

# Physiological studies on cold tolerance in squash (Cucurbita pepo L.) plant

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This study was carried out at the Experimental Station of Agricultural Botany Department, Faculty of Agriculture, Mos. tohor, Zagazig University, Benha branch during 1998 and 1999 seasons on squash (Cucurbita pepo. L.) plant cv. [Eskandrani]. The study included two independent experiments: a laboratory experiment and a pot experiment. I-The laboratory experiment: The aim of this experiment was to study the applied low temperatures as a pre- sowing treatment at the levels of  $-1$ ,  $-2$ ,  $-3$  and  $-4^{\circ}\text{C}$  for two exposure periods of 12 and 24 hours on the germination percentages and rates of treated squash seeds II-The pot experiment : This experiment was done under the out-door conditions to study the effect of the low temperatures as a pre- sowing treatment for two exposure periods on growth, flowering, chemical composition, yield and fruit quality of squash plant. The applied low temperatures as a pre- sowing treatment were  $-1$ ,  $-2$ ,  $-3$  and  $-4^{\circ}\text{C}$  for 12 and 24 hours exposure periods. Seeds were sown at 2nd and 51<sup>st</sup> of January for 1998 and 1999 seasons, respectively. The obtained results Could be 1- The laboratory experiment: a- seed germination : Different applied low temperature levels significantly increased germination percentage and decreased the germination rates in the two exposure periods. Also,  $-2^{\circ}\text{C}$  for 12 hours exposure period was the most effective in this respect. These values were, 93.33 & 91.67% and 6.27 & 6.29 days for germination percentages and rates in 1998 and 1999 seasons, respectively. This experiment clearly indicated the improvement of squash seed germination with the low temperature treatment. II-The pot experiment! a- Growth behaviour : 1 - The applied low temperatures as a pre-sowing treatment (  $-1$ ,  $-2$ ,  $-3$  and  $-4^{\circ}\text{C}$ ) for the two assigned time of exposure significantly increased the all estimated root parameters i.e., size, length, diameter and fresh weight of roots. This increment of root growth was obtained in the two seasons under study. 2- Also, the applied low temperatures promoted vegetative growth of squash plant regarding stem length, stem diameter, stem fresh weight g/plant, leaves number and total leaf area/plant. 3-The treatment of  $-3^{\circ}\text{C}$  for 12 hours exposure time was the most effective level regarding the different estimated growth characters b - Dry weight : 1-The low temperatures as a pre- sowing treatments increased roots and shoots dry weights as compared with the control treatment. The more effective treatment was that of  $-4^{\circ}\text{C}$  for 12 hours exposure period. 2- Also, 12 hours of exposure was more pronounced compared with the 24 hours. c- Chemical composition of squash plant: 1-Most of the applied low temperatures as a pre- sowing treatments considerably affected the chemical composition of squash plant compared with the control treatment. 2-Also, the low temperatures as a pre- sowing treatments at  $-2^{\circ}\text{C}$  for 24 hours exposure period gave the highest content of chlorophyll a, b and carotenoids, N, P, K, Ca and Mg as well as the highest content of reducing sugars, non-reducing sugars, total sugars, total carbohydrates, nitrate reductase activity and nitrate accumulation either even comparing with other treatments or the control. 1-The effect of the all applied low temperatures significantly increased the earliness of flowering and the number of female flowers per plant as well the enhancement of the sex ratio. 2-The best treatment was at  $-2^{\circ}\text{C}$  for 24 hours exposure period. e- Yield and yield components: 1-All the applied low temperatures increased early and total yields in term of number of early and total fruits per plant, weight of early and total yield per plant as well as early yield (%) and relative total yield (%) at the two seasons compared with those of the control treatment. 2-The highest early and total fruit yields were obtained with  $-2^{\circ}\text{C}$  for 24 hours

exposure period.3-These values were 291.54 & 289.58 g/plant and 2.50 & 2.49 kg/plant for the early and the total yields per plant in 1998 and 1999 seasons, respectively.f- Chemical constituents and fruit quality : 1- The quality characteristics of squash fruits, i.e., vitamin C, titratable acidity and total soluble solids as well as minerals composition, (N, P, K, Ca and Mg%) and also, reducing non-reducing and total sugars, total carbohydrates were increased with the all applied low temperature levels for the two exposure periods.2-Also, the low temperature of  $-2^{\circ}\text{C}$  for 24 hours exposure period showed the highest values of the most fruit characteristics.3-These values were, 15.18, 14.84 mg/100 g f.w. & 5.75, 5.50% and 0.572, 0.546% for vitamin C, total soluble solids and titratable acidity in 1998 and 1999 seasons, respectively.g- Physical characters of fruits:1-The low temperature as a pre-sowing treatment increased the average of fruit weight, fruit, length, fruit diameter and fruit shape index compared with the control.2-The treatment of  $-4^{\circ}\text{C}$  for 24 hours exposure period gave the highest values of these fruit parameters. While, fruit length was not affected by the period of treatment in the two seasons-under study.Finally, it could be concluded that exposing seeds of squashcv. Eskandarani after being imbibed water to  $-2^{\circ}\text{C}$  for 24 hours exposure period might considered as a great economic treatments regarding not only earliness of fruit yield but also getting good fruit quality as well.