Preface

Any external factor that imposes negative impact on growth and development of the plant is known as stress. Plants often experience abiotic stress like drought, salinity, alkalinity, temperature, UV-radiations, oxygen deficiency, etc. Abiotic stress is responsible for the huge crop loss and reduced yield more than 50% of some major crops. Ion imbalance and osmotic stress is the primary effect of abiotic stress. Prolonged exposure to primary stress causes secondary stress through the generation of reactive oxygen species (ROS). These are deleterious for the plants as it causes oxidative damage by reacting with biomolecules. Plants are able to perceive the external and internal signals and are then used by the plant to regulate various responses to stress. Plants respond the abiotic stress by up- and downregulation of genes responsible for the synthesis of osmolytes, osmoprotectants, and antioxidants. Stress-responsive genes and gene products including proteins are expressed and provide tolerance to the plant. To understand the physiological, biochemical, and molecular mechanisms for abiotic stress, perception, transduction, and tolerance is still a challenge before plant biologists.

The chapters in this book deal with the effect of different abiotic stresses on plant metabolism and responses of the plants to withstand the stress. Chapter 1 describes involvement of different osmolytes, osmoprotectants, and antioxidants during abiotic stress. Chapter 2 deals with the role of halophytes in understanding and managing abiotic stress. Chapter 3 addresses the effect and defense mechanisms in plants under UV stress. Chapter 4 throws light on the potassium uptake and its role under abiotic stress. Chapters 5–7 deal with the effect of temperature (heat, chilling) on plants and their responses. Chapter 8 deals with the formation and function of roots under stress. Chapter 9 is concerned with role of ROS and NO under abiotic stress. Chapter 10 throws light on nitrogen inflow and nitrogen use efficiency (NUE) under stress. Chapter 11 addresses Am symbiosis and soil interaction under abiotic stress. Chapter 12 deals with the role of small RNA in abiotic stress. Chapter 13 describes the involvement of transcription factors (TFs) under abiotic stress. Chapters 14–17 deal with the involvement of different signaling molecules (Ca^{2+}, H_2O_2, and phytohormones) under abiotic stress. Chapter 18 covers the role of ethylene and plant growth-promoting bacteria under environmental stress. Chapter 19 throws light on new approaches about metal-induced stress. Chapters 20 and 21 address the role of sulfur and salicylic acid in

alleviating heavy metal-induced stress. Chapters 22 and 23 cover the bioremediation of organic contaminants and utilization of different weeds in removal of heavy metals. We hope that this volume will provide the background for understanding abiotic stress tolerance in plants.

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