

5- SUMMARY AND CONCLUSION

This study was conducted to elucidate the effect of different nitrogen levels and gibberellic acid foliar spray as well as their combinations on vegetative yield; quality, seed yield and seed characteristics of spinach cv. (Saloniki). Two field experiments were carried out at the Experimental Farm of the Faculty of Agricultural Science, Moshtohor, Zagazig University. during the period from 1978-1980.

First experiment:

This experiment was performed to investigate the effect of nitrogen application and gibberellic acid foliar spray on vegetative growth, chemical composition of leaves and yield component of spinach. Nitrogen rates were 0, 20, 40 and 60 kg/fed , while those of GA₃ were 0, 10, 50 and 100 ppm. Obtained results can be summarized as follos:

A- Effect of nitrogen

1) Increasing nitrogen levels led to a gradual increase in plant height. Maximum increase was noticed at 60 kg N/fed. Moreover, it decreased dry matter percent of spinach leaves.

2) Chlorophyll a and b contents of leaves increased with

applying different N. levels. Using 40 kg N/fed. led to the maximum increment. On the other hand, carotene content was decreased with increasing N-levels.

- 3) Total nitrogen content of leaves was increased due to the various levels of nitrogen fertilizers showing its maximum increment at 20 kg N/fed. Moreover, the Nitrate-N content increased gradually up to 60 kg N/fed. Such increment was still acceptable for humans.
- 4) Increasing nitrogen levels led to an increase in both phosphorus and potassium content of leaves. As for calcium using only 20 kg N/fed. increased its concentration. Further addition of nitrogen rates showed a decreasing tendency in calcium content.
- 5) Using various nitrogen levels caused a gradual decrease in sugars content (reduced, non reduced and total). On the other hand, it led to an increase in total carbohydrates especially at 40 kg N/fed.
- 6) Total and Marketable yield was increased due to the various N rates. The best response in this respect was at 60 kg N/fed.

B- Effect of gibberellic acid:

- 1- Increasing GA_3 concentrations increased gradually plant height as well as dry matter content of spinach leaves, while it decreased photosynthetic pigments contents of leaves.
- 2- Spraying spinach plants with 10 ppm GA_3 decreased greatly nitrate-N content of leaves and therefore it induced the greatest increase in total nitrogen.
- 3- Using various GA_3 concentrations, decreased gradually phosphorus, while it increased both potassium and calcium content of leaves.
- 4- Increasing gibberellic acid concentrations decreased, sugars content (reduced and non reduced) while it increased total hydrolyzable carbohydrates of leaves.
- 5- In spite of the gradual increase of total vegetative yield observed in case of using various GA_3 concentrations, the marketable yield was severely decreased . This might be due to the stimulatory effect of gibberellins on inducing flowering.

C- Interaction between nitrogen and gibberellic acid:

- 1- Using 60 kg N/fed. combined with 100 ppm GA_3 showed the highest increase in plant height. Meanwhile there was no clear trend regarding dry matter content of leaves.

Second experiment:

This study was carried out to elucidate the effect of nitrogen fertilizer and gibberellic acid foliar spray on sex expression, seed yield and seed characteristics of spinach. Nitrogen rates were: 0, 20, 40 and 60 kg N/fed, while those of GA_3 were: 0, 10, 50, 100 and 200 ppm.

The results obtained can be summarized as follows:

A- Effect of nitrogen.

- 1) Increasing nitrogen levels decreased number of male plants, while it increased number of female plants. In this connection, sex ratio (M/F) was decreased.
- 2) Both seed yield per plant as well as total seed yield (kg/fed.) increased with using various nitrogen levels. The highest increment was obtained at 40 kg N/fed.
- 3) Applying nitrogen at various used levels decreased average weight of 1000 seeds.
- 4) Using either 40 or 60 kg N/fed. led to an increase in germination percentage of subsequent produced seeds. Germination rate did not significantly affected due to the various N rates.

B- Effect of gibberellic acid.

- 1) Increasing GA_3 concentration gradually increased number of male plants and decreased that of female

- 2- Using either 40 or 60 kg N/fed. without spraying plants with GA_3 increased chlorophyll a and b contents of leaves, while there was no clear trend regarding carotene.
- 3- Adding 20 kg N/fed. combined with spraying plants with 10 ppm GA_3 increased total nitrogen content. The least nitrate-N content of leaves was obtained in case of spraying plants only with 10 ppm GA_3 .
- 4- Phosphorus content of spinach leaves increased due to using higher N levels (40 or 60 kg/fed.) without any spraying treatments. No clear trend was noticed in case of potassium and calcium.
- 5- Using either 40 or 60 kg N/fed. combined with 100 ppm GA_3 led to the maximum increment in carbohydrate content which was connected with the least sugars content of leaves.
- 6- Although the highest total vegetative yield was obtained in case of using 60 kg N/fed. combined with 100 ppm GA_3 , the marketable yield was markedly decreased. The greatest marketable yield was obtained by using only 60 kg N/fed.

B- Effect of gibberellic acid:

- 1- Increasing GA_3 concentrations increased gradually plant height as well as dry matter content of spinach leaves, while it decreased photosynthetic pigments contents of leaves.
- 2- Spraying spinach plants with 10 ppm GA_3 decreased greatly nitrate-N content of leaves and therefore it induced the greatest increase in total nitrogen.
- 3- Using various GA_3 concentrations, decreased gradually phosphorus, while it increased both potassium and calcium content of leaves.
- 4- Increasing gibberellic acid concentrations decreased, sugars content (reduced and non reduced) while it increased total hydrolizable carbohydrates of leaves.
- 5- In spite of the gradual increase of total vegetative yield observed in case of using various GA_3 concentrations, the marketable yield was severely decreased . This might be due to the stimulatory effect of gibberellins on inducing flowering.

C- Interaction between nitrogen and gibberellic acid:

- 1- Using 60 kg N/fed. combined with 100 ppm GA_3 showed the highest increase in plant height. Meanwhile there was no clear trend regarding dry matter content of leaves.

which led to an increase in sex ratio.

- 2) Seed yield per plant as well as total seed yield per feddan was increased by using different GA_3 concentrations. The maximum increment was in case of using 50 ppm.
- 3) Spraying plants with 10 ppm GA_3 increased the average weight of 1000 seeds.
- 4) Seed germination percentage was gradually increased as GA_3 concentration increased. Germination rate was enhanced as a result of spraying plants with 50 ppm GA_3 .

C- Interaction between nitrogen and gibberellic acid.

- 1) Using gibberellic acid at different concentrations combined with any nitrogen level reflected a bad effect on number of female plants, which led to an increase in sex ratio.
- 2) Adding 40 kg N/fed. combined with 50 ppm GA_3 exerted the maximum increase in seed yield per plant as well as seed yield per fed.
- 3) No significant effect on average weight of 1000 seeds and seed germination characters was observed due to the combination between nitrogen fertilizer and GA_3 spray.

It is obvious from these results that, for obtaining the highest marketable and total vegetative yield of spinach cv. saloniki showing good quality, it is advisable to fertilize plants with 60 Kg N/fed. without spraying with gibberellic acid.

Moreover, in case of spinach seed production, it is preferable to use 40 kg N/fed., and spraying plants with 50 ppm GA₃, 3 times at 2, 4 and 6 true leaves stage.