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Drought Stress Tolerance in Plants, Volume 1

Physiology and Biochemistry

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Preface

Plants are subjected to a wide range of abiotic stresses, such as drought, salinity, extreme temperatures, pollution, UV radiation, etc. Abiotic stress adversely affects crop production worldwide, causing yield reductions for most major crops. Among the various abiotic stresses, drought is considered to be the most serious. Due to an increasing global population, drought may lead to a serious food shortage by 2050, when the world's population is expected to reach ten billion. This situation may be worsened due to global climate change that may multiply the frequency, duration, and severity of water deficit. Hence, there is an urgent need to improve our understanding of the complex mechanisms associated with drought tolerance and to develop elite crop varieties that are more resilient to drought without affecting other agronomic and quality parameters. Identification of novel genes responsible for drought tolerance in crop plants will contribute to our understanding of the molecular mechanisms behind drought tolerance. The discovery of novel genes, the analysis of their expression patterns in response to drought, and the determination of their potential functions in drought adaptation will provide the basis for effective breeding strategies to enhance crop drought tolerance. The general effects of drought on plant growth are well known, but the effects of water deficit at the biochemical and molecular levels are not well understood. Although we do not have a complete understanding of the biological mechanisms associated with tolerance to drought, tolerance can to some extent be explained on the basis of ion homeostasis mediated by stress adaptation effectors, toxic radical scavenging, osmolyte biosynthesis, water transport, and the coordination of long-distance signaling mechanisms. Complete elucidation of the physiological, biochemical, and molecular mechanisms by which plants respond to drought, including signal perception and transduction, as well as adaptation, is still a challenge for plant biologists.

In this book we present a collection of 21 chapters written by recognized experts in the field of plant drought responses, tolerance, and crop improvement. This volume deals with an array of topics in the broad area of drought responses and tolerance in plants and focuses on plant "physiology and biochemistry." The information presented in this book demonstrates how plants respond to drought and will ultimately lead to both conventional and biotechnological approaches for improvement of crop

productivity under drought stress and for sustainable agricultural production. We trust that the information covered in this volume will be useful in building strategies to counter the negative impacts of drought. Hopefully this volume will serve as a major source of information and knowledge to graduate and postgraduate students and researchers investigating abiotic stresses. We also believe that it will be of interest to a wide range of plant scientists, including agronomists, physiologists, biotechnologists, molecular biologists and plant breeders who have concerns about the drought responses of plants and improving the drought tolerance of crop plants.

As editors of this volume, we are grateful to the authors of various chapters of this book for writing their chapters meticulously and enabling us to produce this volume in time. We would also like to extend our thanks to Dr. Kenneth Teng and the editorial staff of Springer, New York, who enabled us to initiate this book project. Finally, our special thanks to Springer, Switzerland, for publishing this volume. We fervently believe that the information covered in this book will make a sound contribution to this fascinating area of research.

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Srinagar, Kashmir, India
West Bengal, India
Dunedin, New Zealand
Yokohama, Japan

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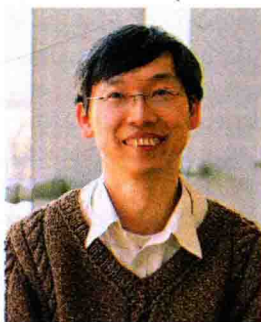
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