Toxic Metal Absorptivity to Agriculture Soil

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Introduction

Soil contamination has increased by several folds within the recent past due to various man made activities. Various types of toxics involve in the processes of making contaminated soil profiles. There are many toxic metals and chemical complexes which contaminate soils. When toxic agents contact with soils they may absorb or adsorb in to the soil structure depending on their structural and physical properties. One of the major sources of contaminant is agrochemicals. Due to expansion of agricultural practices and over use of agrochemicals (pesticides, weedicides, insecticides, fungicides and others) the effect has become adverse.

Sri Lanka is covered with versatile range of soils with highly contrast physical properties. In this study, soil samples from different agricultural areas in Badulla district have been used to determine their quantity of toxic metal absorptivity quantitatively.

Method

Five areas were selected where there are many types of agricultural activities. Uncontaminated samples were collected from these farms (Mirigama, Passara, Badulla Bandarawela and Welimada). Soil properties like moisture content, soil pH, bulk density, hydraulic conductivity, soil porosity were studied in order to categorize the soil types.

Soil columns were made for these samples and metal absorptivity was studied by adding *Roundup* pesticide (which is heavily used agrochemical in the area). Concentration of the agrochemical was kept at its normal dosage. Original agrochemical was fully studied with ASS to identify the containing metal ions and the obtained leachates were also measured for the same set of metal ions to confirm their soil absorptivity under specific time period.

Obtained AAS results interpreted to identify the correlations between soil properties and toxic metal absorptivity.

Results

Table 01: The soil properties of collected samples

sample	pH	Moisture content	Bulk density	porosity	Hydraulic conductivity
A	4.18	25.975	1.12	57.7358	0.131408
B	4.77	2.749	0.84	68.3018	0.408656
C	4.05	11.82	0.74	72.0754	0.277594
D	4.43	5.222	0.86	67.5471	0.366963
E	4.48	12.758	0.76	71.3207	0.0116
F	4.56	12.76	0.82	69.0566	0.308462
G	5	0.562	0.64	75.8490	0.2583
H	5.07	0.513	0.72	72.8301	0.511017
I	4.13	7.645	0.68	74.3396	0.278002
J	4.47	5.229	0.7	73.5849	0.172283
K	5.84	34.976	1.12	57.7358	0.421605
L	4.42	17.467	0.98	63.0188	0.524233
M	5.62	13.258	0.82	69.0566	0.182757
N	6.69	11.842	0.96	63.7735	0.38114
O	5.7	8.886	0.82	69.0566	0.149535

Soil properties like soil Ph, soil moisture, soil bulk density, soil porosity, soil hydraulic conductivity were measured. Then toxic metal absorbance to soil was measured by AAS and results are graphically shown here. Then it was analyzed whether there is any relationship between soil properties and toxic metal absobvity.

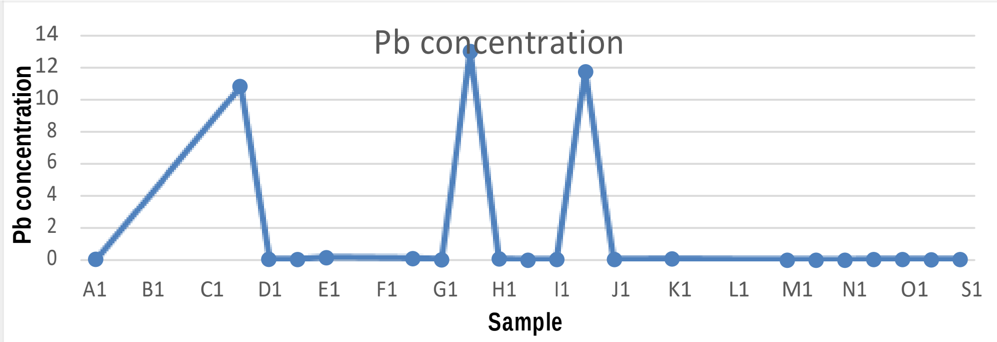

Figure 01 : Pb concentration variation of samples.

Pb concentration of samples varies as G > sample I > sample C

Three samples are in acidic state. Acidic environment is better for Absorption of Pb. Moisture content does not affected to the absorption of Pb. Lower bulk densities are preferred for absorption of Pb. High porosity is better for Pb absorption. Hydraulic conductivity also does not affect to the absorption of Pb. Other samples do not show a Pb concentration because their absorbance is less than 0.001.

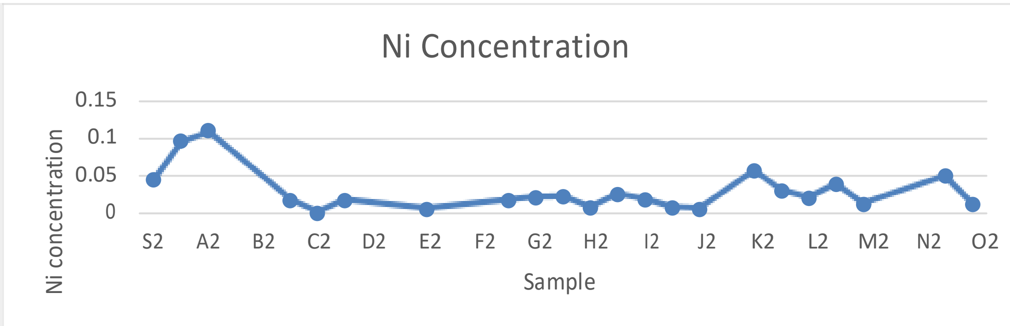

Figure 02 : Ni concentration variation of samples.

Ni concentration of samples varies as, A> Sample k > sample O

Acidic environment is preferred for the Ni absorption. Moisture content does not effect to the Ni absorption. High bulk density is better for Ni absorption. Low porosity is better for Ni absorption. Hydraulic conductivity does not much affected to the absorption of Ni.

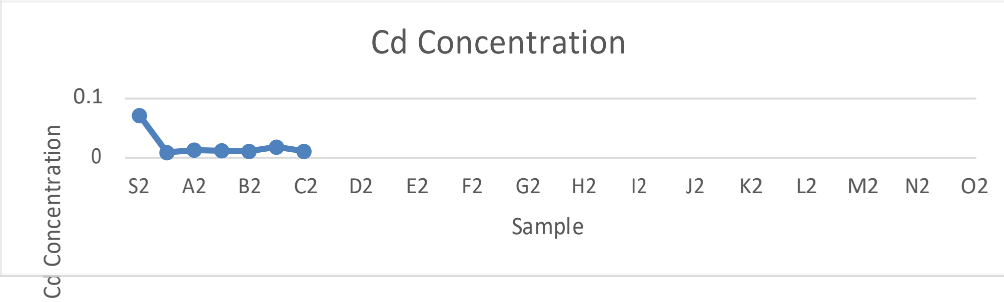

Figure 03 : Cd concentration variation of samples.

Cd is present in sample A,B and C in little amounts. There is no Cd in other samples because their Cd absorbance is less than 0.001

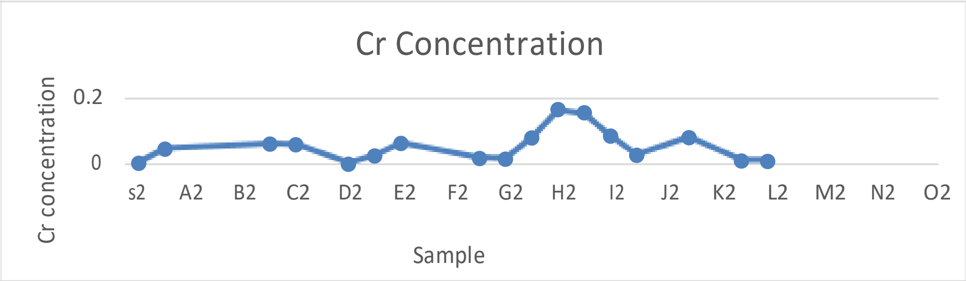

Figure 04 : Cd concentration variation of samples.

Cr concentration of samples varies as, sample H> sample I > sample k

Acidic environment is preferred for the Cr absorption Moisture content does not affect to the absorption of Cr Bulk density, porosity and hydraulic conductivity do not effect to the absorption of Cr

Conclusion

According to the obtained results soils with higher organic content have absorbed higher amount of toxic metals. Soil pH and hydraulic conductivity do not affected significantly in the absorptivity of metals.

In this investigation was used agrochemical in small amount and the cause of agricultural field have accumulated various large number of agrochemical due to the usage of agro chemicals as type of insecticides, pesticides, weedicides and fungicides. These types of agrochemicals are accumulated during the last number of years. That caused to the agricultural soils were contaminated by significant amount of toxic including toxic metals which accumulated toxics were finally entered to the ground water and this cause to contaminate the ground water and the environment related to it.

References

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