SUMMARY

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The main purpose of this investigation was to study the effect of some factors controlling availability and mobility of some macro and micro nutrients i.e., P, Zn, Fe, Mn and Cu in a sandy soil and Nile alluvial one. To fulfill this purpose plastic pot and column experiments were conducted.

The pot experiment:

Two Kg portions of each soil (sandy or Nile alluvial) were mixed with $CaCO_3$ applied at a rates of 0 (control), 10, 20 and 30 % (w/w) in combination with Zn in the cheleated (Zn EDTA) and sulfate ($ZnSO_4$) forms at rates of 0 (control), 5 and 10 ppm then packed in plastic pots.

Fifteen grains of barely were planted in each pot and watered with tap water to bring the soil moisture content to 70 % of the field capacity. Plants were thinned to 6 plants/pot. After 50 days from planting, the plants were removed from the pots, weighted, oven dried at 70 °C and reweighed again then ground and chemically analysed for P, Zn, Fe, Mn and Cu.

The soils remained in the pots after removal of the plants were sampled and chemically analysed for P, Zn, Fe, Mn and Cu.

The obtained results could be summarized in the following :

1- The $CaCO_3$ reduced the availability of most of the studied elements (P, Zn, Fe, and Mn) and the effect seemed to be dependent on rate of the applied $CaCO_3$ i.e. the higher the rate of

the applied $CaCO_3$ the lower the availability of the element. This occurred whether $CaCO_3$ was applied solely or in combination with the applied Zn in both of its studied forms or rates. However, the applied $CaCO_3$ did not show an obvious effect on DTPA-extractable Cu in both the investigated soils.

Applying Zn decreased slightly the soil contents of both available P and Mn, while it increased their contents of available Zn. The effect seemed dependent on the form and rate of the applied Zn. Slight and contradictory effects for the applied Zn were observed on availability of Fe, whereas neither rate of the applied Zn nor its form seemed to have a certain effect on availability of Cu.

3- Dry matter yield of barley plants grown on both the investigated soils was decreased due to application of $CaCO_3$, whereas increasing rate of Zn applied to both soils resulted in a progressive increase in concentration and dry matter yield of both roots and shoots.

4- Uptake of P, Zn, Fe, Mn and Cu by shoots and roots of plant was reduced due to treating soils with $CaCO_3$. The effect of $CaCO_3$ increased with increasing rate of its application.

5- Application of Zn to both the studied soils slightly reduced concentration and uptake of P, while it increased concentration and uptake of Zn.

Increasing rate of the applied Zn caused a relatively decrease in Fe uptake by roots but increased its uptake by shoots. Concentration of Fe in the plants grown on the sandy soil was not affected by

increasing rate of the applied Zn or even its applied form, whereas concentration of Fe in shoots of the plants grown on the Nile alluvial soil was reduced upon increasing rate of the applied Zn.

6- Contradictory effects were observed due to increasing rate of the applied Zn on Mn concentration in both shoots and roots of the plants grown on both the sandy and Nile alluvial soils.

7- Concentration of Cu in the barley plant was not affected by Zn application to both the studied soils, but uptake of Cu was affected negatively due to application of Zn.

The column experiment:

Seventy two plastic column were packed with soils mixed thoroughly with $CaCO_3$ at a rate of 0 (control), 10, 20 and 30% (w/w) in combinations with Zn in the form of Zn SO_4 or Zn-EDTA at rates of 0, 5 or 10 ppm and received P in the form of monocalcium phosphate at a rate of 13 ppm. The soil moisture content was kept constant at 70% of the field capacity and the experiment was continuced for a period of 50 days, thereafter the soils in columns were fractionated into 3 successive segments, i.e., 0-10, 10-20 and >20cm in case of the Nile alluvial one or 20-25 cm in case of the sandy soil. Each segment was analysed for both P and Zn.

The results of this experiment revealed the following:

1- Both the sandy and Nile alluvial soils contents of the P and Zn were highest in the surface soil layers and lowest in the deepest ones. Such pattern of distribution of both elements with depth does not indicate an upwardmovement for each of three soil

layers, it reflects only the negative effect soil content of $CaCO_3$ which seemed to accumulate in higher amounts in the deeper soil layers, in turn, its negative influence on availability of both P and Zn.

2- The results indicate that both P and Zn can move further in the sandy soils than the Nile alluvial one.

3- Applying Zn to the soils reduced P availability through the different soil depths. The combined effect of $CaCO_3$ and Zn on P availability was higher than the effect of the single application of $CaCO_3$ or Zn.