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AN INTEGRATED STUDY OF MORPHOPHYSIOLOGICAL AND MOLECULAR RESPONSES TO COMBINED SALT/LOW NUTRIENT STRESS OF LONG STORAGE TOMATO LANDRACES

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Tomato (*Solanum lycopersicum* L.) is an important horticultural crop and a significant source of antioxidants in our diet. Yields suffer losses due to environmental stresses, including drought and salinity, which are among the most significant challenges for the future of global food production.

Reduction of fertilizer inputs, including nitrate is also a priority in plant research, and it is aimed at minimizing pollution caused by agricultural activities, while obtaining fruits of high quality and long storability.

In this study, we analysed vegetative and molecular responses of three tomato landraces (TRPO0040, TRPA0130 and TRPO0670) challenged with salt stress and low nitrate, alone or in combination, and their effects on fruit yield, quality and storability. The experiment was setup in a closed soilless system, in greenhouse, using four different conditions: N1S0: 13.5 mM NO_3^- – 0 mM NaCl; N1S1: 13.5 mM NO_3^- – 80 mM NaCl; N0S0: 3.4 mM NO_3^-– 0 mM NaCl; N0S1: 3.4 mM NO_3^- – 80 mM NaCl. Several parameters were monitored during the vegetative phase, including stomatal conductance, leaf relative water and proline content, expression of selected ion transporter genes. Relative water content was affected by both salt and nitrate concentration, while proline content was dramatically increased by salt stress in high nitrate condition only. Growth parameters as well as fruit yield were reduced in the presence of stress, with the highest reduction observed in plants exposed to the combined stress.

Highest yields were obtained in N1S0, however fruits harvested from low nutrient-treated plants were virtually all marketable, regardless the presence of NaCl. Soluble solids content was highly affected by salt, as expected. The cultivation regime also affected fruit shelf life of the three genotypes over the 90-day period monitored. High salt in the nutrient solution improved fruit shelf life regardless of genotype and nitrate concentration. In the absence of NaCl, NO_3^- supply in the nutrient solution did not affect fruit shelf life in TRPO0670 and TRPA0130, while TRPO0040 fruits showed an extended shelf life at low nitrate compared to high nitrate supply. Fruit firmness and weight declined in all genotypes and treatments during post-harvest; hence, they were not

discriminating parameters between treatments. Nitrogen Use Efficiency (NUE) evaluation in all treatments and landraces revealed that TRPO0040 maintained high NUE under salt stress, indicating that N allocation to fruits was not inhibited by salt in this genotype.

Altogether, we have verified that different cultivation regimes affect fruit shelf life and quality in tomato, and identified a set of vegetative parameters specifically influenced by single or combined stress. In addition, RNAseq and qRT-PCRs analyses are being pursued in order to get further insights into the molecular basis of fruit shelf life under different cultivation regimes.

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