A study on the beravior of some trace elements in calcareous and lacustrine soil environments

Sherine Shehata Mourid

This work was conducted to find out the soil factors that might affect chemical behavior of trace elements in calcareous and lacustrine soils. Fulfilling the purposes of this investigation required digging ten soil profiles, two of them represent the calcareous soils and the other ones represent the lacustrine soils. The soil profiles were described in the filed according to the outlines undertaken by soil survey Staff (1992). Disturbed soil samples were collected from the different profile layers according to the morpholoLical variations to determine the main physical and chemical properties of the chosen soils. Both total and DTP A-extractable contents of Cd, Co, Ni, Cr, Fe, Mn, Zn, and Cu were determined for all the soils under study. Three statistical measurements i.e. weighted mean (W), trend (T) and specific range (R) of the studied trace elements were derived for each profile samples. Moreover, distribution of each trace element among the different soil fractions was conducted using the sequential extraction method proposed by Tessier et al.(1979).The most important results of this investigation can be summarized in the following:- The color of the soils under investigation varied from yellow or light brown to very dark gray. However, mottling and dark spots are common features in the subsurface and deep horizons of the heavy clay soils of the northern Delta (i.e. Bahr El-Bakar and Bahr Hadous). Structure of the investigated soils differed from massive to weak or strong sub angular blocky in most of the studied profiles. The mostdistinct features of the calcareous profiles are the lime nodules.- Textures of the studied soils ranged from heavy clay in the northern part of the Delta (lacustrine soils) to loamy sand in the calcareous soils. Organic matter content of both the calcareous and lacustrine soils was low and did not exceed 2.7%. The active surface area ranged from 50.09 to 68.0 m2/g soil in the calcareous soils. Higher values were recorded for the lacustrine deposits (86.0 — 671.0m2/g). Total CaCO3 content ranged between 0.16% in El. Tina plain to 73.20 El-Hamman soil whereas the active fraction of CaCO3 varied from 0.12 to 8.05%, soil pH values in most of the profiles were around 8 in the calcareous soils and fluctuated/exceeded 7 in the lacustrine deposits.- The cationic composition of both the calcareous and lacustrine soils followed the descending order Nat > Mg2+ > Ca2+ > K1+ whereas the anionic composition of these soils followed the order: C 1- > SO42- > HCO3” with an entire absence of CO32” ions. Values of the cation exchange capacity ranged from 4.9 (in EL-Tina plain) to 60.2 cmolc kg’ soil in Bahr El-Bakar. Regarding contents of the amorphous materials in the calcareous soils, it was found that SiO2 content ranged from 2577 to 26667 mg/kg’ while amorphous Al203 ranged from 1540 to 13333 mg/kg-1. The corresponding SiO2 values of the lacustrine soils ranged from 4667 to 26667 mg/kg-1 whereas those of Al203 ranged from 1333 to 2333 mg/kg-1.Values of total content of the studied elements varied widely and seemed to be significantly dependent on some soil properties. DTPA- extractable content on the other hand, seemed to be dependent in some cases, on total soil content of these elements, however, in most cases, the DTPA extractable contents of the studied elements did not reflect obviously their corresponding total ones and depend, to different extents, on soil properties.Values of the weighted mean (W), the trend (T) and specific range (R) varied from an element to another and from a soil to another and reflected different pedogenic processes, sedimentation regimes as well as local conditions of each soil profile.-The solid-phase chemical forms of the different studied elements varied widely due to soil type, soil depth and element under study.-Results showed that the chemical

behaviors of Zn and Cd are similar whereas Fe, Mn, Co, Cr, and Ni behave differently while Cu behaves in a way different from both the two groups due to the high affinity of Cu for organic mazer legends.The aforementioned results indicate that the total content of any of the studied trace elements is distributed widely among its solid phase components. Such a finding is helpful in increasing soil contents of the required micronutrients through increasing or enhancing the soil properties that lead to presence of the elements in its more soluble fraction of fractions. On the other hand, this finding of is an effective tool in controlling the environmental hazards which associate the enrichment of soils with toxic metals that can be absorbed by plants and, hence take their ways in the food chain.Accordingly, some additive e.g. $CaCO_3$ and organic matter may be valuable in reducing the potential hazard of the phytotoxic elements in soil environment.