Adsorption of some ions in soil and its agricul tural implications

Ibrahim Abd El–aty Ali Abou–Amer

The objective of this study was to examine the effect of some soil compenents such as clay content, calcium carbonate and iron oxides on availability of both phosphorus and zinc. Also, the effect of organic ligands (citrate, oxalate and acetate) on phosphorus and zinc adsorption and their bonding energy in calcareous soils as well as the effect of applied organic matter, phosphorus and zinc on barley growth an its content of phosphorus and zincFifteen surface and subsurface soil samples representing the studied calcareous soils were collected from north, western coast. Samples were obtained also from areas at the north and south El-Sallam canal in North Sinai.Results indicated that,values of available phosphorus extracted by Olsen's method ranged from 7 to 18ppm and from 5 to 17ppm in surface and subsurface layers, respectively. While, values of available zinc extracted by DTPA method varied from 0.47 to 2.64ppm and -from 0.41 to 1.75ppm in surface and subsurface layers, respectively. Significant positive correlation was found between each of available phosphorus and zinc with organic matter content in soils.Values of soil phosphate potential ranged from 5.92 to 7.38unit according to Aslyng equation, and ranged from 6.12 to 7.50 unit according to Larsen equation, while the values of equilibrium phosphate potential varied from 6.99 to 7.39 unit.Values of differential phosphate buffering capacity (DPBC) ranged from 83 to 250 units and significantly correlated with soil clay content.Phosphorus adsorption:Data indicated the important role played by each of clay and CaCO3 content in increasing the ability of soils to adsorb phosphorus.Organic lignads reduced P-adsorption by soils ,this effect seems to correlate with the concentration of ligands and is affected by the timing of both P and Zn application to the soil , either before or after organic ligands application .A maximum reduction in phosphate adsorption occurred when the organic ligands were added before application of phosphorurs specially at the second rate of organic ligands. Also, citrate showed more pronounced effect on P-adsorption than both oxalate and acetate.Organic ligands markedly decreased P-bonding energy in soils which significantly correlated with soil properties specially clay content, CEC and surface area. Also, the decrease in P-bonding energy depended on the concentration of ligands and the time of applied phosphorus or ligands to soil. Data also show that citrate had more effect than oxalate and acetate .Organic ligands application decreased the values of P-desorption. This effect was dependent on the concentration of organic ligands and timing of their application .Zinc adsorption:Variable effect of organic ligands on Zn-adsorption depended on the concentration of both zinc and organic ligands was recorded.The variable effect of organic ligands on zinc adsorption depended on concentration of both zinc and organic ligands. The difference between Zn-adsorption in the presence of organic ligands varied from one ligand to another. Zinc sorption decreased in the presence of citrate more than oxalate but acetate effect , according to Langmuir isotherm, was insignificantMaximum reduction in Zn-adsoption was occurred when organic ligands were added after application of Zn .The effect of organic ligands on Zn-bonding energy depended on the concentration of organic ligands and type of this ligandThe decrease in Zn-bonding energy washigher when Zn was added to the soil before application organic ligands.,particularly citrate and oxalate, if compared with Zn addition after ligands, application.Values of "b" constant varied depended on the concentration of these ligands and the time of Zn or ligands addition..Greenhouse Experiment:Application of organic matter, phosphorus and zinc increased the dray matter yield of barley plants.The percentage of increases

were 29%, 32% and 15% over the control for organic matter, phosphorus and zinc, respectively.Phosphorus content in barley plants increased significantly due to organic matter, phosphorus or zinc application, while zinc content decreased with application of organic matter and phosphorus and increased with zinc application.