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Climate continues to change and natural resources are more and more limited due to increasing demand. Therefore, elucidation of interactions of plants with their environment is of vital importance. This book examines some of the most important abiotic stresses limiting plant growth and productivity in their natural and managed environments. Recent progress in molecular biology and biotechnology is reflected in changes made in this third, thoroughly revised edition.

The book is introduced by the chapter focused on cellular membranes as the sites of sensing of stress and sites of regulation of plant responses. The second chapter concerning heat stress emphasizes identification of optimum temperature for each plant species before examination of heat injury and establishment of heat tolerance. Mechanisms of plant adaptation to chilling or freezing (namely the role of cold-responsive genes, COR proteins, osmolytes, and phospholipase D) are considered in the third chapter. The fourth chapter deals with short-term and long-term responses of plants to changes in irradiance with the emphasis of photoprotective mechanisms. Involvement of hormones, especially abscisic acid (ABA), in detection and signaling of water stress, and in development of drought tolerance are the main topics of chapter five. It is also shown how different ABA-deficient and ABA-insensitive mutants have recently contributed to improvement of our knowledge in

this field. In close relation is the sixth chapter devoted to salinity as salt and dehydration stresses show a high degree of similarity with respect to physiological, biochemical, molecular, and genetic effects. However, in addition of osmotic effects, specific ion toxicity is evaluated. The topic of the chapter seven is waterlogging and this chapter is focused mostly on adverse effects of lowered oxygen supply. As concern possible stresses caused by insufficient or excessive mineral nutrition, only one chapter (chapter eight) deals with low phosphorus availability as a primary constraint to plant productivity. The chapter nine is an overview of the physiological effects of copper, iron, manganese, molybdenum, zinc, cobalt, nickel, vanadium, cadmium, chromium, lead, mercury and other heavy metals. The chapter ten partially repeats the previous chapters and summarizes function of roots under drought, salinity, waterlogging and soil compaction. The chapter eleven points to the different methods for determination of stress injury and stress tolerance and the last, chapter twelve, is the survey of genomic approaches to improving abiotic stress tolerance.

The readable text of each chapter is accompanied by illustrative figures and tables, and comprehensive list of references. The information presented in this book can help readers in better understanding mechanisms of abiotic stress tolerance on whole-plant, cellular, and molecular levels.

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