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REPORT

Heavy Metal Accumulation in Industrial Solid Waste Amended Soil

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The accumulation of Zn, Pb, Cu, Hg, As, Cr, Cd and Ni in industrial solid waste amended soil profiles was determined. The soil samples were taken at a depth of 10–15 cm from the surface. The status of the metals in seven different samples was determined. All samples were collected from different locations on polyethylene sheets and allowed to dry in air at ambient temperatures. The concentration of these metals was detected by atomic emission spectroscopy. The concentration of some metals was found to be higher.

Key Words: Accumulation of metals, Amended soils, Industrial area, Rasayani.

The aim of this work is to investigate the concentration of waste amended soil with heavy metals. The metal specification has become a most important area of inquiry because of its importance in understanding of the fate and effect of metals in the environment[1]. The heavy metals also form complexes with organic compounds adsorbed in the structure of primary and secondary minerals[2]. Some workers[3] have also concluded that the organic compounds constitute only 3–4% of the sediment and have been known to play an imporant role in various processes such as solubility, concentration and accumulation of metals.

Certain metals such as Pb, Cd, Zn and Cu were investigated as affected by soil organic matter. In these metals, the increasing concentration of soil organic matter caused a decrease in their mobility. When adsorption was related to soil organic matter content, for may trace elements, these research workers found the strength of adsorption was dependent only on pH, showing an increase with rising pH.

The solid waste amended soil samples were collected from different locations of Patalganga MIDC areas of Rasayani near Khopoli city at a depth of 10–15 cm from the surface. The metal concentration was detected by ICP-AES method at Centre for Materials for Electronics Technology, Pashan Road, Pune.

The results obtained during the present investigation are given in Table-1. The amounts of As and Cr in all solid waste amended soil samples were detected less

than 0.1 and 0.2 μg/g respectively. Cadmium was present in the detectable range of 0.020–0.059 μg/g. Cadmium is a well known carcinogen and at high levels, it causes kidney problems and anaemia. Copper was present in all the samples and ranged from 0.42–1.98 μg/g. Many researchers[4,5] studied copper complex formation. They concluded that there is greater affinity between copper and its complexes, which results in low mobility of copper in soil. Mercury has not been detected in most of the samples except at near Reliance Industries. Mercury was detected 1.21 μg/g. Mercury is converted by natural biological processes to the poisonous neurotoxin methyl mercury. Nickel was found in only four locations and ranging from 0.20–0.75 μg/g. Organic complexation of nickel apparently was not as strong as that of copper[1]. Lead was found in all the solid waste amended soil samples. It ranged from 0.041-2.2 μg/g. It is strongly bonded to humic material[6]. Zinc was found in all the soil samples and existed in the range of 1.92-12 μg/g. Generally zinc has been found to be only weakly complexed by the organic matter in sewage[7]. Some researchers have concluded that zinc is complexed under the most favourable conditions, *i.e.*, high charge density of organic matter, low pH and low solubility of complexing metals[7].

TABLE-1
CONCENTRATION OF METALS (SAS) IN μg/g

S.No.	Location of sample	Cd	Cu	Ni	Pb	Zn
1.	Near State Bank of India	0.032	1.70	ND	0.62	12.00
2.	Near Hindusthan Organic Chemicals	0.200	1.74	ND	1.30	1.98
3.	Near Hindusthan Organic Chemicals	0.041	1.49	0.75	1.47	2.90
4.	Near Cipla Industries,	0.049	0.42	0.64	1.91	2.90
5.	Near Bank of Maharashtara	0.034	0.47	0.36	0.041	2.45
6.	Near Reliance Industries	0.059	1.98	0.20	0.52	2.48
7.	Reference soil sample Near Rasayani	0.054	1.89	ND	2.20	3.12

N.D.: Not detectable.

The accumulation of heavy metals in the soil samples is often the result of repeated sewage sludge disposal[8]. The concentrations of some metals were found higher in these samples. It clearly indicates that the metals accumulate in the top soils by an external atmospheric input. The researchers concluded that the metal concentration in soil was propertional to sludge applications[8].

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