# DETERMINATION OF HEAVY METALS IN THE GROUND WATER BY ATOMIC ABSORPTION SPECTROPHOTOMETER

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**ABSTRACT**

The heavy metals present in the ten different well-water samples drawn from ten different location of Gondia district. All the samples are taken from different talukas of Gondia district. All the selected locations of ground water are used for drinking and domestic purposes.

The heavy metals contamination of iron, copper, zinc, lead, chromium, cadmium manganese & mercury were estimated by using atomic absorptions spectrophotometer and this data is then compared with standard values. Data reveals that some heavy (Cu, Mn. etc.) metals are found above the desirable limit.

**KEY WORDS:** Heavy Metals, Ground Water, Atomic absorption Spectrophotometer, etc.

## INTRODUCTION

Different ground water samples may contain heavy metals like iron, copper, zinc, lead, manganese, chromium & mercury in such quantities which are required for better growth of plants & animals but at higher concentration these metals may be harmful and water becomes polluted.[1]

Ground water is the main source for drinking as well as domestic requirement of Human being.

The heavy metal are non biodegradable, once they get into ground water, they persist for long duration.[2]

Shrikanth ET at.[3] has published data of Pb, Ca, Ni, & Zn contain of ground water around Hussain saga Lake Hyderabad. Ayyadurai ET al.[4] reported mercury pollution in water of Madras City. Heavy metals contamination in water and their impacts on fauna & flora[5] has been estimated i.e. trace element in ground water of tuppa area of Nanded Maharashtra. Khursid ET. al[6] have find out degradation of water quality due to heavy metal pollution in Faridabad district.

Rao and Chanakya[7] reported effect of industrial effluents on ground water quality of Katten industrial area of Andra Pradesh.

Some areas of Gondia district (talukas) are highly industrial places having large number of coal mines, cement factories, paper mills etc. with high probability of heavy metal contamination therefore the present study was undertaken.

**EXPERIMENTAL**

The ground water samples taken from different talukas of Gondia district, which is located in the eastern region of Maharashtra. It is highly industrial developed place. Industrial waste water is absorbed in large scale around the city.

To find out heavy metals in ground water samples were taken from ten different selected sites of the city. Ten villages of selected talukas with prime importance from each direction were selected for study. The ground water sample from well was collected for analysis.

Samples were collected in the bottles and preserved in the refrigerator. The analysis of ground water samples for Heavy metals analysis was done by using Atomic absorption spectrophotometer. Atomic Absorption spectrophotometer (AAS) is technique used for the determination of metals. Air acetylene Atomic absorption

spectrophotometer is preferred for the determination of near about 30 elements. The temperature of the flame goes to around 2400$^0$C. The atoms then exposed to radiation. Free atoms absorb these wavelengths and absorbance is proportioned to the concentration of the atoms in the flame.

First the standard solutions of salt of the metal ions were prepared. The concentration of the metal ion was determined separately by using Atomic absorption spectrophotometer. Graph was prepared for each concentration of the salt solution. Then the sample solution was introduced in the spectrophotometer to determine the concentration of the heavy metal present in the sample.

In this way from all these samples the concentration of metal like Pb, Fe, Cu, Cr, Cd, Mn & Hg were determine.

Heavy metal concentration present in the samples was then compared with standard values.

**OBSERVATION:**

**Table 1:** Heavy metals in the different well water sample in September-2011.

| Heavy Metals | Sample I | Sample II | Sample III | Sample IV | Sample V | Sample VI | Sample VII | Sample VIII |
|---|---|---|---|---|---|---|---|---|
| Zn | 0.96 | 0.12 | 0.83 | 0.15 | 0.86 | 0.15 | 0.16 | 0.17 |
| Pb | 0.011 | 0.013 | 0.012 | 0.014 | 0.015 | 0.017 | 0.02 | 0.019 |
| Fe | 0.16 | 0.17 | 0.18 | 0.14 | 0.12 | 0.18 | 0.2 | 0.21 |
| Cu | 0.05 | 0.03 | 0.05 | 0.07 | 0.02 | 0.02 | 0.03 | 0.05 |
| Cd | 0.008 | 0.009 | 0.008 | 0.007 | 0.008 | 0.009 | 0.01 | 0.009 |
| Cr | 0.03 | 0.03 | 0.04 | 0.04 | 0.05 | 0.02 | 0.02 | 0.02 |
| Mn | 0.14 | 0.182 | 0.15 | 0.09 | 0.36 | 0.08 | 0.14 | 0.05 |
| Hg | 0.0011 | 0.001 | 0.0006 | 0.0007 | 0.0007 | 0.0009 | 0.001 | 0.001 |

* All values are in ppm.

**RESULT AND DISCUSSION:**

The trace heavy metal contamination in ground water samples collected from different locations around the Gondia district was investigated. These findings are given in the table and then compared with standard limit prescribed by WHO (1993)[8] and BIS (1991)[9].

From the above table, certain things can be discuss for different heavy metals.

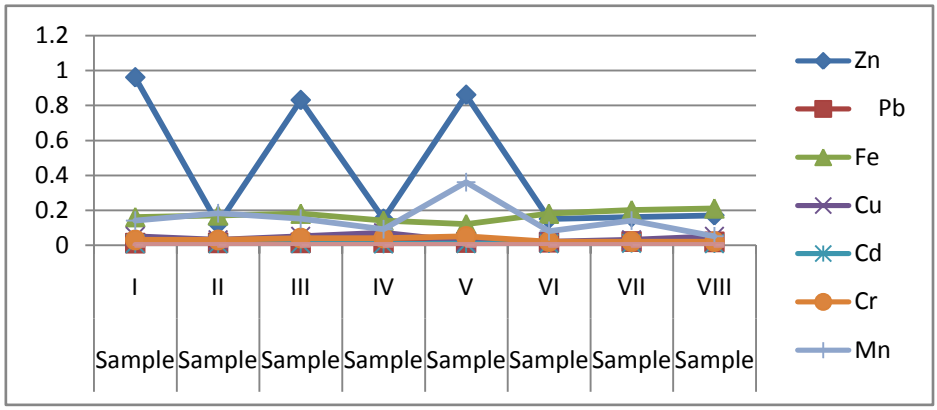
**Iron (Fe):**

Well water containing soluble iron remain clear but causes precipitation occur on oxidation and appears turbid Fe determined by atomic absorption spectrophotometeric.[10] The iron concentration in potable water is limited to 0.1 mg/L with upper limit 0.3 mg/L. From the above table, the concentration of Fe in ground water study area ranges from 0.12 to 0.26 mg/L Iron (Fe) present in all these samples are under the limit.

**Lead (Pb):** The lead content in study area ranged from 0.011 to 0.024 mg/L. At such levels, no lead toxicity problems are to be expected from these samples because they are in the limit range. Atomic absorption spectrophotometry was used for the investigation of Pb from different water sample.[11]

**Copper (Cu.):** Investigation study shows that Cu present in the various samples ranges from 0.02 to 0.07 mg/L by AAS method. Concentration of Cu maximum found 0.06 mg/L. but it is under the limit. Cu excess of 1.0 mg/L. impart some taste to water and lower alkalinity, it becomes more toxic.[12]

**Figure 1:** Chart of Heavy metals in the different well water sample in September-2011**.**




**Zinc (Zn):** After investigation of various samples for the determination of Zn by AAS, it was obtained in the range 0.12 to 0.96 mg/L. Zinc is an essential element for both human & animals above 5.0 mg/L. It imparts undesirable bitter astringent taste to water. Zinc deficiency in human body may result infantilism and several other diseases. Zn Concentration found in different samples (well water) shows that, ground water are safe enough for drinking & other domestic purposes.

**Chromium (Cr):** The maximum permissible limit of Cr in drinking water is 0.05 mg/L. The investigation study found that 0.02 to 0.05 mg/L. concentration. High concentration in one sample, but it is also in permissible limit. Above this limit is may be Carcinogenic.

**Manganese (Mn):** Investigation study of Mn stows that range 0.08 to 0.36 mg/L. Higher concentration Mn found around Gondia district. This may be due to the present of solid waste disposal of site & from coal fly ash disposal.[13] The maximum permissible limit is 0.30 mg/L but at one sample it shows 0.34 mg/L. Hence ground water quality at some places is not suitable for drinking purposes.

**Cadmium (Cd):** Cd found in all these different samples is from 0.007mg/L to 0.1 mg/L. under the limit. Therefore all these water samples are suitable for drinking & domestic purposes.

**Mercury (Hg):** Mercury present in the drinking water ranges from 0.0006mg/L to 0.0011 mg/L and if it is more than 0.001 mg/L becomes toxic. All samples contain Hg, within the permissible limit. Hence water is safe for drinking purpose.

## CONCLUSION:

From the above analysis of heavy metals of different ground water samples, small appreciable variations in the concentration of heavy metals are observed. The data reveals that Fe, Cu & Mn were found close to maximum permissible limits. There is contamination of some ground water samples due to the presence heavy metals. The quality of some water samples in the different regions of Gondia district is suitable for drinking and other domestic purposes.

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