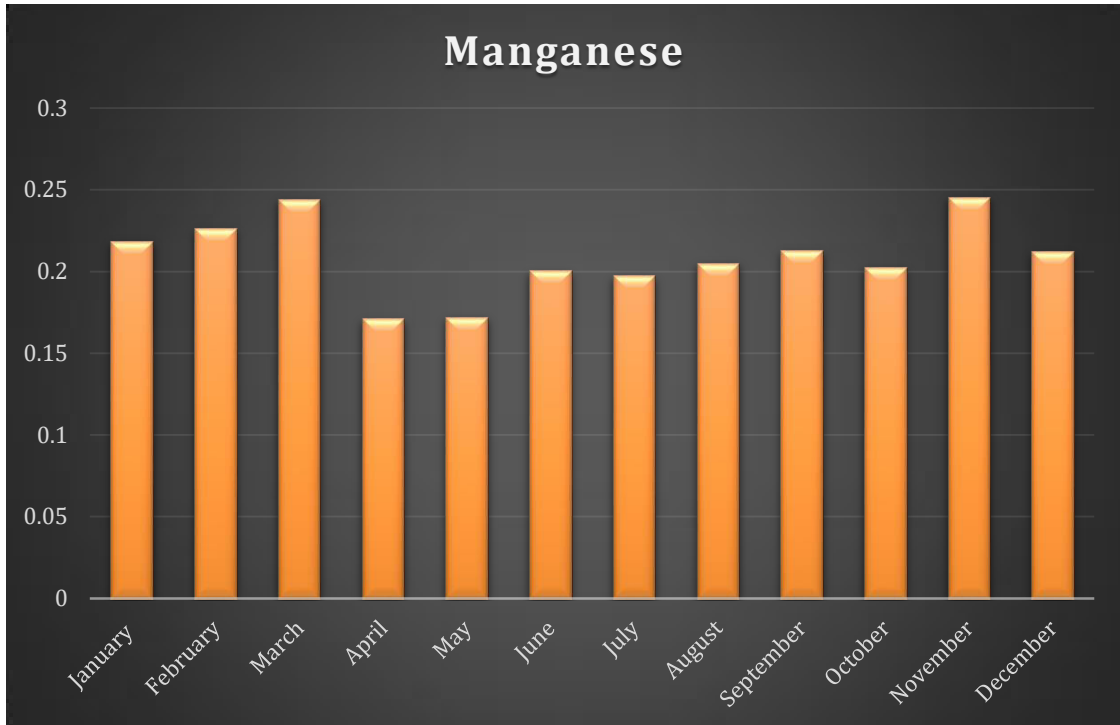
Rivers contains approx. 0.5-1 ppm of iron. The iron samples determined in various months are given where it's average values is 0.414. The maximum and minimum valued sample of iron are 0.513 and 0.241 respectively. Copper content in drinking water must be of 3 ppm. The iron samples determined in various months are given where it's average values is 0.377. The maximum and minimum valued sample of iron are 0.426 and 0.304 respectively. Manganese content in drinking water must be of 0.3 ppm. The iron samples determined in various months are given where it's average values is 0.208. The maximum and minimum valued sample of iron are 0.245 and 0.171 respectively. Lead is very harmful for humans and almost zero ppm should be tried to maintain. The lead samples determined in various months are given where it's average values is 0.385. The maximum and minimum valued sample of lead are 0.411 and 0.352 respectively. Cadmium is regulated as a primary drinking water standard and the MCL is 5 ppb. The cadmium samples determined in various months are given where it's average values is 0.02. The maximum and minimum valued sample of cadmium are 0.028 and 0.012 respectively. Drinking water must not contain zinc more than 5 ppm because of taste. The Zinc samples determined in various months are given where it's average values is 0.175. The maximum and minimum valued sample of Zinc are 0.185 and 0.161 respectively. The Fluoride samples determined in various months are given where it's average values is 1.574. The maximum and minimum valued sample of Fluoride are 1.662 and 1.492 respectively.



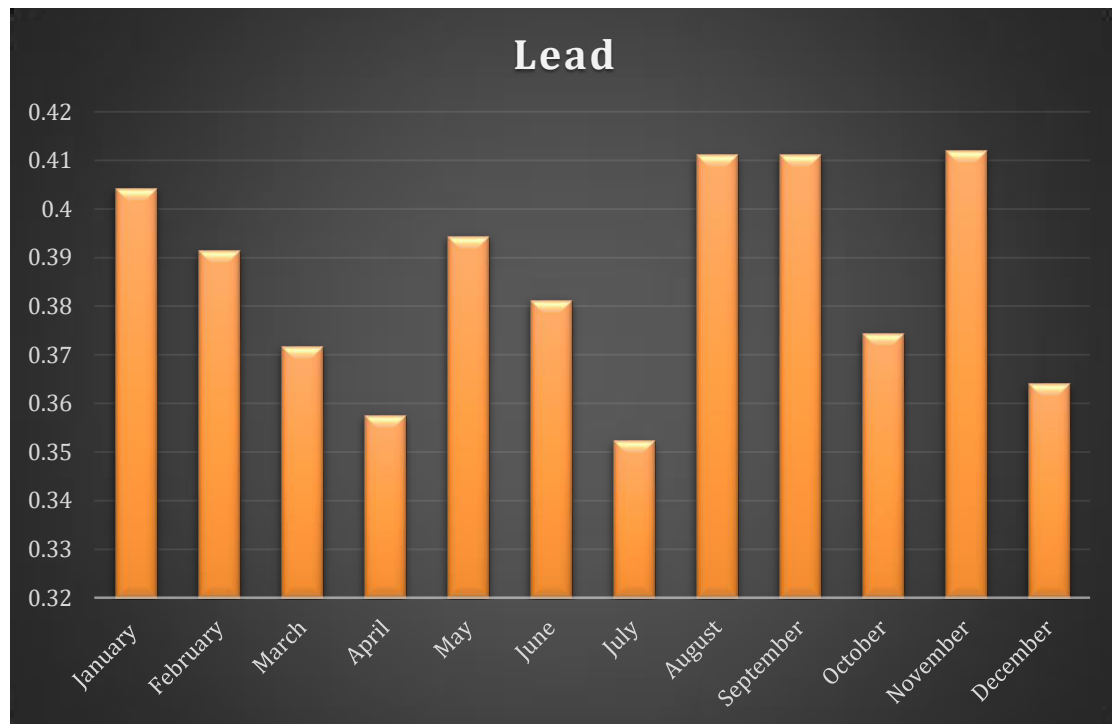
Graph 1. Concentration of iron (mg/kg)



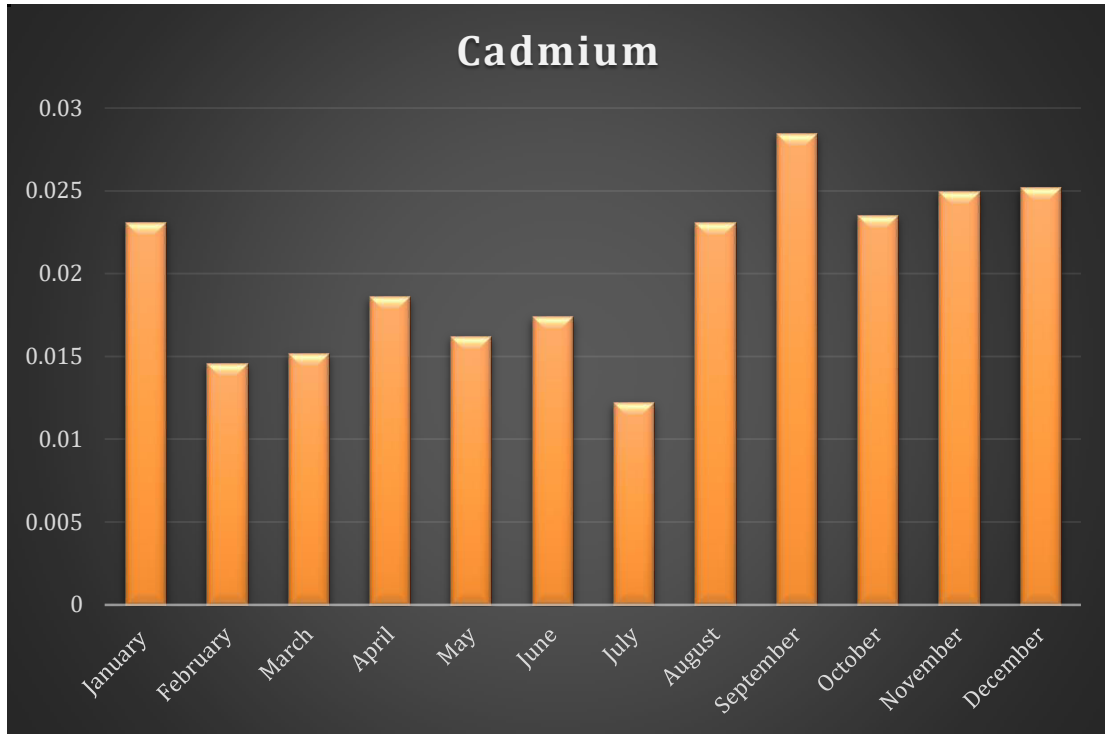
Graph 2. Concentration of Copper (mg/kg)



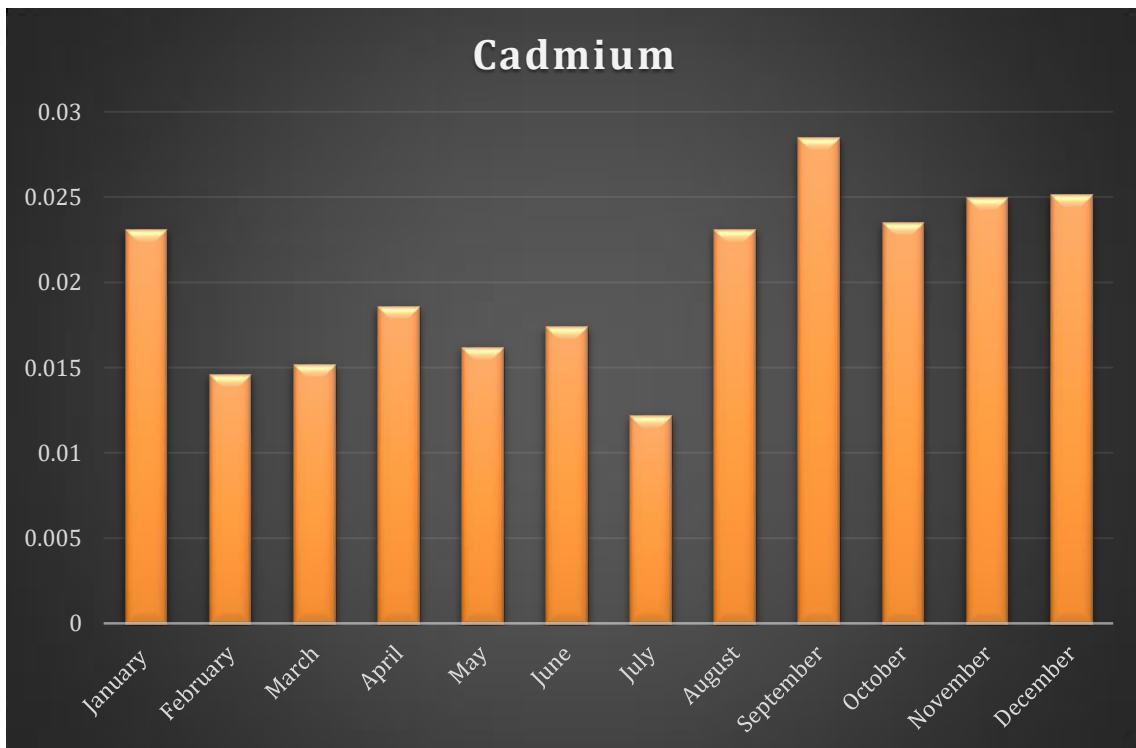
Graph 3. Concentration of Manganese (mg/kg)



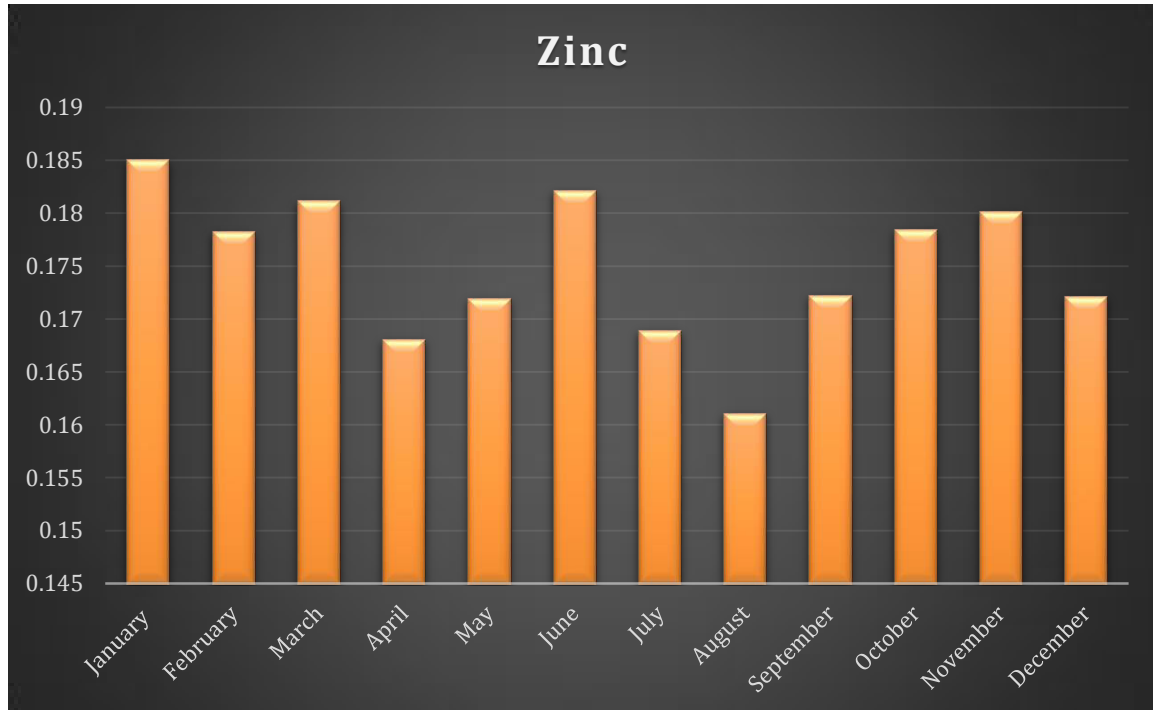
Graph 4. Concentration of Lead (mg/kg)



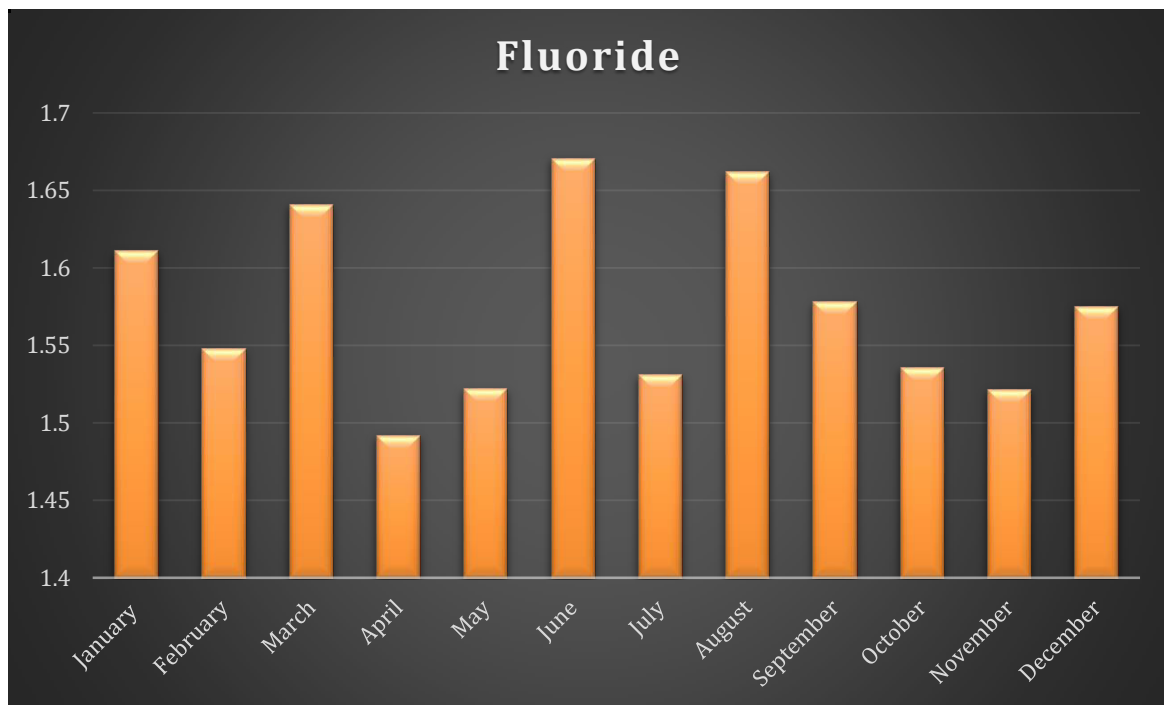
Graph 5. Concentration of Cadmium (mg/kg)



Graph 5. Concentration of Cadmium (mg/kg)



Graph 6. Concentration of Zinc (mg/kg)



Graph 7. Concentration of Fluoride (mg/kg)

Degradation of soil hampers the productivity, which is due to natural and artificial factors. United Nations suggest that the world population by 2050 could reach 890 crores and at least 100 crores people will be chronically malnourished or starving. As population continue to increase, human disturbance of the earth's ecological system to produce food and



fibre will place greater demand on soils to provide essential nutrients. The soils native potential to supply sufficient nutrients has significantly decreased with higher plant productivity levels [12]. The amount of heavy metals has indicated large variations depending on the locations. This variation may be due to geological and geographical features in different locations [5][19]. The requirement of analytical science is becoming crucial and the boundaries of trace analysis are constantly being lowered. The challenge remains to precisely quantify the elements at incredibly small fractions; as techniques develop, these lower levels will easily be obtained [16]. Heavy metals like lead (Pb), mercury (Hg), cadmium (Cd), and arsenic (As) are significantly toxic elements known for their ability to bio concentrate in the human body, resulting in multi-organ disruption [1][10]. The mechanism of toxicity for trace metals can be explained by their potential to interact with the nuclear proteins and DNA, causing oxidative deterioration of the biological macromolecules. Determining trace levels of metals in samples can also help to recognize contaminants and provides crucial data to help both process improvement and chemical product development [1][7]. These metals may accumulate to a very high toxic levels and cause severe impact on the aquatic organisms without any visible sign [8][20].

#### IV. CONCLUSIONS:

The river water samples in present study are partially harmful to the human beings and it may use in domestic purpose. The analyzed data revealed that iron and fluoride metals were found to be the abundant metals in the river Godavari and its tributaries. In the present research paper the Atomic Absorption Spectrometer (AAS) was used for analysis of trace metals in the river water in the year 2021. The Average values of concentrations of trace metals like Iron, Copper, Manganese, Lead, Cadmium, Zinc, Fluoride are 0.414, 0.377, 0.208, 0.385, 0.020, 0.175, 1.574 mg/kg respectively. The major advantage lies with the ability to determine metal concentrations over a continuous size spectrum rather than at discrete size ranges. The type of sample and concentration range of trace metal influence the selection of the technique to be used. Overall it was found that atomic absorption/emission spectroscopy techniques could provide not only estimation of wide range of trace metals but also ensure immense reliability by exhibiting good precision and accuracy at trace level. Present research work will be very helpful in the future so as to quantify the trace metals concentrations in the river water.

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