SUMMARY

Two field experiments were carried out during 1978 and 1979 seasons at the Research and Experiment Station of the Faculty of Agricultural Science, Moshtohor, Kalubia Governorate, to study the effect of some macro and micro elements on the growth and yield of maize.

The soil of the experiments was clay textured with a pH value 7.9, an organic matter content of 2.5% and contained 1.15 ppm available Zn.

Each experiment included 28 treatments which were the combination of four levels of nitrogen and seven Zn treatments.

N levels were: zero, 30, 60 and 90 kg N/fad. Zn treatments were: zero, 10, 20, 30 kg $ZnSO_4$ as soil application and 0.3, 0.6 and 0.9% $ZnSO_4$ as foliar application.

The design of the experiments was split plot with four replications. The four N levels were arranged in the main plots and sub plots were assigned for Zn treatments. The sub plot area was 21 m^2 (1/200 fad.).

Results could be summarized as follows:

1. Dry weight of leaves, stems, reproductive organs and grains as well as the whole maize plant were markedly

affected by N fertilizer levels in both seasons at the different stages of growth.

Similarly, Zn application significantly increased the dry weight of the different parts of maize plant as well as the whole plant at the different growth stages in the two successive seasons.

2. Plant height increased significantly as the nitrogen level increased.

Zn fertilization favourably affected plant height of maize plants during the two seasons. Soil application of $ZnSO_4$ up to 20 kg/fad. or foliar application of 0.6% $ZnSO_4$ increased significantly plant height.

3. Stem diameter increased significantly as the nitrogen level increased.

Soil application of Zn sulphate up to 20 kg/fad. or foliar application at the rate 0.6% $ZnSO_4$ increased stem diameter of maize plant. Stem diameter decreased with increasing Zn application.

4. Nitrogen had no significant effect on the number of leaves of maize per plant.

Number of leaves/plant was not significantly affected by the application of Zn.

5. Leaf area of the topmost ear was increased successively with increase in the rate of N up to 90 kg/fad.

Zn had a significant effect on the leaf area of maize plants in the two successive seasons.

6. The application of nitrogen caused a significant decrease in the percentage of barren plants in maize in both seasons.

Zn fertilization showed a significant effect on the percentage of barren plants in 1978, while in 1979 the effect of Zn was not significant.

In 1978 Zn application significantly decreased the percentage of batren plants.

7. Number of ears/plant significantly increased with increase in N levels and with increase in Zn levels in both seasons.

8. Nitrogen fertilizer had no significant effect on the number of rows/ear in both seasons.

Zn fertilization either as soil or foliar application did not show significant effect on the number of rows/ear.

9. Nitrogen slightly affected number of kernels/raw, where a significant effect was observed only in one season.

Zn fertilizer did not show significant effect on the number of kernels per row.

10. Nitrogen had no significant effect on the number of kernels per ear.

The effect of Zn on the number of kernels/ear was not significant.

11. Ear length significantly increased as the N level increased in both seasons.

Zn fertilization had significant effect on ear length only in 1978 season.

12. Nitrogen showed significant effect on ear diameter of maize plants only in one season.

Zn as soil application increased significantly ear diameter of maize plants in the two successive seasons, whereas foliar application of Zn significantly increased ear diameter only in the first season.

13. Ear weight and weight of kernels per ear significantly increased as the nitrogen level increased in both seasons.

Zn fertilization favourably affected ear weight and weight of kernels/ear of maize plants.

14. The 100-kernels weight was significantly increased by nitrogen application in one season.

On the other hand, Zn fertilizer had no significant effect on the 100-kernels weight in both seasons.

15. Shelling percentage was not significantly affected by the application of nitrogen and Zn.

16. Weight of grain/plant was significantly influenced by nitrogen levels in the two successive seasons. Maximum weight of grain per plant was obtained by applying 90 kg N/fad.

Zn fertilization significantly increased the weight of grain/plant in the two seasons. Maximum weight of grain/plant was obtained by applying 20 kg $ZnSO_4$ or 0.6% $ZnSO_4$ as soil or foliar application, respectively.

17. The grain yield of maize significantly increased as the nitrogen level increased.

In 1978 season, the application of 30, 60 and 90 kg N/fad. increased grain yield of maize over unfertilized treatments by 31, 61 and 66% respectively.

In 1979 season, the three N levels increased grain yield by 27, 61 and 65% respectively.

Zn levels had significant effect on grain yield of maize plant in both seasons.

In 1978 season the addition of 10, 20, 30 kg $ZnSO_4$/ fad. as soil application or 0.3, 0.6 and 0.9% $ZnSO_4$ as foliar spray increased the grain yield by 10, 25, 6, 14, 18 and zero% over the control, respectively.

In 1979 season, the grain yield increased by 13, 24, 6, 19, 20 and 1% over the control due to the application of 10, 20, 30 kg $ZnSO_4$ as soil application and 0.3, 0.6 and 0.9% $ZnSO_4$ as foliar spray, respectively.

18. In 1978 season, the application of ZO, 60 and 90 kg N/fad. significantly increased the crude protein yield by 40, 81 and 98% over the control, respectively.

In 1979 season, the crude protein yield increased by 45, 106 and 119% over the control due to the application of 30, 60 and 90 kg N/fad., respectively.

Zn fertilizer significantly increased yield of crude protein during the two successive seasons.

In 1978 season, the addition of 10, 20 and 30 kg $ZnSO_4$ fad. as soil application or 0.3, 0.6 and 0.9% $ZnSO_4$ as foliar spray significantly increased the protein yield by 13, 30, 2, 20, 25 and 3% over the control, respectively.

In 1979 season, the crude protein yield increased by 21, 32, -1, 22, 28 and 5% over the control due to the

application of 10, 20, 30 kg $ZnSO_4$/fed. as soil application or 0.3, 0.6 and 0.9% $ZnSO_4$ as foliar spray, respectively.

19. N content in leaves, stems, reproductive organs, grains as well as the whole plant considerably increased with increase in N fertilizer levels.

N content as percentage in leaves, stems, reproductive organs, grain as well as the whole plant was not affected by Zn fertilization throughout growth stages.

20. Application of nitrogen to maize plant showed no significant effect on Zn content in plant organs as well as the whole plant, during the different growth stages.

Zn fertilizer as soil or foliar application increased Zn content in different parts of maize plant as well as the whole plant at different growth stages.

21. If content of both nutrients approached the optimum levels of about 2.9% for N and 65 ppm for Zn in maize leaves after 42 days from planting, the N: Zn ratio would be (446) which seems to be satisfactory for the growth of maize plant.

22. The optimum N : Zn ratio of maize stem was 301, which would seem to be satisfactory for the growth at 42 days from planting.

23. N : Zn ratio in maize graine in the last sample (98 days after planting was higher (467) than that obtained by different plant parts. Optimum N : Zn ratio in maize grains was 500.

Maize response to zinc was evident when such ratio was higher.

24. N : Zn ratio in maize plant increased gradually with increasing nitrogen fertilization. On the other hand, increasing $ZnSO_4$ rates resulted in decreasing N : Zn ratio.

Optimum N : Zn ratios in maize plant were found to be 382, 318 and 290 at 42, 70 and 98 days after planting, respectively.

25. In 1978 season, the interaction between nitrogen and Zn levels had significant effect on dry weight of whole plant at different growth stages, leaf area of the topmost ear, ear length, weight of grain/plant, yield of grain/fad. and crude protein yield/fad.

In the second season, namely, 1979 season, the dry weight of whole plant at different stage of growth and leaf area were significantly affected by N x Zn interaction.