

RETENTION OF HEAVY METALS BY EPPAWALA ROCK PHOSPHATE AMELIORATED SOILS

M.A.T.D. MARASINGHE AND SRIMATHIE P. INDRARATNE

Department of Soil Science, Faculty of Agriculture, University of Peradeniya, Peradeniya

Contamination of the environment by heavy metals is a major concern because of their toxicity and threat to human life and the environment. Heavy metals contribute largely for the pollution of agricultural soils. This study was carried out to compare the retention of heavy metals by Eppawala Rock Phosphate (ERP) and an Alfisol as the soil, and to study the retention ability of heavy metals by different inorganic and organic fractions of ERP-ameliorated Alfisols.

Adsorption studies were conducted for the Alfisol and ERP by equilibrating Zn, Cu and Cd in varying concentrations and calculating maximum adsorption capacity (M) using Langmuir equation. The ERP-ameliorated soil was prepared by mixing ERP with Alfisol at the rate of 100 g/kg. This mixture was then contaminated with heavy metals by spiking Zn, Cu and Cd at the rate of 100, 100 and 2 mg/kg, respectively. Five extractions were conducted sequentially, to determine the fractionation of heavy metals into water soluble, exchangeable, carbonate bound, organic matter bound and Fe, Mn oxide bound forms.

The M values of ERP for Zn, Cu and Cd were much higher than that for Alfisol. The fractionation study revealed that Zn was associated with the exchangeable, carbonate bound, organic matter bound and Fe, Mn oxide bound fractions in 70%, 1.5%, 4.7% and 5.1% respectively. Exchangeable Zn fraction was significantly higher than other Zn fractions ($P < 0.05$). Copper was found in all the above-mentioned five fractions. Exchangeable Cu fraction was significantly higher than the other Cu fractions ($P < 0.05$). Sorption of Cd into Fe and Mn oxides was 70%, and it was significantly higher ($P < 0.05$) than other Cd fractions. Fractionation of Cd into water soluble and exchangeable was not detectable and carbonate bound and organic matter bound fractions were only 4% and 5% respectively.

The ERP has higher retention ability of heavy metals than that of Alfisol. Therefore, ERP has the ability to ameliorate Zn, Cu and Cd-contaminated soils. In contaminated soils Zn is mostly associated with exchangeable fraction whereas Cu is in the exchangeable fraction and forms complexes with organic matter. The ERP-ameliorated soils converted Cd into non-available forms. The ERP-ameliorated soils could be effectively used to remediate the Cd contamination.