

Effect of fertilizer application to the agricultural soil and the determination of soil to plant transfer coefficients of selected elements

W. P. R. T. Perera*, M. D. N. R. Dayananda, W. S. M. Botheju, Janitha A. Liyanage

Department of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka

Transfer of metals from soil to plant depends on the availability of particular elements in soil and the fertilizer which are applied to the agricultural fields. This study aims to determine the effect of fertilizer application to the agricultural soil and to determine the soil to plant transfer coefficients of selected elements in Eppawala Grama Niladhari Division (GND), Anuradhapura, Sri Lanka. Fifteen soil and rice root samples were randomly collected from paddy fields and composite fertilizer samples were prepared by adding Urea, Muriate of Potash and Rock Phosphate in the ratios which were used by farmers in sampled area. Metals were analyzed by Inductive Coupled Plasma Mass Spectrometry (ICP-MS-Agilent 7800). Mean concentrations of Cr, Fe, Cu, As, Cd, Pb and Zn in fertilizer composites were 445.00 ± 171.00 , 114638.00 ± 46722.00 , 92.90 ± 38.40 , 178.00 ± 109.00 , 5.56 ± 3.41 , 912.00 ± 534.00 and 2553.00 ± 1452.00 in mg/kg respectively. Mean concentrations of Cr, Fe, Cu, As, Cd, Pb and Zn in soil samples were 0.22 ± 0.03 , 135.10 ± 38.90 , 1.37 ± 0.16 , 0.25 ± 0.30 , 0.01 ± 0.00 , 0.32 ± 0.07 and 40 ± 10.3 in mg/kg respectively. The transfer coefficients (TC) of different metals were quantified to indicate the lability of metals in soils. Greater TC value indicates relatively poor retention of metal in soil or greater efficiency of plant roots to absorb metal, and low TC is attributed to strong sorption of metal to the soil colloid. TCs from soil to roots for Cr, Fe, Cu, As, Cd, Pb and Zn were 62.14, 260.04, 46.93, 6.94, 21.26, 14.14 and 3.37 respectively. It indicates that rice roots absorb higher amounts of metals in soil colloids which are resulting mostly from the fertilizer applications. It can be concluded that considerable amount of metals coming from the fertilizers are remaining in the soil and the efficiency of absorbing metals from plant roots is higher than the retention of metals in soil as having greater Transfer Coefficients.

Keywords: Fertilizer, Soil colloids, Rice roots, Transfer coefficients

*Corresponding author. Department of Chemistry, University of Kelaniya, Kelaniya, Sri Lanka.
Email address: 2017_perera@kln.ac.lk