Proceedings of the LXIV SIGA Annual Congress
Online, 14/16 September, 2021
ISBN: **978-88-944843-2-8**

Oral Communication Abstract – 5.05

PHYSIOLOGICAL AND GENOMIC CHARACTERIZATION OF A TOMATO GENOTYPE ABLE TO IMPROVE RESOURCE USE EFFICIENCY IN WATER-LIMITED CONDITIONS.

FRANCESCA S.*, VITALE L.**, ARENA C.***, OLIVIERI F.*, MAGGIO A.*, BARONE A.*, RIGANO M. M.*

*) Department of Agricultural Sciences, University of Naples “Federico II”, Portici (NA), Italy.
**) National Research Council, Department of Biology, Agriculture and Food Sciences, Institute for Agricultural and Forestry Systems in the Mediterranean, Portici, Italy.
***) Department of Biology, University of Naples “Federico II”, Naples, Italy.

heat stress, drought, combined stress, RRS

Climate change is increasing the frequency of high temperature shocks and water shortage, pointing to the need for developing novel tolerant varieties and to understand the mechanisms engaged to withstand abiotic stresses. The aim of the present study was to confirm the tolerance to elevated temperatures of one tomato genotype (E42), previously selected as a stable yielding genotype under high temperatures. A rigorous phenotyping under controlled conditions was therefore carried out in E42 and in one known heat-tolerant genotype (LA3120) to investigate the different strategies activated in the two genotypes in response to limited water availability and combined water and heat stresses. Growth parameters and leaf gas exchange measurements revealed that the two genotypes used different physiological strategies to overcome individual and combined stresses, with E42 having a more efficient capability to utilise the limiting water resources. Indeed, E42 was able to preserve the same shoot and root fresh weight under limited water availability, proving its ability to maintain high plant carbon gain. Moreover, in E42, a higher root/shoot ratio was recorded under water stress, a specific trait that has been previously reported in drought tolerant genotypes, and which may have provided an advantage in nutrient and water uptake in E42. In LA3120 the

combined stress induced a strong decline of net photosynthesis, followed by a decrease in stomatal conductance and quantum yield of PSII electron transport, suggesting that the combined stress determined both stomatal and non-stomatal limitation to carbon assimilation. On the contrary, in E42 plants subjected to combined stress, photosynthesis was preserved and the electron transport rate increased compared with plants subjected to heat stress. Activation of antioxidant defence mechanisms seemed to be critical for both genotypes to counteract combined abiotic stresses. A Reduced Representation Sequencing (RRS) approach allowed to explore the genetic variability of both genotypes to identify candidate genes that could regulate stress responses. We retrieved RRS data (obtained in a previous work) from 27 genotypes and analysed their nucleotide variability. This analysis allowed to confirm the high genetic variability of E42 and detect mutations in candidate genes that should be further analysed, including one in a gene coding for an Arabinogalactan protein (AGP). Altogether, results here obtained have shown how new tomato genetic resources can be a valuable source of traits for adaptation to combined abiotic stresses and should be used in breeding programs to improve stress tolerance in commercial varieties, to respond to the challenge of feeding a growing world population.