Promote adaptation to drought and fruit quality by alternating increased intensity of deficit irrigation and recovery period

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Under natural conditions, plants experience repeated cycles of water deficit and recovery period, which could negatively impact on plant growth and yield. However, deficit irrigation is known to improve fruit quality under certain conditions of application. Understanding the genetic variability in plant response and adaptation to such conditions is crucial for breeders. The 8 parents of the Multi-Parent Advanced Generation Inter-Cross population of tomato, with the largest genetic variability observed in tomato, were selected for this study. Three 15-day periods of water deficit (-38%, -45% and -55% of water supply compared to the well-irrigated control) interrupted by two 15-day periods of recovery, were applied from the reproductive stage. Stress intensity applied to each genotype was assessed based on the predawn water potential. Adaptation to drought was evaluated by plant growth (estimated leaf surface area), fruit size and weight, and fruit quality (appraised by soluble sugar and organic acid contents). According to the predawn water potentials, significant differences of stress perception among genotypes appeared only during the third period of water deficit. Plant growth and fruit caliber were not significantly affected, although slightly reduced, by the alternating treatments. Fruits were divided into two batches according to the stage of development (cell division, cell expansion and ripening) affected by treatments. Results showed a significant increase in sucrose and low increase in glucose and fructose in fruits as well as a decrease in citric acid regardless of the fruit development stage affected. On their whole, results indicated that the alternation between deficit irrigation and recovery periods permit to maintain plant growth and fruit caliber and to slightly improve fruit taste.

Keywords: *S. lycopersicum*, Magic population, water deficit, recovery, fruit quality