5. SUMMARY

Two separate experiments on spinach (*Spinacia oleracea, L.*) Saloniki cultivar were carried out at the Experimental Farm of the Faculty of Agriculture Moshtohor, Zagazig University (Benha Branch) during the winter season of 1995 and 1996. Seeds were grown directly in the permanent field at 28\textsuperscript{th} and 30\textsuperscript{th} October of both seasons respectively.

- **First Experiment: Effect of level and source of nitrogen on vegetative growth, yield and quality of spinach:**

Field experiments were carried out to study the effect of different N-level (0, 20, 40 and 60 kg N/fad.) as soil application from urea, ammonium nitrate and ammonium sulphate. This experiment included 12 treatments which were the combination of 4 N-levels within 3 N-sources. A split-plot design with four replicates was adopted. The nitrogen level served as main plots and the sources served as sub-plots. The rate of P and K fertilizers were applied at 16 kg P\textsubscript{2}O\textsubscript{5} and 48 kg K\textsubscript{2}O/Fad. for all treatments. Fertilizers were added to the soil at two split equal portions 3 and 5 weeks after sowing. Agriculture practices were done as commonly followed in the district.

The obtained results could be summarized as follows:

1- **Effect of N-level.**

1.1 Increasing level of nitrogen fertilizer encouraged all plant growth characteristics; plant height, number of leaves, leaf area and fresh weight except dry matter percentage. Whereas, no significant differences in dry weight per plant were found due to N-level.
1.2 Increasing N-level from 0 up to 60 kg N/fad. significantly increased nitrate accumulation, chlorophyll a,b and total chlorophyll as well as carotene, N, K, Ca and Mg contents in spinach plant foliage.

1.3 Increasing N-level of N-fertilizer from 0 up to 60 kg N/fad. significantly increased total fresh yield of spinach. The increment of total yield was 14-27 % reached its highest level by 60 kg N/fad.

2- **Effect of N-source.**

2.1 Ammonium sulphate application significantly increased plant height and fresh weight per plant followed by ammonium nitrate whereas urea had the lowest effect on these characteristics. However, there is no significant effect on number of leaves and leaf area due to nitrogen sources.

2.2 Ammonium sulphate application gave the best values of chlorophyll a, b and total chlorophyll as well as carotene on spinach leaves. Whereas, urea gave the lowest values. Adding ammonium nitrate significantly increased nitrate accumulation on spinach plants as compared with ammonium sulphate or urea.

2.3 Higher values of total fresh yield produced by ammonium sulphate followed by ammonium nitrate, then urea.

3. **Effect of N-level within N-source :**

Adding 60 kg N/fad. from ammonium sulphate on spinach plants gave the favorable effect of plant growth characteristics and total fresh yield.
Results showed that 60 kg N/fad. as ammonium sulphate produced the lowest nitrate accumulation, and the highest values of fresh yield.

**Conclusion:**

As general conclusion, adding 60 kg N/fad. as ammonium sulphate after 3 and 5 weeks of sowing could be recommended as the most favourable treatment for increasing total fresh yield of spinach plants and for improving the most plant growth and chemical composition as well as quality characteristic of leaves with the minimum nitrate accumulation.

- **Second Experiment: Effect of micronutrients on vegetative growth, yield and quality of spinach:**

  This experiment included 7 treatments which are different concentration of Fe-EDTA (120 or 240 ppm), Zn-EDTA or Mn-EDTA at (60 or 120 ppm) as foliar application as two foliar spray on spinach at 3rd and 6th leaf stage after sowing, added to the control without micronutrients application. Plants received NPK fertilizers at rates of 40 kg N, 16 kg P2O5 and 48 kg K2O/fad. as urea, calcium super phosphate and potassium sulphate, respectively. NPK were added at two equal portion at 3 and 6 leaf stage. A complete randomized block design with four replicates was adopted.

**Results were as follows:**

1. All micronutrients application increased plant height, fresh weight and dry weight per plant than the control. Foliar application of Zn gave the favourable effect on plant growth.

2. Zn application increased N%, K%, Mg% and Zn content but decreased Fe and Mn content. Also no significant effect was noticed
in Ca%, P% or nitrate accumulation in spinach due to micronutrients foliar spray.

3. The highest values of total fresh yield were obtained with Zn treatments at 60 or 120 ppm. This increase reached 16.4, 23.7% than the control.

Conclusion:

As general conclusion, spraying spinach plants with Zn-EDTA at 60 ppm at 3rd and 6th leaf stage could be recommended as the most favourable treatment for increasing plant growth and total fresh yield with high quality.