

V. SUMMARY AND CONCLUSION

Two separate experiments were carried out at the Laboratory of the Horticulture Department and the Experimental Farm of the Faculty of Agriculture at Moshtohor in winter seasons of 1987/1988 and 1988/1989. The first experiment aimed to elucidate the effect of seed-cold treatment on seed germination, seed and seedling chemical composition as well as growth and quality of tomato transplants cv. U.C 97-3. The second experiment was carried out to investigate the effect of seed-cold treatments as well as rate of phosphorus and potassium fertilizers on plant growth, chemical composition, flowering as well as fruit yield and quality of tomato.

First Experiment: (The Laboratory Experiment)

In this experiment 8 treatments as the combination of three seed-cold treatments (-1°C , -2°C and -3°C) within two periods of low temperature (12 and 24 hours) beside two control treatments unsoaked & soaked in distilled water respectively) forming 8 treatments.

Obtained results can be summarized as follows:

1. Germination percentage was increased and number of days required for germination of the maximum number of seeds was significantly decreased due to exposure of tomato seeds to -1 , -2 or -3°C for 12 hours.
2. Keeping seeds at -1°C for 12 or 24 hours increased reducing sugars content in tomato seeds compared with that of all used treatments except that of the dry seed control. However,

all used seed-cold treatments increased non-reducing sugars content in tomato seeds compared with the dry seed control. Moreover, the total sugars content of seeds was decreased as a result of seed-cold treatment.

3. Keeping seeds at all used seed-cold treatments significantly increased the enzyme activity compared with the two control treatments.
4. Seeds exposed to -1°C or -3°C for 24 hours resulted in the highest plant height, stem diameter, fresh and dry weight per 20 transplants.
5. N, P and K contents of transplants foliage were increased as a result of exposing seeds to -3°C for 24 hours followed by -1°C for 24 hours and -3°C for 12 hours.
6. Seed-cold treatment at -1°C for 24 hours resulted in the highest values of reducing, non-reducing and total sugars content in transplant foliage.
7. Total indoles and phenols content of tomato leaves were increased as a result of all used treatments specially at -1 , -2 or -3°C for 24 hours.
8. Keeping seeds at all used seed-cold treatments significantly increased the enzyme activity specially at -1°C for 24 hours and -2°C for 12 or 24 hours compared with the two control treatments.

Second Experiment:

This experiment included 21 treatments which were the combination between 7 seed-cold treatments (-1 , -2 and -3°C within two chilling periods i.e. 12 and 24 hours beside the

control treatment) and three different levels of phosphorus and potassium fertilizers (99 kg N + 32 kg P_2O_5 + 36 kg K_2O /Fad., 99 kg N + 48 kg P_2O_5 + 48 kg K_2O /Fad. and 99 kg N + 64 kg P_2O_5 + 72 kg K_2O /Fad.)

Obtained results were as follows:

1. Most of the used seed-cold treatments promoted tomato vegetative growth characteristics as compared with the control treatment. Seed-cold treatment either $-1^{\circ}C$ or $-3^{\circ}C$ for 24 hours showed the highest vegetative growth of tomato plants i.e. plant height, number of shoots and leaves per plant as well as fresh and dry weight per plant. The medium used level of fertilizers (99 kg N + 48 kg P_2O_5 + 48 kg K_2O /Fad.) enhanced all studied characteristics in this respect. Keeping tomato seeds at $-3^{\circ}C$ for 24 hours with the second used level of fertilizers increased number of leaves per plant and fresh and dry weight per plant at both growing seasons.
2. Keeping seeds at $-3^{\circ}C$ for 24 or 12 hours increased N and P content in tomato plant foliage. However, treatment of $-2^{\circ}C$ for 24 hours and that of $-3^{\circ}C$ for 12 hours showed the highest K content in plant foliage. Reducing, non-reducing and total sugars increased with the exposure of seeds to $-1^{\circ}C$ for 24 or 12 hours. N, P and K uptake as well as reducing, non-reducing and total sugars increased with increasing level of applied P and K fertilizers up to the highest used level of fertilizers (99 kg N + 64 kg P_2O_5 +

72 kg K_2O /Fad.). The highest used level of fertilizers combined with seed-cold treatment at $-3^{\circ}C$ or $-2^{\circ}C$ for 24 hours resulted in the highest values of N and P content in plant foliage. However, treatment of the same used level of fertilizers combined with seed-cold exposure at $-2^{\circ}C$ or $-1^{\circ}C$ for 24 hours showed the highest K content in plant foliage. The highest values of reducing, non-reducing and total sugars content of plant foliage were obtained in case of applying the highest used level of fertilizers combined with seed-cold treatment at $-1^{\circ}C$ for 24 or 12 hours.

3. Keeping seeds at all used seed-cold treatments significantly enhanced plant flowering by pushing plants to early flowering. Exposure of tomato seeds to $-1^{\circ}C$ for 12 or 24 hours showed the highest significant increment in number of flowers per plant. However, the maximum fruit setting percentage was obtained in case of keeping seeds at $-1^{\circ}C$ or $-2^{\circ}C$ for 12 hours. The maximum early flowering, number of flowers per plant and fruit setting percentage were obtained in case of applying the medium used level of fertilizers (99 kg N + 48 kg P_2O_5 + 48 kg K_2O /Fad.). Seed-cold treatment at $-1^{\circ}C$ for 12 hours combined with any one of the three used rates of fertilizers resulted in the highest values of number of flowers per plant. Meanwhile, the same seed-cold treatment combined with the second used rate of fertilizers showed the highest percentage of fruit

- setting. Flowering time was enhanced by all treatments especially with the treatments of -2°C or -3°C for 12 or 24 hours combined with the second used rate of fertilizers.
4. The maximum number of fruits and yield per plant as well as early and total yield per faddan were obtained with keeping tomato seeds at -1°C , -2°C or -3°C for 12 hours. The medium used level of fertilizers (99 kg N + 48 kg P_2O_5 + 48 kg K_2O /Fad.) resulted in the highest values of tomato fruit yield and its components. The interaction between the second used level of fertilizers and seed-cold treatment at -1°C , -2°C or -3°C for 12 hours showed the highest values in this respect.
 5. Average fruit weight, fruit length and fruit diameter were significantly increased due to exposure of tomato seeds to -1°C , -2°C or -3°C for 12 hours. The highest values of average fruit weight, fruit length and shape index were recorded in fruits of plants received the medium used level of fertilizers. The combination between seed-cold treatment (-1°C , -2°C or -3°C for 12 hours) and the second used level of fertilizers (99 kg N + 48 kg P_2O_5 + 48 kg K_2O /Fad.) produced fruits with the highest average fruit weight and diameter. The highest values of fruit length and fruit shape index were due to exposure seeds to -2°C or -3°C for 24 hours in combination with the second used level of fertilizers.
 6. Tomato fruits containing the highest content of vitamin C, titratable acidity and T.S.S were picked from plants grown

by seeds treated with -1°C or -2°C for 24 hours. Moreover, reducing, non-reducing and total sugars were significantly increased also in case of treating tomato seeds with -1°C or -2°C for 12 hours. Vitamin C, T.S.S, reducing, non-reducing and total sugars contents of tomato fruits were increased with increasing the level of macronutrients up to the highest used level (99 kg N + 64 kg P_2O_5 + 72 kg K_2O /Fad.).

Finally, it may be concluded that seed-cold treatment at -1°C , -2°C or -3°C for 12 hours as well as soil application of macronutrient to tomato plants cv. U.C 97-3, grown in winter season, at a medium level of fertilization of 99 kg N, 48 kg P_2O_5 and 48 kg K_2O /Fad. at three equal portions at 3, 7 and 11 weeks after transplanting resulted in the highest total and early yield of tomato fruits of good physical and chemical characteristics under such conditions of this work.