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# PHYSIOLOGICAL, BIOCHEMICAL AND MOLECULAR ANALYSES OF PEPPER RESPONSE TO HIGH SALT CONDITIONS AND THE IMPACT ON FRUIT QUALITY

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High salt level in soil and water is one of the most damaging abiotic stresses limiting crop production, especially in Mediterranean areas. Salinity can cause adverse effects on plant development at molecular, biochemical and physiological level and can have a negative impact on yield and fruit quality. Among horticultural crops, pepper (*Capsicum annuum* L.) is considered moderately sensitive to salinity; therefore the selection of genotypes tolerant to salt and with improved fruit quality is a major breeding goal for this crop that is regularly cultivated in dry/saline environments with high requirements of water resources and with organoleptic/nutritional fruit features highly appreciated by consumers.

In order to dissect the complexity of the response to high salt levels and to evaluate the effect on pepper fruit quality, an integrated approach has been used by a deep characterization of biochemical, physiological and molecular processes occurring in pepper in response to saline stress. We investigated the response to saline stress conditions (0-30-90-120 mM NaCl in nutrient solution) of two pepper genotypes (cv “Quadrato D'Asti” and local variety “Cazzone Giallo”) during plant and fruit development using a closed soilless system in greenhouse.

Agronomic and physiological parameters, such as leaf area, yield, solute accumulation, gas exchanges, total water potential and osmotic potential, were measured during the plant vegetative and reproductive stages and related to the expression of genes involved in ion transport activity (*sodium/hydrogen antiporter*), structural activity (*actin, beta tubulin*) or coding for key metabolic enzymes (*phytoene desaturase, galactono-_-lactone dehydrogenase, delta 1-pyrroline-5-carboxylate synthetase*); in addition, targeted (ABA, proline, ascorbic acid, carotenoids) and untargeted (phenols, carbohydrates, organic acid, volatile compounds) metabolic profiles were determined by LC-MS and GC-MS. The obtained results clearly indicated, in both genotypes under study, that salinity affected consistently, significantly at 90-120 mM NaCl, plant growth and physiological parameters due to an impaired water status and ion accumulation. Salt treatments adversely affected plant weight (fresh and dry) and fruit yield by decreasing both the fruit fresh weight and the number of fruits per plant (marketable fruits), but did not affect fruit quality. Moreover, increasing NaCl stress, the gene/metabolite profiles were influenced, considering both the diverse stress treatments and the different stage of plant growth. These data will be integrated

with the results of global transcriptome and metabolome analyses in different tissues by a Systems Biology approach to unveil stress-activated response mechanisms affecting pepper fruit nutritional quality.

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