Deciphering ascorbic acid regulation in tomato fruit ripening

Celine Bournonville, Carine Ferrand, Daniel Just, Virginie V. Garcia, Daniel Jacob, Rebecca Stevens, Hélène Gautier, Christophe Rothan, Pierre Baldet

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Bournonville, C. (1), Ferrand, C.(1), Just, D.(1), Garcia, V.(1), Jacob, D.(1), Stevens, R.(1), Gautier, H.(1), Alkan, N.(1), Rothan, C.(1), Baldet, P.(1)

(1) INRA, Université de Bordeaux, Villenave d'Ornon, France

The ascorbic acid (AsA) is an essential antioxidant in both plants and humans. Plant-derived AsA is the major source of vitamin C in the human diet. In addition to its effect on tomato nutritional value, increasing tomato AsA content would likely affect postharvest storage and resistance to fungal pathogens of the fruit. While AsA metabolism is well characterized, the mechanisms involved in its regulation remain poorly understood. Recent studies in Arabidopsis indicate that this pathway is highly regulated at transcriptional level by single regulatory proteins. In order to investigate the regulation of AsA in tomato (*Solanum lycopersicum*) fruit, we undertook two different strategies to identify regulatory factors controlling fruit AsA content.

First strategy is based on the screening of an EMS tomato mutant population in the miniature cultivar Micro-Tom for identifying mutant lines with AsA-deficient or AsA-enriched fruits. Among the 500 M2 mutant families screened for AsA content, four mutant lines with increases in fruit AsA content ranging from 2.5 to 4 fold and 2 mutant lines with reduced AsA-content ranging from 0.2 to 0.4 fold were selected. These lines are currently studied for pathogen resistance. In addition, the isolation of the causal mutations has been undertaken by a BSA-NGS mapping approach for two of the mutant lines with AsA-enriched fruit. Second strategy is based on the exploitation of genomics data resulting from comparative analysis of four tomato lines silenced for key enzymes of the AsA biosynthetic and recycling pathways (Garcia *et al.* 2009). Correlation analyses between fruit AsA content and transcript levels identified a large number of transcription factors (TF) putatively regulated by AsA. Among them, fifteen candidate genes displaying high correlation ($R^2 \geq 0.95$) with AsA content have been selected and are currently studied for their implication in the regulation of fruit AsA content using various approaches. Current results confirm that several of the TFs studied are indeed linked to AsA, thus providing new targets for studying AsA accumulation in the fruit. Strategies, tools and current results will be presented and discussed.

References

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