Effect of some micronutrients supplying power on some oil crops productivity in calcarious soils

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The main goal of this study is to evaluate the soil native supplying power of iron, manganese and zinc in the calcareous soils of Egypt represented mainly by the north western coast as well as both south and north of El-Tahrir Province (El-Beherae Governorate), whereas, 41 representative soil samples (0-30cm) were collected for the study from those areas.The results of the experiments carried out in this investigation are presented and discussed for each studied element (iron, manganese and zinc) as follows: preliminary study, physical and chemical analysis of soil at 41 locations though the studied areas, chemical and biological evaluation of soil supplying power for Fe, Mn and Zn and finally a field experiment to induce the native supplying power of the soil nutrients under study.5.1. Preliminary study:Before beginning the performance of the main experiments of this study, this part of work was undertaken.The 41 soil locations were subjected to intensive physical and chemical analyses of the different parameters that may participate or involved in available nutrients to growing plant, using 41 samples representing 41 locations. These analyses included:1- Total and DTPA extractable Fe, Mn and Zn in the studied soils.2-Successive extraction of Fe, Mn and Zn from other samples from the corresponding main ones for wat r soluble, exchangeable, and complexed forms of the concerned nutrients.3-The Fe, Mn and Zn forms associated with organic atter.4-The residual inorganic phase of the Fe, Mn and Zn.The obtained results of all these forms in all he studied soils were as follows:- The total amounted about 10452, 350 and 86.5pge for Fe, Mn and Zn, respectively.- The available DTPA amounted about 3.54, 5.19 and 1.38ftge for Fe, Mn and Zn, respectively.- The water-soluble amounted about 0.35, 0.63 and 0.14uge forFe, Mn and Zn, respectively.- The exchangeable amounted about 2.91, 4.47 and 1.12Kge for Fe, Mn and Zn, respectively.- The complexed amounted about 7.88, 4.75 and 0. 9p.gg1 for Fe, Mn and Zn, respectively.- The remained associated with OM amounted about 0.46, 4.75 and 1.60pse for Fe, Mn and Zn, respectively.- The remaining inorganic form amounted about 99. 94.3 and 94.8% of the total of Fe, Mn and Zn, respectively.from the multiple and stepwise regression ana ysis, it can be concluded that the most soil indigenous properti s affecting the different nutrient forms (i.e., Fe, Mn and Zn) are each of:(1) Both active CaCO3 and total content,(2)Cation exchange capacity (CEC),(3)Organic matter content (OM),(4)Silt and clay (either with or without CaCO3).5.2. Soil supplying power for iron, manganese and zinc:On the light of the different initial analyses, only 15 soil samples were selected to determine the native soil supplying power (for Fe, Mn and Zn) through two types of techniques;(a)Chemically by successive extractions of Fe, Mn and Zn by DTPA solution (10 extractions),(b)Biologically by successive cropping of barley plants (10 cuts), over two successive growing seasons.The higher values of nutrients (Fe, Mn and Zn) recovery by DTPA, total dry matter and uptake were associated with the highly total and active CaCO3 content and the loamy texture.In view of the results of the conducted experiments, i.e., the successive extraction and cropping as well as the change in DTPA extractable Fe, Mn and Zn after each two cuts in the 15 investigated soils, it can be inferred that the native supplying power of loamy soils, which have high total and active CaCO3, is higher in Fe, Mn and Zn nutrients than those of sandy ones, which have low total and active CaCO3 content. Also, it was concluded that there were highly positive significant correlation between chemical and biological extraction of Fe, Mn and Zn nutrients.5.3. Field experiments of peanut and sunflower:On the light of the previous lab and greenh three-separated

field experiments (for Fe, Mn anc conducted and repeated over two growing seasons. the first one (Tahrir south soil) was representing theuse study, Zn) were Two soils, oils of lownative supplying power and CaCO3 content (4.94%) and the other soil was representing the relatively higher supp ying power of nutrients and content of CaCO3 (27.11%). Both soils were subjected to planting with peanut (Arachis hypogae, Giza5) and sunflower (Helianthus annus, Euroflora) under tr atments of composting (20m3/fad) and noncomposting, ordinary superphosphate application was undertaken at rates o 0, 6.5 and 13kg P/fad as well as to micronutrients (Fe, Mn any Zn), their application was run at rates of 0, 15 and 30kg/fad for each as sulfates. The three experiments were undertaken t the same locations during the two summer seasons of 2005 and 2006, respectively.5.3.1. Effect of compost:Compost application at the rate of 20m3/fad increased the total dry weight, seed yield, oil yield yield of peanut and sunflower over the control (u Tharir south (soill), Tahrir north (soil2) in both gro as well as in each of Fe, Mn and Zn experiments (tabl5.3.2. Effect of phosphorus:The application of P fertilizer at the rate of significantly increased the total dry weight, seed yie and protein yield of peanut and sunflower over (untreated) in Tharir south (soul), Tahrir north (soignificantly nd protein treated) in ing seasons , A).13kg P/fad d, oil yield :he control 12) at bothgrowing seasons as well as in each of Fe, Mn and Zn experiments (table, A).5.3.3. Effect of micronutrients (Fe, Mn and Zn):Micronutrients application at the rate of 30kg/fad in sulfate form significantly increased the total dry weight, seed yield, oil yield and protein yield of peanut and sunflower over the control (untreated) in Tharir south (soil 1), Tahrir north (soil2) at both growing seasons as well as in each of Fe, Mn and Zn experiments (table, A).5.3.4. Interaction effect between added compost and ordinary super phosphate fertilizers:Results of both the 1st and 2nd growing seasons as well as in each of Fe, Mn and Zn experiments, the total dry weight, seed yield, oil yield and protein yield of peanut and sunflower increased significantly with increasing the added rates of ordinary super phosphate under the control treatment (zero compost) and 20m3/fad of compost treatments (table, A).5.3.5. Interaction effect between added compost and micronutrients i.e., Fe, Mn & Zn fertilizers:Results of both the 1St and 2nd growing seasons as well as in each of Fe, Mn and Zn experiments, the total dry weight, seed yield, oil yield and protein yield of peanut and sunflower increased significantly with increasing the added rates of micronutrients (Fe, Mn and Zn) under control (zero compost) and 20m3/fad of compost treatments (table, A).5.3.6. Interaction effect between ordinary super phosphate and micronutrientsResults of both the and 2nd growing seasons as well as in each of Fe, Mn and Zn experiments, the total dry weight, seed yield, oil yield and protein yield of peanut and sunflower increased significantly with increasing the added rates of micronutrients (Fe, Mn and Zn) under three rates of P treatment (table, A).5.3.7. Interaction effect among the three studied factors:The interaction effect among the three studied factors, compost, ordinary super phosphate and micronutrients, on each of total dry weight, seed yield, oil yield and protein yield of peanut and sunflower plants) was maximized under the higher level of compost (20m3) combined with the highest rate of both single super phosphate (13kg P/fad) and micronutrient (30 kg/fad) fertilizers under all experiments (Fe, Mn and Zn).Ultimately, in all cases, it was noticed that although the values in soil 1 (which is poor in native fertility) are generally lower than that in soil2 (which is rich in native fertili) in both seasonl and season2 with compost, P and micronutrients (Fe, Mn and Zn) applications, the response of the former is more than that of the latter (table, A).1-3 AD a••• f-t-9)-3co z-, A5 eDCI g0to to,s5.5 eD:55#NAME?0. 0 ,r0 Z’’ ci-2 ,ms..-—. er,= ..!...(l) ,....,W61 ”eDA ,---, ,T,• 1,-) O cz = cz rA thAnRoci5 N ../ © r) c;)CD C1:,.....”DDfQ .9CDel..,©GZ.o Cr)Or. .o?4., o?te.1’g ef, rraet,= ,t.,O rr.