ASSESMENT OF PHYSICO CHEMICAL PROPERTIES AND HEAVY METALS IN SOILS OF SOME RURAL AREAS AROUND GOBICHETTIPALAYAM, ERODE DISTRICT, TAMILNADU.

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ABSTRACT

Soil pollution is a predominant one in urban areas. Nowadays soils in rural areas are also slowly contaminated due to synthetic fertilisers in agricultural practices, industrial development, urbanisation, traffic emission and anthropogenic activities. Heavy metals are severely contaminated the soil. Heavy metals released into the environment either naturally or by anthropogenic activities. Soil quality is mainly based on their physicochemical parameters. It directly correlates with the sustainability of the environment. Urban soils, soils around industrials areas are mainly concentrated by researchers. But soils in rural areas are also slowly polluted by various factors. Soil pollution decrease the quality of the soils and crops. Soil pollution leads to water pollution also. It creates harmful effects in the environment. Soil properties are preferably based on land use and management. We should give severe attention to soil contamination in rural areas.

KEY WORDS: Soil pollution, rural areas, heavy metals, physicochemical properties.

INTRODUCTION:

Rural areas are generally outside of towns and cities. In rural areas we can get clean air, water, and soil. Soils in rural areas are slowly contaminated. Soil is reservoir for water, nutrients and microorganisms. Soil is the basic needs of human beings for various activities. The following physicochemical parameters of soils like pH, electrical conductivity, total organic carbon, total phosphorous and nitrogen were evaluated. Heavy metals are not bio – degradable, they persist and accumulate in the soil for a longer time and resulting into severe environmental pollution (Mtunzi et al, 2015). To monitoring environmental pollution, determination of metals in soils are very important (Al-Khashman, 2012). Anthropogenic activities like agricultural, industrial, traffic emission, domestic activities, mining and other human activities leads to higher concentration of these heavy metals in the soil when compared with geogenic or lithological processes (Pam et al 2013). Understanding soil pollutants and their dependence on its physicochemical properties has provides a basis for careful soil management that limits as far as possible the negative impact of the pollutants on the ecosystem (Dawaki 2013).

In this study, the rural areas were selected for the assessment of contamination. The study area was found nearer to the urban area. The reason behind that is the rural area was gradually polluted by the anthropogenic activities and vehicular emissions and many industrial activities. This study was conducted to evaluate the soil status based on physicochemical characteristics and heavy metal content in soil. The metal content of soil was increased. Fast urbanization, industrial development and intensive agriculture were the main reason for the increase of metals in soils. Zn, Cr, Pb, Cu, Ni and Cd were present in soil. Cadmium

contamination was higher in sampling areas. This was due to anthropogenic activities. Cr and Ni were lithogenic (natural) in origin and the Cu, Pb and Zn were mixed in origin. The main sources of metals in urban areas were cement production, vehicle exhaust and vehicular traffic, while phosphate-based fertilizers were the main sources in rural areas. In the study more than 80% of the metropolitan region surveyed. They were at moderate to high ecological risk. (F.V.B. da Silva et al., 2017). The soil quality and health issues in the Yangtze River Delta have become more prominent, because of rapid urbanization, industrialization, and agriculture intensification. It severely affected the safety of agricultural products and human health (Zhong et al., 2011).

In Qinghai-Tibet Plateau the roadside top soils were evaluated for the concentration of copper (Cu), zinc (Zn), cadmium (Cd), lead (Pb), chromium (Cr), cobalt (Co), nickel (Ni) and arsenic (As). This study focused on potential environmental risks of these roadside heavy metals due to traffic emissions. With the increase of roadside distance the heavy metals' concentrations and their ecological risk indices decreased exponentially (Xuedong Yan, et. al 2013). From the pedogenetic processes of weathering of parent materials heavy metals occur naturally in the soil environment at levels that are regarded as trace (<1000 mg kg^{-1}) and rarely toxic (A. Kabata-Pendias and H. Pendias 2001, G. M. Pierzynski, et. al 2000).

In our study, the rural areas around Gobichettipalayam were selected for the assessment of contamination. The study area was found nearer to the urban area. The reason behind that, the rural areas are gradually polluted by the anthropogenic activities and vehicular emissions and many industrial activities. This study was conducted to evaluate the soil status based on physicochemical characteristics and heavy metal content in soil.

MATERIALS AND METHODS

STUDY AREA

The soil samples were collected around the rural areas of Gobichettipalayam. Such as Othakuthirai, Odathurai, Kuhalur, Bommanayakkanpalayam, and Vellalapalayam.

PHYSICO-CHEMICAL ANALYSIS AND HEAVY METALS IN SOIL SAMPLES

The collected soil samples were air-dried, ground into fine powder using pestle and mortar. Then the soil samples were passed through a 2 mm sieve. The processed soil samples were used for determining the pH, electrical conductivity (EC), organic carbon, available phosphorus and total nitrogen. Estimation were done by standard procedures. The presence of heavy metals in soil samples were also evaluated. ICP-MS is used for the estimation of heavy metals in soil samples.

TABLE 1. PHYSICO-CHEMICAL PROPERTIES OF DIFFERENT SOIL SAMPLES

Parameters	Soil 1	Soil 2	Soil 3	Soil 4	Soil 5
ph	7.87	8.2	8.2	8.2	8.1
Soil conductivity	0.026ms	0.022ms	0.054ms	0.023ms	0.021ms
Total organic carbon	5.58%	3.85%	4.9%	3.25%	3.7%
Phosphorous	0.06%	0.09%	0.26%	0.03%	0.22%
Total nitrogen (mg/g)	3.09	0.46	0.99	1.14	0.48

TABLE 2. VARIATION IN HEAVYMETALS IN SOIL SAMPLES

(All are mg /gm)

S. no	Heavy metals	Soil 1	Soil 2	Soil 3	Soil 4	Soil 5
1	As	-	-	-	-	-
2	Se	-	-	0.0143	-	-
3	Mo	0.0001	0.0001	0.0001	0.0001	0.0001
4	Cd	-	-	-	-	-
5	Pb	-	-	-	-	-
6	Cr	-	-	-	-	-
7	Be	-	-	-	-	-
8	Al	0.3318	981.666	0.5055	0.1614	0.5481

DISCUSSION:

All the soil samples were normal in condition. The pH range from 6 – 8.5 is normal (SS Kekane et.al 2015). Soil conductivity and phosphorus were higher in soil sample 3. Soil conductivity is increased with the increase of concentration of ions. Total organic carbon was higher in sample 1. The lower pH was observed in the soil sample1. The lower pH was due to the presence of higher concentration of organic carbon (SS Kekane et.al 2015). Nitrogen was higher in soil sample 1.

Arsenic, cadmium, lead, chromium and beryllium were absent in all the soil samples. Selenium was found in soil sample 3. Molybdenum and aluminium were present in all the soil samples. Aluminium was present in higher amount compared with molybdenum. In soil sample 2 aluminium was present in higher amount. In diverse ways soil properties affect the availability of metals in soils. The heavy metal concentration decreased with the increase of soil pH (R. D. Harter, 1983). Soil properties affect metal availability in diverse ways. He reported that soil pH is the major factor affecting metal availability in soil.

CONCLUSION

The concentration of heavy metals in soil samples are due to industrial or traffic origin. Evaluation of heavy metals in soils are often required in order to assess a possible risk to humans and the environment, and prevent potential health and environmental hazards. Based on the above results, we conclude that the soils of rural areas around Gobichettipalayam can be classified as in general as non-polluted with a lower extent of metals.

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