Genotype by watering regime interaction in cultivated tomato: from phenotypes to genes

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Genotype by watering regime interaction in cultivated tomato: from phenotypes to genes.

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In the next decade water will be limiting crop production, in particular in Mediterranean regions. Studying genotype x water regime interactions is needed to improve plant adaptation to drought. In response to environmental constraints, plants can change their phenotypes (at molecular, physiological and morphological levels). In Tomato, extensively grown in Mediterranean regions, first studies have shown genetic variability in the response to drought, but few genes/QTLs have been identified and mostly in wild related species. Studying water deficit in this crop is of particular interest since a mastered water deficit can stimulate metabolite production, increasing plant defenses and concentration of compounds involved in fruit quality at the same time. We analyzed two populations: recombinant inbreed lines (RILs) and unrelated cherry tomato accessions, grown in greenhouse under two watering regimes. We assessed a large genetic variability and highly significant genotype x water regime interactions, for several plant and fruit traits, in the two populations. Large fruit accessions showed high sensitivity to drought. The two panels were genotyped with large sets of SNP and quantitative trait loci (QTLs) were identified, combining linkage and association mapping. 20% of the QTLs were interactive between the watering regimes, mostly with antagonist effects according to treatment. Analysis whole genome of gene expression in young leaves from the RIL parents provided interesting candidate genes under interactive QTLs.