

Preface

Since the last edition of *Plant Abiotic Stress*, insight has come from various research programs that now shines new light on the determinants of plant adaptation to environmental stress. While there are many sources of plant stress, this book will focus as in the first edition on the inanimate components of the environment associated with climatic, edaphic, and physiographic factors that substantially limit plant growth and survival. Categorically, this book places a focus on plant abiotic stresses caused by flooding, drought, salinity, non-optimal temperatures, and poor soil nutrition. Discussions of plant abiotic stress that originate from climate change, and its potential impacts on crop production, are also included in these chapters.

The greatest cause of reduced yield in annual crops worldwide is the combined impact of abiotic stress. For example, the threat of water scarcity to crop production worldwide is increasing as continued overutilization of aquifer-based irrigation by farmers continues unabated, a condition that is now posing a serious threat to the long-term sustainability of many regional agricultural systems. With increasing irrigation in arid and subarid zones comes increased salinization of field soils, a condition already having dramatic negative impacts on crop yield in many parts of the world. Another major threat is temperatures that are too high, too low, or too erratic for efficient crop production, much of this due to changes in climate. Degradation of field soils by increasingly intensive cultivation to satisfy growing world demand for agricultural products is compounding soil degradation and directly limiting crop yield. Although better field management practices can improve production efficiency, there can be no doubt that new crops with increased resistance to drought, salinity, sub- and supra-optimal temperatures, poor soil nutrient status, and other stresses, like flooding and global climate change, are necessary to meet future food, fiber, and biomass needs globally.

The advent of new technologies for the efficient identification of genetic determinants involved in plant stress adaptation, fostered especially by the use of molecular genetics and high throughput transcriptome, proteome, metabolome, and ionome profiling, as well as the use of genome-wide association and other molecular mapping tools, has improved our understanding of the mechanisms plants use to tolerate abiotic stress and revealed new opportunities for creating improved stress-tolerant crops. This book seeks to summarize the large body of current knowledge about the diverse mechanisms that confer or

influence plant stress tolerance, placing special emphasis on the cellular aspects of plant response whose expression is common across diverse environments. Leading scientists involved in plant abiotic stress research worldwide provide a comprehensive treatise to these major stress factors having an impact on world crop production. The material presented in this book emphasizes fundamental genetic, epigenetic, physiological, biochemical, and ecological knowledge of plant abiotic stress, which may lead to novel applications for improving crop performance in stressful environments.

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