Comparative Study of Heavy Metals in Soil and Ground Water of Various Areas

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Abstract: The heavy metal present in soil and ground water enters into food chain and causes serious health issues. Heavy metals are not biodegradable thus it causes serious environmental problem. The present study was carried out with samples of soil and ground water from some commercial and industrial areas of Indore (Polo ground, Indian oil corporation AB road, Holkar Science College, Poultry form sanwer road, Cement Roofing industry AB road Manglia Indore, Greater Vaishali, Pond in front of Shanchi milk industry) and then the results of both water and soil ware compared. To determine the concentration of heavy metal in soil and water AAS (Atomic Absorption spectroscopy) is used. Before determine the concentration of some heavy metal we first analyzed some physicochemical properties and finally the study concluded that pretreatment process for reducing the amount of heavy metal is mandatory before the soil can be used as soil conditioner or fertilizer in the soil.

Keywords: Heavy metal, Contamination, pH, Conductivity, Pollution, AAS

1. Introduction

It is well known fact that in our ecosystem heavy metals are present naturally. In current scenario some of the heavy metals are introduce in the eco-system from anthropogenic sources i.e. pollution from human activities through direct ingestion or contact with contaminated soil to the food chain (soil-plant-human or soil-plant-animal-human). Polluted water and soil sources may become dangerous for health causing various cancers cardiovascular or neurological diseases. For instance lead in human body causes Anemia, nephropathy (kidney disease), Encephalopathy (brain dysfunction). Chromium in human body leads to pulmonary fibrosis (Lung scarring), lung cancer, hemolysis. Cadmium causes osteomalacia (Softing of bones), proteinuria (excess protein in urine)

"The united states of environmental protection agency (US EPA) sets the levels of metals in soil and water called soil screening level (SSL)". The acceptable limit according to WHO 2008 for heavy metal in mg/kg [2,5] is given in below table I

Table 1: Acceptable limit for heavy metal in mg/kg							
Fe	Ni	Pb	Zn	Cr	Cu	Cd	Mn
0.30	0.10	0.05	5.0	0.05	1.0	0.005	0.10

In this research work sample of soil and ground water is taken from different industrial and commercial areas of Indore and then the sample were tested using AAS method. The results of soil and water are compared.

2. Literature Review

Mehari Murz Weldemariam use AAS method to determine concentration of heavy metal (cd, cr, fe, cu, zn, pb) in sludge sample from apex weaving and finishing mills in almeda textile industry northern tigrai , Ethipia.[1] The study concluded that pretreatment process for reducing the amount of heavy metal is mandatory before the sludge can be used as a soil conditioner or fertilizer in the agricultural soil.

Chaitali V. Mohod Jayashree Dhote collected sample of water from various sources at ground surface and tap water this sample were tested by Atomic Absorption Spectroscopy and differential pulse anodic stripping voltammetry (DPASV). The determination of heavy metals found in their respected work were as Cd, Cr, Co, Fe, Mn, Pb, Ni, Zn the concentration determine were more than the maximum admissible and desirable limit when compared with the national and international organization like WHO (2008), USEPA,EUC, EPA.

Opaiuwa, O.D., Aremu, M.O., Ogbo, L.O., Abiola, K.A., Odiba, I.E., Abubakar, M.M., and Nweza, N.O. studied on heavy metal concentration in soils, plant leaves and crops grown around dump sites in Lafia Metropolis Nasarawa State Nigeria by Atomic Absorption spectroscopy. They found that The values of all the metals analyzed for samples from dumpsites were higher than those from the control site suggesting possible mobility of metals from dumpsites to farmlands through leaching and runoffs, but were below values recommended by the World Health Organization (WHO)

3. Material and Methods

The soil and water were collected from different commercial and industrial areas of Indore city, in rainy season july 2015,

To take the sample the whole field is divided into 4 equal sector, from each sector the soil sample were collected from 2 layers i,e. upper layer (1c.m.-2 c.m.) and lower layer (6 c.m.-7 c.m.) and the temperature was noted immediately. Sample taken from each sector were mixed in equal proportion to get the final sample.

Water sample were collected directly from the reservoir without any prior processes. The soil composites were store

in air tight polythene bags water sample store in plastic bottles and keep in cool place and there both were labeled.

We used AAS for analysis of heavy metals in soil and water, because of high accuracy of AAS. The result will be in ppm and ppb. The reason behind using AAS is that it can detect the target metal in present of many metals.

4. Result and Conclusion

The table below shows the results. It can be seen from the table II that the concentration of heavy metal in water is negligible as compared to soil of respective area.

Metal	Iron		Cromium		Nickel		Cupper		Zink		Lead		Manganese		Cadmium	
Location	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water	Soil	Water
Pologround near Police petrol pump	5.100	NIL	0.707	NIL	0.416	NIL	0.432	NIL	0.686	0.006	0.589	NIL	2.6	NIL	NIL	NIL
AB Road Manglia Cement Roofing Industry	3.450	NIL	0.472	NIL	0.298	NIL	0.495	NIL	1.320	NIL	2.231	NIL	1.9	NIL	NIL	NIL
AB Road Manglia Indian Oil Corporation	3.558	0.498	1.587	NIL	.0597	NIL	0.264	NIL	0.630	0.064	0.234	0.028	2.5	1.206	NIL	NIL
AB Road Manglia Pond in front of Sanchi Milk Industry	4.527	0.049	0.745	NIL	0.669	NIL	0.293	NIL	0.426	NIL	0.170	NIL	3.47	0.245	NIL	NIL
Sanwer road Poultry farm	3.830	NIL	0.395	NIL	0.399	NIL	0.631	NIL	1.630	0.002	5.526	0.380	2.5	NIL	NIL	NIL
Holker science Collage	0.530	NIL	0.093	NIL	0.592	NIL	0.160	NIL	0.235	0.020	0.309	NIL	2.6	NIL	NIL	NIL
Greater Vaishali	5.102	0.051	0.505	NIL	0.443	NIL	0.378	NIL	0.359	0.022	0.125	NIL	2.9	NIL	NIL	NIL

Table 2: Observed heavy metal in	ı mg/kg	in Sample
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The results were also compared with permissible limits of heavy metal in water and soil standardized by international organization WHO and it was found that the concentration of Fe, Ni, Pb, Cr, Mn. metal are exceeding permissible limit in all locations and concentration of heavy metal in water is under limit except iron in water of oil industry

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