

1. Record Nr.	UNINA9910898095503321
Autore	Nikalje Ganesh C
Titolo	Plant Secondary Metabolites and Abiotic Stress
Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2024 ©2024
ISBN	1-394-18644-4
Edizione	[1st ed.]
Descrizione fisica	1 online resource (692 pages)
Altri autori (Persone)	ShahnawazMohd PariharJyoti QaziHilal Ahmad PatilVishal N ZhuDaochen
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Series Page -- Title Page -- Copyright Page -- Dedication -- Contents -- Foreword -- Preface -- Acknowledgment -- About the Book -- Chapter 1 Biochemical Responses of Plants to Individual and Combined Abiotic Stresses -- 1.1 Introduction -- 1.2 Biochemical Responses to Individual Abiotic Stresses -- 1.2.1 Heat Stress -- 1.2.2 Cold Stress -- 1.2.3 Drought Stress -- 1.2.4 Flood Stress -- 1.2.5 Salinity Stress -- 1.2.6 Heavy-Metal Ions -- 1.3 Biochemical Responses to Combined Abiotic Stresses -- 1.3.1 ROS and Antioxidant Defense -- 1.3.2 Hormonal Crosstalk and Signaling Pathways -- 1.3.3 Metabolic Adjustments and Secondary Metabolites -- 1.3.4 Photosynthetic Adaptations and Carbon Partitioning -- 1.3.5 Osmotic Adjustment and Water Use Efficiency -- 1.3.6 Epigenetic Modifications and Gene Regulation -- 1.3.7 Molecular Signaling and Transcriptional Networks -- 1.3.8 Protein Homeostasis and Chaperone Machinery -- 1.3.9 Nutrient Uptake and Metabolism -- 1.3.10 Cellular Signaling and ROS Signaling -- 1.3.11 Metabolic Reprogramming and Stress-Responsive Metabolites -- 1.4 Conclusion -- References -- Chapter 2 Unraveling the Dynamics of Antioxidant Defense in Plants Under Drought Conditions -- 2.1 Introduction -- 2.2 Oxidative Stress in Plants Under

Drought Condition -- 2.3 Antioxidant Defense System of Plants -- 2.4 Enzymatic Antioxidants and Their Response Against High ROS Under Drought Stress -- 2.4.1 Ascorbate Peroxidase -- 2.4.2 Catalase -- 2.4.3 Dehydroascorbate Reductase -- 2.4.4 Glutathione Peroxidase -- 2.4.5 Glutathione Reductase -- 2.4.6 Glutathione S-Transferase -- 2.4.7 Monodehydroascorbate Reductase -- 2.4.8 Peroxidases -- 2.4.9 Peroxiredoxins -- 2.4.10 Polyphenol Oxidases -- 2.4.11 Superoxide Dismutase -- 2.4.12 Thioredoxin -- 2.5 ROS-Scavenging Non-Enzymatic Antioxidants and Their Response Under Drought Stress. 2.5.1 Ascorbic Acid -- 2.5.2 Carotenoids -- 2.5.3 Flavonoids -- 2.5.4 Glutathione -- 2.5.5 Phenolic Compounds -- 2.5.6 Tocopherols -- 2.5.7 Proline -- 2.6 Interplay of ROS With Reactive Carbonyl, Nitrogen, and Sulfur in Plant Cells: A Crosstalk Saga -- 2.7 Conclusion -- References -- Chapter 3 Plant Metabolism and Abiotic Stress in Crops -- 3.1 Introduction -- 3.2 Concepts and Types of Abiotic Stress in Crop Plants -- 3.2.1 Temperature Stress -- 3.2.1.1 Oxidative Damage Caused by Temperature Stress -- 3.2.2 Salinity Stress -- 3.2.3 Drought -- 3.2.4 Heavy Metal Stress -- 3.3 Plant Metabolism -- 3.3.1 Biosynthesis of Secondary Metabolites -- 3.3.1.1 Shikimate (Shikimic Acid) Route -- 3.3.1.2 Mevalonic Acid (Mevalonate) Route -- 3.3.1.3 Methylerythritol-Phosphate Route -- 3.4 Conclusion -- References -- Chapter 4 Targeting Compatible Solutes for Abiotic Stress Tolerance in Plants -- 4.1 Introduction -- 4.1.1 Common Abiotic Stress -- 4.2 Stress Caused by Abiotic Factors -- 4.2.1 Cold -- 4.2.2 Salt -- 4.2.3 Heavy Metal Stress -- 4.2.4 Light Stress -- 4.2.5 Compatible Solutes as Small Molecules -- 4.3 Present Compatible Solutes for Stress Tolerance in Plants -- 4.3.1 Betaines -- 4.3.2 Amino Acids -- 4.3.3 Polyols and Non-Reducing Sugars -- 4.3.4 Polyamines -- 4.4 Genetic Engineering Perspective for Compatible Solutes Mediated Abiotic Stress Resistance in Plants -- 4.5 Importance of Ethylene in the Controlling of Osmolytes Under Abiotic Stress -- 4.5.1 Proline and Ethylene -- 4.5.2 Betaine and Ethylene -- 4.5.3 Polyamines and Ethylene -- 4.5.4 Sugar Alcohols and Ethylene -- 4.6 Importance of Salicylic Acid in Controlling of Osmolytes Under Abiotic Stress -- 4.6.1 Proline and Salicylic Acid -- 4.6.2 Betaine and Salicylic Acid -- 4.6.3 Polyamines and Salicylic Acid -- 4.6.4 Sugar Alcohols and Salicylic Acid. 4.7 Importance of Cytokinin in the Controlling of Osmolytes Under Abiotic Stress -- 4.7.1 Proline and Cytokinin -- 4.7.2 Betaine and Cytokinin -- 4.7.3 Polyamines and Cytokinin -- 4.7.4 Sugar Alcohols and Cytokinin -- 4.8 Importance of Abscisic Acid in the Controlling of Osmolytes in an Abiotic Environment -- 4.8.1 Proline and Abscisic Acid -- 4.8.2 Betaine and Abscisic Acid -- 4.8.3 Polyamines and Abscisic Acid -- 4.8.4 Sugar Alcohols and Abscisic Acid -- 4.9 Conclusion -- Author Contributions -- Conflict of Interest -- References -- Chapter 5 Oxalate Crystals and Abiotic Stress Tolerance in Plants -- 5.1 Introduction -- 5.2 Formation of Crystals of Calcium Oxalate -- 5.3 Forms of Oxalate Crystals in Plants -- 5.3.1 Raphides -- 5.3.2 Styloid Crystals -- 5.4 Role of Oxalate Crystals to Cope with Abiotic Stresses -- 5.4.1 Oxalate Crystals and Heavy Metal Stress -- 5.4.2 Oxalate Crystals Helps in Drought and Salinity Stress -- 5.4.3 Oxalate Crystal and Defense Against Herbivory -- 5.5 Conclusion -- Acknowledgments -- Competing Interests -- References -- Chapter 6 Role of Signaling Molecules in Enhancing Abiotic Stress Tolerance in Plants -- 6.1 Introduction -- 6.2 Signaling Molecules -- 6.3 ROS Signaling -- 6.4 ABA in Stress Tolerance -- 6.5 Mitogen-Activated Protein Kinase (MAPK) -- 6.6 Cross-Talk Between Plants MAPK During Abiotic Stress Signal Transduction -- 6.6.1 Role of MAPK in Abiotic Stress Management -- 6.6.2 MAP Kinase in Oxidative Stress -- 6.6.3 MAP

Kinase in Light Stress -- 6.7 CRISPR-Cas9 in Stress Tolerance -- 6.7.1 Role of CRISPR in Drought Tolerance -- 6.7.1.1 Role of CRISPR in Salt Tolerance -- 6.7.1.2 Role of CRISPR in Heat Stress Tolerance -- 6.8 Conclusion -- References -- Chapter 7 Impact of Abiotic Stress Signals on Secondary Metabolites in Plants -- 7.1 Introduction -- 7.2 Abiotic Stresses in Plants -- 7.2.1 Drought Stress. 7.2.2 Salinity Stress -- 7.2.3 Temperature Stress -- 7.2.4 Light Stress -- 7.2.4.1 Impact of Ultraviolet (UV) Radiation -- 7.2.5 Soil Nutrient Stress -- 7.2.6 Heavy Metals -- 7.3 Conclusion -- 7.4 Future Prospective -- References -- Chapter 8 Role of Reactive Oxygen Species (ROS) in Plant Responses to Abiotic Stress -- 8.1 Introduction -- 8.2 Role of ROS in Plant Growth and Development -- 8.3 Involvement of ROS in Plants' Stress Response -- 8.4 ROS Regulation in Plants -- 8.5 Genes and Proteins Involved in ROS Regulation in Plants -- 8.6 Conclusion -- References -- Chapter 9 Reactive Oxygen, Nitrogen, and Sulfur Species Under Abiotic Stress in Plants -- 9.1 Introduction -- 9.2 Abiotic Stress in Plants: Molecular Perspective -- 9.2.1 Signal Transduction Mechanisms -- 9.2.1.1 SOS (Salt Overly Sensitive) Signaling, Which is Ca²⁺-Dependent, Controls Ion Homeostasis -- 9.2.1.2 Signaling of Osmotic/Oxidative Stress -- 9.2.1.3 Ca²⁺-Dependent Signaling that Stimulates Abundant-Type Genes Throughout Late Embryogenesis (DRE or CRT Class Genes) -- 9.3 Role of Oxygen in Abiotic Stress -- 9.4 Role of Sulfur in Abiotic Stress -- 9.5 Role of Nitrogen in Abiotic Stress -- 9.5.1 Drought Stress -- 9.5.2 Cold Stress -- 9.5.3 Salinity Stress -- 9.6 Cross-Talk Between Oxygen, Sulfur, and Nitrogen During Abiotic Stress -- 9.7 Conclusion and Future Prospective -- References -- Chapter 10 Regulation of Plant Hormones Under Abiotic Stress Conditions in Plants -- 10.1 Introduction -- 10.1.1 Brief Overview of Phytohormones -- 10.2 ABA's Function in Plant Defense Mechanisms -- 10.3 Hormonal Cross-Talk in Plant Defense -- 10.3.1 Impact of Water Stress on Plant Growth -- 10.3.2 Impact of Water Stress on Germination -- 10.3.3 Inorganic Nutrition -- 10.4 Plant Morphology and Anatomy -- 10.5 Photosynthesis -- 10.6 Hormonal Balance. 10.7 Plants Under Abiotic Stress Benefit from Phytohormones Mediated by PGPR -- 10.7.1 PGPR and Seed Germination -- 10.7.2 PGPR and Root Architecture -- 10.7.3 PGPR and Shoot Development -- 10.7.4 PGPR and Relative Water Content -- 10.7.5 Interstitial Fluid Modulation by the Synthesis and Accumulation of Dissolved Compatibility -- 10.7.6 Fabrication of Exopolysaccharides -- 10.8 Changes in Phytohormone Activity Caused by PGPR Under Drought -- 10.8.1 Deaminase for 1-Aminocyclopropane-1-Carboxylic Acid (ACC) -- 10.8.2 Volatile Organic Compounds -- 10.8.3 PGPR-Mediated Alteration of Plant Antioxidant Defense Organization -- 10.8.4 Molecular Research on Drought Stress Reduction by PGPR/Alteration of Stress-Responsive Gene Expression -- 10.9 Future Prospects -- 10.10 Conclusion -- Acknowledgments -- References -- Chapter 11 Altering Secondary Metabolite Profiles in Barley for Crop Enhancement: Role of Novel ACT Domain Proteins -- 11.1 Introduction -- 11.2 Methods -- 11.2.1 Data Collection and Retrieval -- 11.2.2 Analysis of ACR Gene Family in *Hordeum vulgare* -- 11.2.3 Sequence Alignment -- 11.2.4 Phylogenetic Analysis -- 11.2.5 Gene Expression Analysis -- 11.3 Results -- 11.3.1 Molecular Characterization of the Barley (*Hordeum vulgare* ssp. *vulgare*) ACR-Like Gene Family -- 11.3.2 Chromosome Localization Analysis: Investigating the Position of ACR-Like Genes on the *Hordeum* Genome -- 11.3.3 Amino Acid Sequence Similarity Analysis of *Hordeum* ACR-Like Proteins -- 11.3.4 ACR-Like Proteins: The Presence of Four Copies of ACT Domains -- 11.3.5 Subcellular Localization of ACR-Like Proteins --

11.3.6 Gene Expression Patterns of ACR-Like Proteins -- 11.4
Discussion -- 11.5 Conclusion and Future Research Directions --
References -- Chapter 12 Metabolites and Their Regulation During
Salinity Stress in Plants -- 12.1 Introduction.
12.2 Salt Stress Affects Plant Growth.
