Preface

Due to climate change plants are frequently exposed to various stresses. In response to stresses, various signaling intermediates, in plant cells and tissues are accumulated and interact with one another to provide a defense. Reactive oxygen, nitrogen, and sulfur species (RONSS) constitute key features underpinning the dynamic nature of cell signaling systems in plants. These molecules have long attracted attention in plant science on the basis of both their protective as well as damaging effects. Numerous reports have focused on the elucidation of their signaling role, but also the cross-talk between them when plants are exposed to biotic and abiotic stresses. Particularly interesting was the establishment of the existence of a complex interaction between ROS and RNS, in which both reactive species are used by plants as signal transduction molecules during basic biological and cellular processes, while it has recently been suggested that RSS may also play a role in this interaction. Interestingly, RONSS have also been shown to exert growth-promoting properties when applied under non-stress conditions. In the recent decades, the concept of reactive species (ROS, RNS and RSS) has been shifted. Besides the detrimental effect on plant cells, basal level of some ROS (e.g. H_2O_2) is critical to maintain routine metabolic activities including signaling cascades in plants under stress conditions acting as a signaling response and can promote plant development and reinforce resistance to environmental stresses. In the last decade, great progress has been made in understanding of the role of NO in plants. It was shown that NO functions as a signaling molecule and is involved in a variety of physiological processes, including germination of seeds, root growth, stomatal closure, and reactions in response to stress factors. Many observations from the recent researches suggest that the role of RSS in the redox biology of plants is much greater than the ROS. ROS and RNS are produced in plants as a consequence of aerobic metabolism and because of their toxicity when high levels are present, different antioxidant systems exist in plants to regulate their concentration. ROS and RNS low doses however, are used by the plant as signaling molecules involved in most of the plant processes from development to resistance to stress. However, the interaction among ROS, RNS and RSS in conferring plant stress tolerance is a potential area to explore.

In the present book "Reactive Oxygen, Nitrogen and Sulfur Species in Plants: Production, Metabolism, Signaling and Defense Mechanisms," the main objective is to provide a comprehensive collection of up-to-date knowledge spanning from biosynthesis and metabolism to signaling pathways implicated in the involvement of RONSS to plant defense mechanisms. This is done through 40 chapters written by 140 experts in the field of plant stress physiology, crop improvement and genetic engineering,

ultimately aiming to become a useful information tool for plant breeders, molecular biologists, plant physiologists as well as a guide for students in the field of Plant Science. Importantly, the editors and contributing authors hope that this book will lead to new discussion and efforts toward the elucidation of the nature and mode of action of these ubiquitous molecules. Finally, the editors would like to express their sincere gratitude to all contributors for their interest and cooperation that made the present title possible.

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