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Poster Communication Abstract – 5.25

SIMULTANEOUS APPLICATION OF HEAT AND DROUGHT STRESS ON DURUM WHEAT-THINOPYRUM PONTICUM RECOMBINANT LINES REVEALED TOLERANCE TRAITS ASSOCIATED WITH PRESENCE OF THE WILD 7EL1 CHROMOSOME INTROGRESSIONS

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Intensification of abiotic stress occurrence and severity heavily affects yield of major crops worldwide. In the Mediterranean basin the combination of high temperature peaks/heatwaves and drought phenomena has negative effects on durum wheat (DW) production. With the aim of increasing DW tolerance towards heat stress and water deficit, introgression of genes/QTLs derived from wild wheat relatives, naturally adapted to harsh environments, could be a suitable strategy. Here we analysed the response to a combination of water deficit and heat stress (WH) of three DW-*Thinopyrum ponticum* recombinant lines (RLs) previously obtained via chromosome engineering strategies, carrying (+) on their 7AL arms a differently sized 7el1L chromosome segment transferred from the wild species, along with the corresponding non-carrier sib lines (-) and the ICARDA cv. Margherita as tolerant control. Water withholding lasted from booting stage until maturity, with soil water content set at 30% for stressed and at 70% for unstressed plants. Heat stress was applied at anthesis during 3 (WH3) or 7 (WH7) consecutive days. For the treatment, temperature was gradually increased from 22°C to 38°C, maintained for 2h and gradually brought back to 22°C (total heat stress duration 6 h/day). Photosynthetic efficiency parameters and stomatal conductance (SC), measured on flag leaves (FL) immediately after WH application, water use efficiency (WUE), proline content of both FL and spikes, as well as plant yield components, were the main traits used to assess the tolerance of the genotypes tested. The RLs, named R5+, R112+ and R23+, possessing 23%, 28%

and 40% of 7el1L respectively, revealed differential behaviours towards the WH combined stress. R5+ showed an excellent performance, even compared with Margherita, with minor variations of yield-related traits, an early stress perception (as from SC values) and the highest increase of WUE and FL proline content (+130% in WH7). As for R112+, which showed good heat tolerance in previous experiments, it was negatively affected by the simultaneous application of water withholding. In fact, presence of its 28%-long 7el1L segment was associated with low WUE in the most extreme WH7 condition and with depression of many yield-related traits. Finally R23+, despite exhibiting considerable reduction of yield parameters compared with the other RLs, exhibited a better performance than its control (-) line for parameters such as spike fertility index, grain number/plant and harvest index. This work provides useful insights into how specific wild genepool introgressions affect heat and drought tolerance of the recipient crop species, thus guiding the selection of novel genotypes with combined stress-related positive traits for use in DW breeding programs.

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