Genetic and genomic control of response to water deficit in cultivated tomato

Elise Albert, Yolande Carretero, Justine Gricourt, Esther Pelpoir, Romain Novaretti, Claire Duffes, Julien Bonnefoi, Mathilde M. Causse

ISHS INTERNATIONAL SYMPOSIUM

INNOHORT

Innovation in
Integrated & Organic
Horticulture

Avignon, France

2015

June 8 - 12

PROGRAM AND ABSTRACT BOOK

ISHS

INNOHORT
is organized by

INRA
SCIENCE & IMPACT

UNIVERSITÉ D'AVIGNON

tersys
l'intelligence du vivant

GENETIC AND GENOMIC CONTROL OF RESPONSE TO WATER DEFICIT IN CULTIVATED TOMATO

Elise Albert [1], Yolande Carretero [1], Justine Gricourt [1], Esther Pelpoir [1], Romain Novaretti [1], Claire Duffes [2], Julien Bonnefoi [2], Mathilde Causse [1]

[1] INRA, GAFL, F-85000 Montfavet, France; [2] GAUTIER Semences, F-13630 Eyragues, France

In the next decade water will be increasingly limiting crop production, in particular in Mediterranean region. Improving plant water use efficiency (WUE) by studying genotype x water regime (G x WR) interactions is of main interest to improve plant adaptation to low water availability. At different degrees, plants can change their phenotypes (molecular, morphological and physiological levels) in response to environmental changes. These modifications relate to phenotypic plasticity. In Tomato (Solanum lycopersicum L.), extensively grown in Mediterranean region, first studies have shown genetic variability in the response to water deficit, but very few genes/QTLs have been identified and mostly in wild relative species. Studying water deficit in this fleshy fruit is of particular interest since a well mastered water deficit can stimulate secondary metabolism production, increasing plant defenses and concentration of compounds involved in tomato fruit quality at the same time. In our laboratory, we analyzed 119 recombinant inbreed lines (RIL population) and 142 unrelated cherry tomato (Solanum lycopersicum L. cerasiforme) accessions (GWA population), grown in greenhouse under two watering regimes (WR), in two locations (Morocco and France). Plants were phenotyped for plant phenology, plant vigor and fruit quality traits. We assessed genetic variability and G x WR interactions, for the above traits in the two populations. QTL and GWA analysis were conducted to identify QTL x watering regime (QTL x WR) interactions. The presentation will give a short overview of the research methods available to study genotype by environment interactions in plant and to present the first results of our research project. The possible use of slight water deficit to improve tomato fruit quality in future breeding programs will be investigated.

Keywords: Genotype x Environment interaction, QTL, GWAS, linkage mapping, water deficit, tomato