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What is the best possible response of plants to combined stresses? Indeed the simplest one

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Plant responses to salinity and drought stresses have been extensively studied to provide new metabolic targets and improving the tolerance to adverse environments. Most of these studies have been performed in growth chambers under the minimum requirement of light sufficient for the maximum photosynthetic efficiency and growth (300–350 µmol m–2 s–1 PAR), despite nature plants face frequently fluctuations of light intensities exceeding their photosynthetic capacity. High light and salinity can be potentially dangerous for the impairment of the plants antioxidant defense mechanisms causing a strong increase of intracellular ROS and oxidative stress. In this study durum wheat seedlings were used as experimental model to investigate the plant response to salinity (100 mM NaCl), high light (900 µmol m–2 s–1) or both stresses simultaneously, focusing on the physiological and metabolic changes potentially involved in osmotic adjustment and antioxidant defense. Simultaneous high light and salinity did not cause many specific changes in durum wheat plants, which anyway maintained their viability and photosynthetic efficiency. They fine-tuned relatively few selected metabolites, in particular GABA, amides, minor amino acids, hexoses and proline, which were probably the main responsible for the osmotic adjustment, the biochemical pH-stat, the assimilation of the excess of ammonium, the scavenging of ROS and the signaling under the two stresses. However, even if this study concerns responses of seedlings rather than grain, the simultaneous several fold increase in the concentration of asparagine and hexoses if maintained until grain maturation, could be prone to acrylamide formation during baking and have possible serious food safety implication.

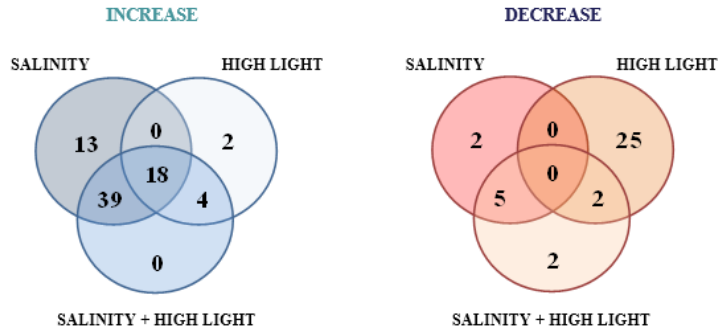

Figure 1: Venn diagram showing the number of parameters which increased (B) or decreased (C) in shoots of durum wheat plants under stress conditions significantly different from control at low light ($P<0.05$)

Biography

Carillo P is an Associate Professor of Plant Physiology at the University of Campania, Italy. She has a strong theoretical and practical background in Plant Physiology, Plant Molecular Biology, Enzymology and Profiling. Her research interests are centered on the interactions between nitrogen assimilation and carbon metabolism, and their short-term and long-term control mechanisms in photosynthetic organisms (unicellular algae and plants). At present, her main focus is the metabolite profiling of crop plants and plant model systems for the comprehension of the fundamental plant molecular and physiological responses to salinity, instrumental for developing new strategies to improve salt tolerance in agricultural crops. Since 2001, she collaborates with researchers of the Max Planck Institute of Molecular Plant Physiology, Potsdam, Germany, for developing new high-throughput methods to measure enzyme activities and metabolites in plants. She is also interested in the valorization and reuse of agricultural residues in a bio-economy perspective.

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