ABSTRACT

Purpose: The purpose of the study was to investigate the concentration levels of total and extractable selected heavy metals such as Cadmium (Cd), Chromium (Cr), Copper (Cu), Nickel (Ni), Lead (Pb), and Zinc (Zn) in soils of Nakuru town and the surrounding farmlands. In addition, soil chemical properties such as pH, % organic carbon and cation exchange capacity were also determined.

Methodology: The study area was divided into two sampling sections, the town area being within 2 Km from the town center and the surrounding farmlands being those beyond 2 Km from the town center. From each section eight (8) sampling sites were established based on their activities and the samples collected in triplicate. The samples were air-dried, crushed, sieved, and stored at ambient temperature before analysis. The soil suspension was used to measure pH (potentiometric method) and the cation exchange capacity (ammonium acetate method), and the organic carbon was determined using oxidation-titration method. The potentially extractable heavy metals were extracted using EDTA method and total heavy metals extracted using digestion method and the concentration estimated using an atomic absorption spectrophotometer. The data obtained from the experimental analysis were subjected to descriptive statistics to get the mean concentration levels.

Results: The results obtained for total content in town soils were, 0.44-1.03 mg/Kg Cd, 0.88-2.24 mg/Kg Cr, 1.61-2.73 mg/Kg Cu, 0.92-2.00 mg/Kg Ni, 0.61-1.49 mg/Kg Pb and 0.21-0.46 mg/Kg Zn while the total content in the surrounding farmland were, 0.26-1.39 mg/kg Cd, 0.59-1.65 mg/Kg Cr, 0.91-4.39 mg/Kg Cu, 0.58-0.83 mg/Kg Ni, 0.50-0.83mg/Kg Pb and 0.11-0.31 mg/Kg Zn indicating higher content in town soils. Extractable heavy metal content levels in town soils were 0.12-0.74 mg/Kg Cd, 0.06-1.10 mg/Kg Cr, 0.76-1.55 mg/Kg Cu, 0.25-0.83 mg/Kg Ni, 0.17-0.11 mg/Kg Pb and 0.07-0.18 mg/Kg Zn, and those from the surrounding farmland soils were, 0.07-0.59 mg/Kg Cd, 0.30-0.59 mg/Kg Cr, 0.61-1.55 mg/Kg Cu, 0.25-0.42 mg/Kg Ni, 0.17-0.33 mg/Kg Pb and 0.04-0.12 mg/Kg Zn indicating the same trend as for the total content. The chemical properties such as pH, % organic carbon and cation exchange capacity in town soils were 6.02-6.92, 0.84-2.3 and 8.13-26 respectively while in surrounding farmland, 5.3-6.65, 0.81-2.3 and 3.9-14 respectively.

Unique contribution to theory, practice and policy: There is need for environmental quality assessment of heavy metal-contaminated soils to disclose the effects of human activities on the environment which will provide the critical information for sustainable development of the limited soil resource. There is need for geochemical studies to create an extensive database of heavy metal background values that can be used for the evaluation of environmental quality