COMPARATIVE ANALYSIS OF HSP101 EXPRESSION IN DURUM WHEAT AND ITS POSSIBLE ROLE IN ACQUISITION OF THERMOTOLERANCE

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The acquisition of thermotolerance relies on the induction of specific pathways during an acclimation period and corresponds to the ability of a plant to survive normally lethal temperatures after an initial exposure to mild heat stress. One of the main aspects of heat shock response is represented by the synthesis of heat shock proteins (HSPs): these can be classified into five groups on the basis of their molecular masses: HSP 100, 90, 70, 60 and low molecular weight HSPs (smHSPs), typically abundant in plants. They are all molecular chaperones, involved in protection of the other cellular proteins against damages deriving from exposure to high temperature, so preventing protein aggregation and refolding or disaggregating partially denatured ones.

Quantitative and/or qualitative variation in HSPs expression was suggested to be correlated to the varying capacities of thermostolerant and thermosusceptible strains to acquire thermotolerance, even if a direct support for their involvement has been difficult to obtain in plants.

At present only the HSP101 has been proven to be related to acquisition of thermotolerance in Arabidopsis: in fact the HOT1 mutant (having a missense mutation in hsp101 gene producing a non functional protein) failed to acquire thermotolerance in the hypocotyl elongation assay; moreover it shows a heat stress sensitive phenotype also by other tests like recovery after high challenging temperatures, chlorophyll accumulation, cell membrane stability and recovery of Luc activity. These data indicate that many processes are dependent on the function of this single chaperone protein and that the production of this specific HSP is required for thermotolerance.

In our work we wanted to asses the role of HSP101 in durum wheat regarding to thermotolerance. As a first step we tried to elucidate the composition of hsp101 gene family in wheat: in fact, while in Arabidopsis a single gene is responsible for HSP101 synthesis, in Triticeae genome at least two genes coding for this protein are present according to the analysis of EST present in database.
Different cDNA fragments have been cloned from two durum wheat cultivars, Creso and Ofanto, classified as sensitive and tolerant to heat stress, in order to perform sequence analyses. These analyses have confirmed the presence of two distinct genes encoding for HSP101, showing in particular the presence of both intra- and inter-specific Single Nucleotide Polymorphisms (SNP). In order to better understand the role of each gene product in the thermotolerance trait we have developed a multiplex Real-Time PCR reaction, targeting the polymorphic regions, that could allow to compare the expression of these gene in the two cultivars, exposed to different thermal regimes in growth chamber or grown in the field.