Pedological studies on some soils in north sinal

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Three field experiments were conducted at theresearch and Experimental Station of the Faculty ofAgriculture at Moshtohor, Kalubia, Egypt in 1983, 1984 and 1985 seasons, to study the effect of nitrogen fertilizer levels, concentrations and application times of zinc sulphate on growth, yield, yield components and chemical content of maize plants (Giza 2 cultivar).Each experiment included four levels of nitrogen fertilizer (Zero, 45, 90 and 135 kg N/fad.), three 111 zinc sulphate concentrations (zero, 0.4% and 0.8% ZnSO4) as well as three application times of zinc sulphate at 30,50 and 70 days after sowing. A split-split plot design with four replications was used. The nitrogen fertilizer levels were arranged in main plots, zinc sulphate concentrations in sub plots and timesof application in sub-sub plots. The area of each sub-sub plot was 21 m2 (5 x 4.2 m). The plot involved6 ridges at 70 cm apart and 5 m length. The distance between hills was 30 cm. The phosphorus fertilizer was applied at the level of 24 kg P205/fad. in a form of calcium super-phosphate (16% P205) before sowing.The following are the most important results: 1. Growth measurements:It is of particular concern to note that all growth characters were measured when the maize plants reached theage of 85 days after sowing.A. Effect of nitrogen fertilizer levels:1.The plant height significantly increased as the nitrogen level increased up to 90 kg N/fad., whereas the difference between 45 and 135 kg N/fad. was not significant.2.The ear position and stem diameter were significantly increased by increasing the level of nitrogen up to 90 kg N/ fad., while no significant increase was obtained by the higher levels (135 kg N/fad.) The difference between 90 and 135 kg N/fad. was not significant in regard to stemdiameter only.3.The dry weights of leaves, stems, ears, tassels and whole plant were significantly increased by increasing nitrogen levels up to 90 kg N/fad., whereas they decreased at the higher levels (135 kg N/fad.).4.The maize plants reached 50% tasseling and silking earlier by increasing nitrogen levels up to 135 kg N/fad. It was noticed that the difference between 90 and 135 kg N/ fad. was not significant for tasseling date.5.The number of green leaves/plant significantly increased as the nitrogen level increased up to 90 kg N/fad. The difference between the number of green leaves/plant due to the application of nitrogen levels of 90 and 135 kg N/fad.was not significant.6.The ear leaf area increased by increasing the level of nitrogen up to 90 kg N/fad., whereas the 135 kg N/fad.decreased it.B. Effect of zinc sulphate concentrations:1. The plant height, ear position, stem diameter,dry weights of leaves ,stems ears, tassels and whole plant, as well as number of green leaves/plant and ear leaf area had all significantly increased as the zinc level increased up to 0.4% ZnSO4, whereas a further increase in the concen-tration of ZnSO4 up to 0.8% decreased them. The differences between the zero and 0.8% ZnSO4 concerning their effects on ear position and number of green leaves/plant were notsignificant.2. The time of 50% tasseling and silv.ing decreased significantly as the zinc increased up to 0.4% ZnSO4. On the other hand significant increases in the time of 50% tasseling and silking were observed when zinc concentration was raised up to 0.8% ZnSO4. However the difference between zero and 0.8% ZnSO4 levels was not significant for thetime of 50% tasseling. C. Effect of application times of zinc sulphate:1.The plant height, ear position and stem diameter increased significantly by the foliar application of ZnSO4 at both 30 and 50 days after sowing, whereas the application of ZnSO4 at 70 days after sowing decreased them.2.The dry weights of ears, tassels, and whole plant as well as ear leaf area were all significantly increased by the application of ZnSO4 at both 30 and 50 days after sowing. However no significant difference between 30 and50 days was observed. Conversely, the application of ZnSO4 at 70 days after sowing resulted a significant decrease in the previously

mentioned characters.3.The dry weight of leaves, dry weight of stems, time of 50% tasseling and silking and number of green leaves per plant were not significantly affected by the application time of ZnSO4 at 30, 50 or 70 days after sowing. D. Effect of the interaction:1.The effect of the interaction between nitrogen levels and zinc sulphate concentrations on the dry weight of stems and ear leaf area was significant. The highest dry weight of stems was obtained from the combination of 90 kg N/fad. and 0.8% ZnSO4, whereas the highest average of ear leaf area was obtained from the combination of 90 kg N/fad. and 0.4% ZnSO4.2.The effect of the interaction between concentra-tions and application times of ZnSO4 on plant height, ear position, stem diameter, dry weights of (ears, tassels and whole plant), number of green leaves/plant, time of 50% silking and ear leaf area was significant. The highest averages for plant height, ear position and stem diameter were obtained from 0.4% ZnSO4 applied at 30 days after sowing. However the highest average for dry weights of ears, tassels and whole plant and number of green leaves/ plant were obtained from 0.4% ZnSO4 treatment applied at either 30 or 50 days after sowing. Moreover the highestaverage for ear leaf area was obtained from 0.4% ZnSO4 treatment applied at 50 days after sowing. The highest average for time of 50% silking was obtained from 0.8% ZnSO4 applied at 70 days after sowing, whereas the lowest one was obtained from 0.4% ZnSO4 at 30 days after sowing. II. Yield and yield components: A. Effect of nitrogen fertilizer levels:1.The percentage of barren plants significantly decreased as the nitrogen level increased up to 90 kg N/fad., while the highest level of nitrogen (135 kg N/fad.) increa ed the percentage of barren plants. However the difference between 90 and 135 kg N/fad concerning the percentage of barren plants was not significant.2.The percentage of double-eared plants, number of ears/plant, ear weight, grain weight/ear, 100-grain weight, number of grains/row and number of grains/ear significantly increased as nitrogen level increased up to 90 kg N/fad. By adding higher amounts of nitrogen up to 135 kg N/fad. these characters had decreased.3.The ear length significantly increased as the nitrogen level increased up to 90 kg N/fad. However there was no significant difference between 90 and 135 kg N/fad.4.The ear diameter significantly increased as the nitrogen level increased up to 135 kg N/fad.5.The shelling percentage was significantly increased as the nitrogen levels increased up to 45 kg N/ fad. However no significant difference between 45 and 90 kg N/fad., concerning shelling percentage, was found.6.The number of rows/ear significantly increased when the level of nitrogen fertilizer was increased up to 90 kg N/fad. This was clearly indicated by the combined analysisof the three seasons only.7.The grain yield/plant significantly increased by increasing the nitrogen level up to 90 kg N/fad., while the application of higher amounts of nitrogen up to 135 kg N/fad. decreased it. However, it was noticed that no significant difference between 90 and 135 kg N/fad., concerning grainyield/plant, was obtained.8.The grain yield/fad. was significantly increased as the nitrogen level increased up to 90 kg N/fad., except in 1983 season, where the highest grain yield of maize was obtained by increasing nitrogen up to 135 kg N/fad. It was found that the application of 45, 90 and 135 kg N/fad. increased the grain yield over the control by 33%, 35% and 38% in 1983 season, by 36%, 42% and 30% in 1984 season and by 66%, 91% and 87% in 1985 season, respectively. Moreover, the combined analysis of the three seasons revealed that the magnitudes of increase amounted to 46%, 57% and 52% due to the application of the previously nitrogen levels,respectively.B. Effect of zinc sulphate concentrations:1.The percentage of barren plants was reduced by applying 0.4% ZnSO4. No significant difference was found between zero and 0.8% ZnSO4 treatments.2.The number of ears/plant significantly increased as zinc sulphate increased up to 0.4%, whereas no significant difference between 0.4% and 0.8% ZnSO4 was observed.3.The ear length, ear diameter and percentage of double-eared plants were significantly increased by applying0.4% ZnSO4. However the difference between zero and 0.8% ZnSO4 was not significant.4.The ear weight and grain weight/ear significantly increased as zinc sulphate increased up to 0.4%, while the highest level of 0.8% ZnSO4 decreased them.5.The shelling percentage was significantly increased by increasing zinc sulphate up to 0.4%. However the difference between 0.4% and 0.8% ZnSO4 concentrations wasnot significant.6.100-grain weight significantly increased by increas-ing ZnSO4 up to 0.4%, but it decreased by using higher concentrations (0.8% ZnS0417.The number of rows/ear, number of grains/row and number of grains/ear were not affected by adding zinc sulphate at any concentration.8.The grain yield/plant was significantly increased by

applying 0.4% ZnSO4, while a further increase in the concentration of ZnSO4 up to 0.8% decreased that character.9.The grain yield/fad was significantly increased as zinc sulphate increased up to 0.4%, while the highest level of 0.8% ZnSO4 significantly decreased it. The present increase in grain yield/fad. over the control reached 24/% and 0.58%, due to the application of 0.4% and 0.8% ZnSO4, respectively.C. Effect of the application time of ZnSO4:1.The percentage of double eared plants and shelling percentage, number of rows/ear, number of grains/row and number of grains/ear were not significantly affected by the application time of ZnSO4 at 30, 50 or 70 days after sowing.2.The number of ears/plant, ear length, ear diameter, ear weight, grain weight/ear, 100-grain weight and grain yield/plant were all significantly increased when zinc sulphate was applied at either 30 or 50 days, while its application at 70 days after sowing tended to decrease all the previously mentioned characters.3.The percentage of barren plants was significantly decreased when ZnSO4 was applied at 50 days after sowing, while spraying ZnSO4 at 70 days after sowing increased it.4.The grain yield/fad. was significantly increased by the application of ZnSO4 at 30 days after sowing in 1983and 1984 seasons. While the grain yield/fad. was signi-ficantly increased by the application of ZnSO4 at 50 days after sowing in 1985 season. Moreover the grain yield/fad. was significantly increased at either 30 or 50 days after sowing in the combined analysis of three seasons. But the application of ZnSO4 at 70 days decreased it. D. Effect of the interaction:1. The interaction between nitrogen fertilizer levels and concentrations of zinc sulphate was found to have a significant effect on ear weight and grain weight/ear. The highest averages (240.5 gm and 211.2 gm) for ear weight and grain weight/ear, respectively were obtained from applying a combination of 90 kg N/fad. and 0.4% zinc sulphate.2.The shelling percentage was significantly affected by the interaction between nitrogen fertilizer levels and concentrations of ZnSO4. The highest average (88.3%) was obtained by adding a combination of 90 kg N/fad. and 0.8%zinc sulphate.3.The grain weight/ear was significantly affected by the interaction between nitrogen fertilizer levels and application times of ZnSO4. The highest average (209.2 gm) was obtained from 90 kg N/fad. combined with spraying zincsulphate at 30 days after sowing.4.The ear weight and 100-grain weight were signifi-cantly affected by the interaction between concentrationsand application times of zinc sulphate. The highest averages (216.3 gm and 35.6 gm) were obtained from applying the concentration of 0.4% zinc sulphate at 50 days aftersowing.5. The grain weight/ear, shelling percentage and grain yield/fad. were found to be significantly influenced by the interaction between concentrations and application times ofzinc sulphate.The highest averages of grain weight/ear, shelling percentage and grain yield/fad. (189.6 gm, 87.9% and 3.068 ton/fad., respectively) were obtained when a concentration of 0.4%zinc sulphate was sprayed at 30 days after sowing. III. Chemical analysis: A. Effect of the nitrogen fertilizer levels:1.The nitrogen content of maize grains and crude protein were significantly increased as the nitrogen level increased up to 135 kg N/fad. No significant differences between 90 and 135 kg N/fad. as well as between zero nitrogenand 45 kg N/fad. were obtained.2.The protein yield/fad. was increased as the nitrogen level increased up to 90 kg N/fad. The magnitudes of increase in protein yield/fad. over the control were 48%, 70% and 63%, due to the application of 45, 90 and 135 kgN/fad., respectively.3. Zinc content of maize grains was significantly increased as the nitrogen level increased up to 45 kg N/fad. However the higher amounts of nitrogen tended to decrease it.B. Effect of zinc sulphate concentrations:1.The nitrogen content of maize grains and crude ptotein were significantly increased by applying 0.4% zinc sulphate, while they decreased when a.concentration of 0.8% zinc sulphate was applied. No significant difference between the control and 0.8% zinc sulphate was observed.2.The protein yield/fad. significantly increased as ZnSO4 increased up to 0.4%, while the 0.8% ZnSO4 decreasedit.3.Zinc content of maize grains was significantly increased by applying 0.4% ZnSO4. However no significant difference between 0.4% and 0.8% ZnSO4 concentrations wasfound.C. Effect of application time of ZnSO4:1.The nitrogen content, crude protein and zinc content of maize grains were not significantly affected by the application times of zinc sulphate at 30, 50 or 70days after sowing.2.The protein yield/fad. was significantly affected by the application time of ZnSO4. The application of zinc sulphate at 30 or 50 days after sowing gavethe highest protein yield/fad., while spraying zinc sulphate at 70 days after sowing decreased it.D. Effect of the interaction:1. The protein yield (kg N/fad.) was significantlyaffected by the interaction between concentrations and

application times of ZnSO4. The highest average (279.7 kg/fad.) was obtained by applying 0.4% ZnSO4 at 30 daysafter sowing.