Effect of spray silicon on salinity tolerance improvment of two tomato (Lycopersicon esculentum Mill.) cultivars growth limited

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SUMMARY

This experiment was conducted during two growing season (2015 and 2016) in private farm in Kufa-Najaf, with the objective of improving salinity tolerance of tomato (*Lycopersicon esculentum* Mill.) with application of silicon. The study included 40 treatments, while were four levels of irrigation water salinity (2.5, 5.0, 7.5 and 10 $dS.m^{-1}$) , two tomato cultivars (Aulla and Majid) and five concentration of silicon (0 , 50 , 100 , 150 , and 200 mg l^{-1}). A split-split plot design was used in a factorial experiment with three factors and three replicates. The results were analyzed using analysis of variance and treatment means were compared using the least significant differences (LSD) at 0.05.

The effect of the above treatment were studied on vegetative growth parameters, chemical constituents of leaves, flowering parameters ,yield and yield components, as well as fruit chemical parameters. The results may be summarized as follows:

1- **vegetative growth parameters:**

Irrigation water salinity at 5, 7.5 and 10.0 dSm^{-1} caused a significant decrease in plant length ,number of side branches, leaf number, leaf area as well as fresh and dry weights of the shoot system, for both growing seasons. Treatment with silicon caused a significant increase in all vegetative growth parameters, for both growing seasons. As for the effect of cultivars, the cultivar Majid was superior in all vegetative growth parameters, as compared with cv. Aulla, for both growing seasons. As for interactions among treatments, they were significant in their effects on vegetative growth parameters and for both seasons.

2- chemical constituents of leaves:

Irrigation water salinity treatments at 7.5 and 10.0 dS m^{-1} caused a significant increase in the concentration of sodium and chloride ions, proline, as well as the plant hormone ABA and potassium ion leakage. However, such treatments caused a significant decrease in K^+, $Ca^{++}$and Si ions total solute carbohydrates and total chlorophylls, and the concentration of both auxins and gibberellins and K^+:Na^+ ratio.

As for treatment with silicon, at 200 mg l^{-1} caused a significant increase in total soluble carbohydrates, total chlorophylls, auxins , gibberellins as well as K^+,Na^+ and Si ions and for both growing seasons. However, the sane treatment led to a significant decreased in the concentration of Na^+ and Cl^-ions as well as

free proline concentration, and ABA levels. Treatment with silicon al so caused a significant increase in K^+:Na^+ ratio, but decreased potassium ion leakage. As for the effect of cultivar plants of the cv. Majid had a significantly higher levels of most chemical constituents as compared with plants of the cv. Aulla, with the exception of the concentration of Na^+, Cl^-, ABA and gibberellins wheres plants of the cv. Majid had the higher levels. As for interactions among treatments, they were significant as there was an increase in the concentration of K^+, Si , total soluble carbohydrates, total chlorophylls, auxins , gibberellins and K^+:Na^+ ratio for both growing seasons.

3-flowering parameters, yield and yield components:

Irrigation water salinity at 7.5 and 10.0 $dS.m^{-1}$ a significantly reduced the number of inflorescence, total number of flowers per inflorescence as well as percentage fruit set. This treatments also caused a significant reduction in yield components, represented by number of fruit, mean fruit weight, yield per plant and total yield for both growing seasons. Silcon treatment at 50 ,100,150,200 mg L^{-1} significantly increased total marketable yield as much as (18.16, 25.12, 37.18 , 35.82) for first season and (19.26, 30.05, 35.83, 29.09) as compared with untreated treatment for second season, respectively. For cultivars, the cultivar Majid was significantly superior in total marketable yield as much as (19.65, 20.66 and %), as compared with cv. Aulla for both growing seasons respectively. The interactions among treatments, were significant in increasing flowering growth parameters, as well as yield and its components.

4- fruit chemical parameters:

Irrigation water salinity at 7.5 and 10.0 $dS.m^{-1}$, caused a significant reduction in ascorbic acid concentration and concentration of β- Carotene and Lycopene, it caused a significant increase in total soluble solids, titratable acidity and, percentage dry matter, as well as the. As for application of silicon, it caused a significant increase in all chemical parameters. The cultivar Majid had a significantly higher chemical constituents as compared with the cultivar, Aulla. The interactions among treatments, were significant in increasing the chemical constituents of the fruits.