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ROLE OF COPPER, ZINC AND CHROMIUM OF GROUND WATER AND SOIL QUALITY INDEX

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Abstract

The concentration levels of selected heavy metals. [Cu, Zn, and Cr] were determined in the soil and water samples collected in Nandurbar district (M.S.). After digestion Atomic Emission Spectrometer (AES) and ICP was employed for the determination. The study area is a hill station on the boundary of Maharashtra, M.P. and Gujarat. The average concentration of heavy metals in the soil are Cu (2.265), Zn (0.774), and Cr (0.415). the concentration of heavy metal in water are Cu. (1.328), Zn (0.345and Cr (0.044) ppm. In the overall the average concentration of copper is highest in water and soil sample

Keywords: - *soil, water, AES-ICP, Zn, Cu and Cr.*

Introduction:

Water is vital natural resources which is essential for multiplicity of purposes. It's many uses include drinking and other domestic uses, industrial cooling, power generation, agriculture (irrigation), transportation and waste disposal. "water contamination by variety of chemical substances or eutrophication caused by several nutrients and fertilizers (south wick, 1976)."

The heavy metal contamination from both natural (geogenic) and anthropogenic sources has increased concern about living in urban environment who are more likely to be exposed to this threat. Natural and anthropogenic sources of soil contamination are widely spread and variable (Tahir et al, 2007). Heavy metals occur naturally in rocks. But most of the heavy metal occurrences in urban soil tend to originate from anthropogenic sources such as industrial, urban development and transport activities (Lee et. al, 2007).

Trace element usually classified as essential to man iodine, iron, zinc, copper, (WHO 1996). The uptake and utilization of essential trace element are under physiological control and well balanced diet is usually adequate in order to maintain trace element homeostasis. (Lentner, 1986). For some essential trace elements, excess and the difference between essential and toxic intake levels may be small (Nord, 1995).

Interest in water analysis is due to enormous importance of water to all categories of living thing. It is necessary for the healthy development of man animals and plants (Abulude et al, 2007). Water plays an important role in bodily intake of true element by human.

Even though some trace elements are essential to man, at elevated levels, essential and non essential elements can cause morphological abnormalities: reduced growth increase mortality and mutagenic effect (Aselolu et al, 2002).

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Heavy metal can enter a water supply by industrial and consumer waste, or even from acidic rain, breaking down soils and releasing heavy metals into streams, rivers, lakes and ground water. The concentration of these heavy metal in soil and water may be traced to bed rock from which the sediments were derived through which the water flows (Ergin et al, 1991).

The objective of this study is to determine the concentration of heavy metal (Cu, Zn, and Cr) in the soil and water samples.

Materials and Methods:-

The soil samples used for the study were collected from different geographical co-ordinates on the site with plastic ladles. Each soil sample was collected at the depth about 15-30cm from surface of soil to obtain through layer of the soil (Norhayati et al, 2007). samples were labeled and stored in polythene bags prior to analysis on each collection point, standard method sample collection was used for collecting the water sample (Trivedy et al, 2000). The samples were kept in refrigerator (4^0c) prior to analysis.

All the water sample were prepared for analysis by treating with concentration HNO_3 and filter (Moddley et. al, 2007).

The samples were analysed for Cu, Zn, and Cr using AES and ICP technique.

Result and Discussions:-

The results of analysis of soil and water samples are presented in Tables 1 and 2. The heavy metal content of soil were 0.167 – 0.55/ ppm for chromium, 0.01 – 0.037 for Cu, 0.302 – 0.88 ppm for zinc.

Chromium (Cr):-

Major source of chromium exposure are chromate steel, cement, leathergoods, and welding fumes. Chromium is a cause of occupational allergic contact and trivalent chromium [Cr (III)] is considered to be the sensitizing agent. Hexavalent chromium is much more toxic than trivalent. Life time exposure to 5 gm/lit. of chromium (III) in the drinking water induced no toxic effects in rats and mice (Rana, et al, 2011).

Chromium in the soil was in the range of 0.167 – 0.558 ppm (Table 1) the lowest chromium content was found in SS-4 and the highest in SS-5 chromium is water sample in the range of 0.042 – 0.059 ppm. (Table-2).

Copper (Cu):-

Copper in the soil sample was in the range of 1.247 – 2.265 ppm (Table No.1) and in water sample range between 0.607 – 1.328 ppm. (Table No.2) The lowest copper content was found in sample – 3 (SS-3) copper is an essential trace element and necessary for the functioning of several enzymes involved in electron transfer (Cytochrome oxidase) and melanin formation (tyrosinase) copper is also essential of utilization of iron and formation of haemoglobin. Copper deficiency in the diet may cause anemia, fertility problem, nervous system disorder and circulatory system diseases. (Mckeague et al, 1980).

Zinc (Zn):-

Zinc in the soil was in the range of 0.35 – 0.90 ppm (Table-1) and in water sample was in the range of 0.296 – 4.732 ppm.(Table-2). The lowest value was obtained from SS-3 (Table No. 1& 2) zinc is an essential trace element for human, animal and higher plants; it is used in fighting skin problems such as ache, boils sore throats (Doren et al, 2002) it is further needed

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for mitosis and needed by the tissue of the hair, nails and skin to be in the top from. Deficiency of zinc results in underperforming immune while high intake harms the immune (Golden & Golden, 1981).

Table No.1 Concentration of Heavy Metal in Soil (ppm):

Samples	Cr	Cu	Zn
SS-1	0.415	2.265	0.90
SS-2	0.190	1.825	0.35
SS-3	0.458	1.247	0.46
SS-4	0.167	1.805	0.66
SS-5	0.558	1.634	0.40

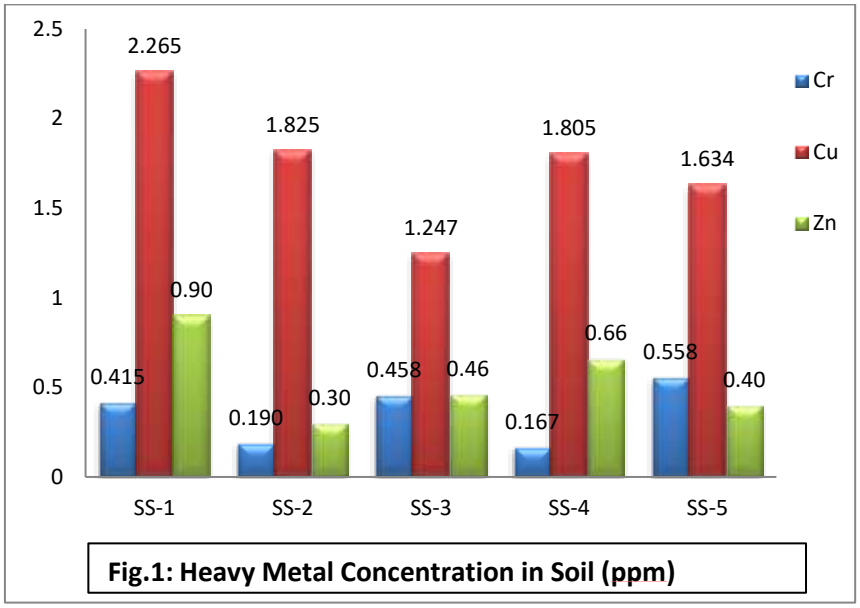

Fig.1: Heavy Metal Concentration in Soil (ppm)

Table No.2 Concentration of Heavy Metal in Water (ppm):-

Samples	Cr	Cu	Zn
WS-1	0.044	1.328	0.345
WS-2	0.059	1.045	0.455
WS-3	0.042	0.619	0.296
WS-4	0.043	0.778	0.736
WS-5	0.059	0.607	4.732

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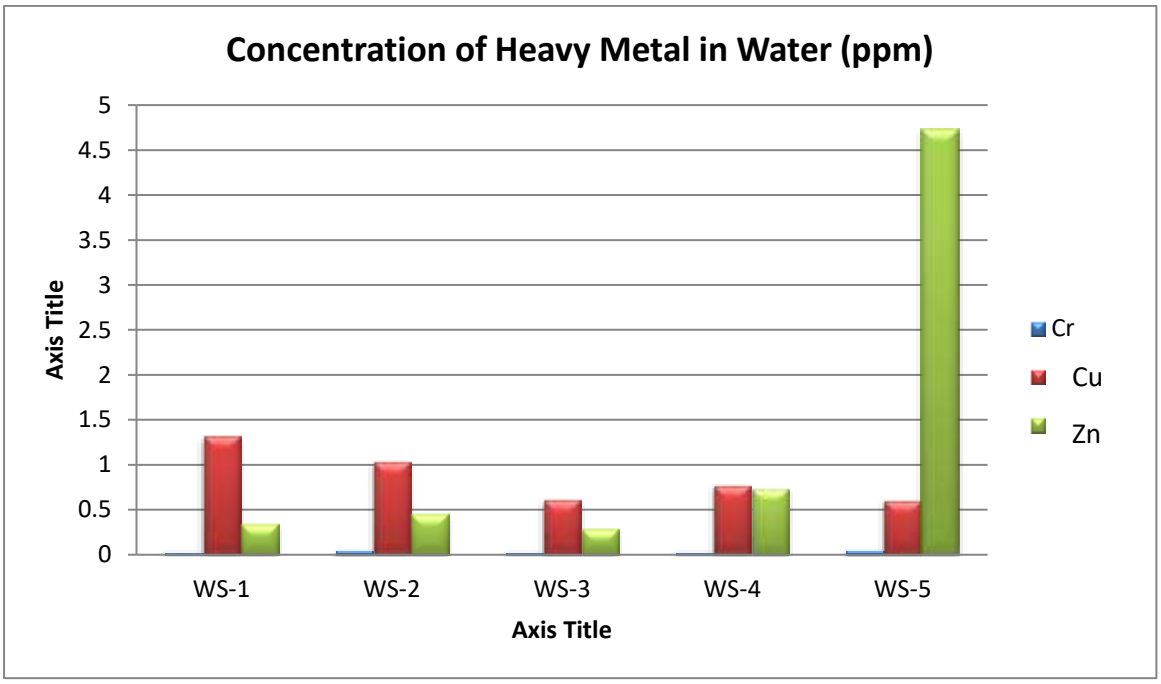

Conclusion:-

Results obtained from this study showed that, there are variations in the metal content of the soil and water from one location to other. The concentration of heavy metals in the water at the area of study were also found to be lower. This is an indication of low contamination of the area of study from anthropogenic sources.

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