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P007 – Rebecca Stevens

Regulation of tomato ascorbate levels: a candidate gene involved in fruit nutritional value and stress tolerance

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Ascorbate is a powerful antioxidant in plants, and its levels are an important quality criterion in commercial species. Factors influencing these levels include environmental variations, particularly light, and the genetic control of its biosynthesis, recycling and degradation. Our previous work has identified QTL for fruit vitamin C content and a candidate gene, encoding a monodehydroascorbate reductase (MDHAR) isoform, an enzyme catalysing reduction of the oxidized radical of ascorbate, monodehydroascorbate, to ascorbate. The activity of this enzyme is also correlated with fruit tolerance to post-harvest chilling stress in introgression lines containing the vitamin C QTL. In order to understand the role of this gene in fruit physiology and metabolism we produced transgenic lines in different genetic backgrounds. We show that the isoform encodes a cytosolic and peroxisomal MDHAR, and that this enzyme negatively regulates ascorbate levels in certain genotypes of *Solanum lycopersicum* (tomato). Transgenic lines overexpressing MDHAR show a decrease in ascorbate levels in leaves, whereas lines where MDHAR is silenced show an increase in these levels in both fruit and leaves. Furthermore, the intensity of these differences is light-dependent. The unexpected effect of this MDHAR on ascorbate levels cannot be explained by changes in the expression of Smirnoff-Wheeler pathway genes, or the activity of enzymes involved in degradation (ascorbate peroxidase) or recycling of ascorbate (dehydroascorbate reductase and glutathione reductase) suggesting a previously unidentified mechanism regulating ascorbate levels. The impact of under-expression of this gene in processing tomato on fruit post-harvest physiology has also been examined.

Keywords: ascorbate, post-harvest, QTL, redox