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Foliar application of glycine betaine for alleviating water stress of tomato plants grown under sandy soil conditions

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Abstract: Two field experiments were carried out during the two growing seasons of 2012/2013 and 2013/2014, in a private farm at Bani Salama region, El-Giza Governorate, Egypt, in order to investigate the effect of foliar application of glycine betaine (GB) on vegetative growth, fruit yield and fruit quality of tomato plants (Marwa hybrid) grown under deficit irrigation (DI) treatments (100% (control), 85%, 70% and 55% of ET_o (Reference evapotranspiration)) in sandy soil. Four GB concentrations (0, 5, 10 and 20 mM/l), were applied after 2 and 6 weeks from transplanting date. Results indicated that, DI treatments significantly decreased the vegetative growth, photosynthetic pigments (chlorophyll a, chlorophyll b and carotenoids), leaf relative water content (LRWC), number of flowers per plant and fruit yield of tomato plants. In contrast, there were positive effects on proline content in the leaves, irrigation water use efficiency (IWUE) and some fruit quality characteristics for tomatoes. Foliar application of GB at 10 mM/l ameliorated the negative effects of water stress and produced the highest significant values of plant length, number of leaves/plant, total leaves area/plant, fresh and dry weights of tomato leaves, LRWC and photosynthetic pigments, in both seasons. While, the values of marketable fruit yield of tomatoes were increased significantly also with foliar application of GB at 10 mM/l (by 12.86% and 13.91% in the first and second seasons, respectively), but there were no significant differences were realized among the GB treatments on the fruit quality. Concerning, the effect of interaction between DI treatments and foliar application of GB, the results revealed that application of irrigation water with 100% ET_0 and 10 mM/l of GB was the best treatment for vegetative growth and fruit yield of tomato plants in open field. It was also concluded that the vegetative growth and fruit yield as well as fruit quality of tomato plants which grown under DI, can be enhanced by foliar application of GB with 10 mM/l.
Key words : Tomato, Deficit irrigation, Glycine betaine, Yield, Fruit quality, IWUE.

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