

Assessment of Heavy Metal Accumulation in Hundri River Bank in Kurnool, Andhra Pradesh

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Abstract: *In this study we analyzed and estimated heavy metal accumulation in hundri river sludge and control (normal fertile soil) quantitatively along with their physical and chemical properties (pH, Temperature, Moisture content, Organic carbon, Nitrogen, Phosphorus and Potassium). Results showed that river sludge shows high pH, low temperature, high organic and NPK than control soils. Our study found eight heavy metal components namely Ag, Co, Cu, Cr, Ni, Cd, Zn, and Pb in both river sludge and control soil. However river sludge showed high amount of all eight heavy metal accumulation than control soils when compared with toxic level standards. Detailed results and discussions were explained below.*

Keywords: Heavy metals; Pollution; Hundri River; sludge; organic matter

1. Introduction

Water is essential components for each and every life form. Crop productivity and development depending on water and soil fertility. Water bodies especially rivers are one of the important natural resource on earth to agriculture as well as human beings. They provide habitat for numerous aquatic lives and help in conserving the biodiversity (Rawat et al., 2017). Now a day's most of the rivers and canals get pollution by adding hazardous chemicals, fertilizers, by industrialization and urbanization. Among soil pollution heavy metal accumulation was one of the serious tasks, because heavy metals enter human and animal bodies through food chain and cause serious health hazards (Williams and David, 1973; DMello, 2003; Abdollatif et al., 2009).

In recent years high concentrations of heavy metals are entering the aquatic system due to the injudicious and unprogrammed discharge of industrial wastes, agricultural effluents and sewage waters, and indirectly from aerial fallout, bioaccumulation of metals in the eutrophicated sections (Mapanda et al, 2005). Due to these activities most of the perennial fresh water rivers like ganga, Krishna, hundri etc, getting pollution. Its leads to accumulation of heavy metals and also changing the soil physical and chemical composition like turbidity Edwards, (1991); Sharma et al., (2000). Plants and vegetables take up heavy metals by absorbing them from contaminated soils and waste water used for irrigating them as well as from deposits on different parts of the plants exposed to the air from polluted environment (Yadav et al 2002). Many urban areas in india grown common leafy vegetables like amaranths, spinach etc under municipal/industrial slugged water (Allen et al, 1986). So heavy metal easily enters human and animal bodies through food chain, it is the major pathway of heavy metal exposure for humans Zemedede Asfaw (1992). This causes an increase in the concentration of heavy metals content in human bodies.

The present study we concentrate on estimation of heavy metal accumulation in hundri river bank, because now Hundri River is used as open waste disposal site in kurnool district, Andhra Pradesh. Apart from its unfortunate fact, the river is also still used for various purposes including irrigation and animal drink. (Chen et al, 2005; Singh et al, 2004). The objective of present study is to assess heavy metal pollution/accumulation in sediments of hundri river bank and control soils.

2. Materials & Methods

Study Site and Sampling

Hundri River is a lifeline for the people of the districts Kurnool, Andhra Pradesh. Soil Samples (slugged and control) soils were collected from hundri river bang and surrounding normal fields. Samples were collected from 5 to 10 cm depth of the middle of the river or the bank of the running water channel and control (normal agricultural fields in Kurnool surroundings). The sediment and control soil samples (300gm) were collected in impenetrable polythene bags with the help of the bed material sampler. All the collected samples were transported to the lab and air dried for 72 h, ground in a mortar, sieved and homogenized before each weighing. Testing instruments were washed with double-distilled water and dried before use.

Preparation of sediment samples

A total digestion method (Allen et al, 1986; modified by Singh et al. 2010) was utilized to determine the heavy metals concentrations in both sediment and control samples, in which 2 gm of each sample was warmed with 20 ml of tri-acid mixture (HNO₃, H₂SO₄ and HClO₄) in the proportion of 5:1:1 in a Teflon measuring beaker at 80^oC for 4-5 h. At the point when the samples totally digested and leave a transparent solution, the sample was cooled to room temperature and after that it was filtered through Whatman No. 42 filter paper into a pre-cleaned 100-ml volumetric flask. These samples were specifically utilized for the investigation of heavy metals by atomic absorption

spectrophotometer ((model AA-6300, Shimadzu, Kyoto, Japan).

3. Results and Discussion

We estimated physical and chemical properties (pH, Temperature, Moisture content, Organic carbon, Nitrogen, Phosphorus and Potassium) and heavy metal (Zn, Pb, Ni, Cd, As, Co and Cr) accumulation in both hundri river sludge and control soil samples, results were represented in (Table.1&2). Results showed that river sludge shows high pH, low temperature, high organic and NPK than control soils. Our study found eight heavy metal components namely Ag, Co, Cu, Cr, Ni, Cd, Zn, and Pb in both river sludge and control soil. However river sludge showed high amount of all eight heavy metal accumulation than control soils when compared with toxic level standards. Based on our results river sludge had more contamination of zinc and lead as compared to other metals cadmium, cobalt, aluminum, arsenic and chromium and the order was Zn>Pb>Ni>Co>Cr>Cd>Ag>As. The results were compared according to the safe limits of metals in edible parts of vegetable according to the Indian Standards). Similar results were reported by Singh et al (2010), Gaeta Tiwari and Chitra Pandae (2008) in slugged grown vegetable plants.

Table 1: Analysis of different physical-chemical properties in hundri river sludge and control soil samples

	Control soil	Hundri river sludge
Soil pH	7.6	8.2
Temp	25°C	21°C
Moisture content (%)	75.34	92.38
Conductivity (dSm-1)	0.54	0.62
Organic carbon (%)	3.47	5.68
Nitrogen (Kg/ha)	5.0	6.8
Phosphorus (Kg/ha)	2.2	5.4
Potassium (Kg/ha)	7.6	15.2

Table 2: Different heavy metal concentrations (ppm) in Hundri river sludge and control soil samples

	Ag	As	Cr	Cd	Co	Ni	Pb	Zn
Control Soil	3	22	2	2	3	8	78	300
Slugged Soil	8	54	8	7	9	21	156	546
Toxic levels	300	2	10	5	5	40	150	400

4. Conclusions

The present study provides the first and useful data for the physical and chemical properties of the hundri river sludge and its sediments and contamination status. From the above study on accumulation of heavy metals in hundri river sludge, the amounts of Zn, Pb, Ni and Co entering the liquid phase of the slugged soil from this enter into food chain through food and fodder. Finally our study stated that do not release untreated industrial, municipal waste water into surrounding rivers and any other water bodies.

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