Preface

The renowned Greek philosopher Heraclitus' famous quote "Change is the only constant in life" seems very apt in a plant's life. Plants, being sessile in nature, are exposed to a wide variety of environmental perturbations from seed germination to senescence. These environmental changes can be caused due to abiotic and biotic factors. Abiotic factors includes physical aspects of a plant's environment such as soil moisture conditions, soil nutrients, and climatic components such as light, temperature extremes, air pollutants, UV-radiation, and wind. Biotic factors encompass pathogens, pests, parasites, animals, and humans. It is also apparent that the various biotic and abiotic factors are constantly changing during the life cycle of a plant. Furthermore, these external factors co-occur in nature. Plants have to make decisions about fine-tuning their responses to allocate resources efficiently for responding to the more serious threats at any given point in time. Paradoxically, most studies of stress responses in plants focus on a single inciting agent. From the point of view of conducting a well-controlled experiment it is the most ideal strategy. However, the results from such studies may not necessarily mimic the response that a plant would elicit under realistic field conditions where multiple factors are simultaneously operating. In recent years several research groups working on different stress combinations and in different plant species have shown that plants evoke a "unique response" to combined stresses. In other words, combined stress response is not just an additive effect of the responses elicited when the stresses are imposed singly.

The unique responses to combined stresses in plants have been observed at the physiological, biochemical, and molecular levels. The chapters in this book address all the three levels of change in various plants in response to various combinations of stresses.

Chapter 1 provides a general review of the combined stress paradigm. Chapters 2 through 4 focus on the impact of higher CO_2 levels in combination with other stresses (temperature, salinity, and soil contaminants). In Chapters 5 through 8 drought stress is examined in conjunction with other abiotic factors (salinity, heat, and ozone) in different crop plants. Chapters 9 and 10 examine the combination of biotic and abiotic factors. The impact of combined stresses in forest ecosystems are discussed in Chapters 11 and 12.

It is my sincere appeal that the plant stress community embraces the concept of combined stress in their future research. A much-needed second green revolution can become a reality when we incorporate the concept of combined stresses in plant stress research.

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