

1. Record Nr.	UNINA9910512167803321
Autore	Mukherjee Soumya
Titolo	Rhizobiology : molecular physiology of plant roots // Soumya Mukherjee and Frantisek Baluska
Pubbl/distr/stampa	Cham, Switzerland : , : Springer, , [2022] ©2022
ISBN	3-030-84985-6
Descrizione fisica	1 online resource (497 pages)
Collana	Signaling and Communication in Plants
Disciplina	581.10428
Soggetti	Roots (Botany) - Physiology Arrels (Botànica) Rizosfera Fisiologia vegetal Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Preface -- Contents -- Root Apex Cognition: From Neuronal Molecules to Root-Fungal Networks -- 1 Introduction -- 2 Root Apex Transition Zone: Oscillatory Brain-Like Cognitive Organ in Soil Exploration -- 3 Neuronal Molecules Relevant for Root Apex Cognitive Navigation and Soil Exploration -- 4 Synaptic Principles Relevant for Root Apex Cognitive Navigation -- 5 Transition Zone Energides in the Driver's Seat to Control Root Apex Navigation -- 6 Changing Metaphor for Transition Zone Energide: From 'Bug in Cage' to 'Spider in Web' -- 7 Evolution of the Root Apex Brain: From Ancient Roots Towards Complex Root Systems -- 8 Root-Fungal Networks Control Underground Supracellular Life -- 9 Conclusions and Gaian Outlook -- References -- Root Architectural Plasticity in Changing Nutrient Availability -- 1 Introduction -- 2 RSA and Nitrogen Mediated Root Remodeling -- 3 Root System Architecture in Response to Phosphate (Pi) -- 3.1 Primary Root Growth Under Pi Deficiency -- 3.2 Lateral Root Growth in Pi Deficiency -- 3.3 Role of Root Hairs in Pi Deficiency -- 4 Conclusion and Future Perspective -- References -- Molecular Physiology of Nitrate Sensing by Roots -- 1 NUE and Roots for a Second

Green Revolution -- 2 Root Morphology: Maize Root Versus Arabidopsis Root -- 3 Main Molecular Actors for Nitrate Sensing in Arabidopsis Root -- 4 Regulation of Root Development by Nitrate Availability: Maize Versus Arabidopsis -- 5 Maize Transition Zone and Nitrate Sensing -- References -- Role of Arbuscular Mycorrhizal Fungi in Root Development with a New Dimension in the Root Web Network -- 1 Introduction -- 2 Improved Nutrient Uptake -- 3 Promotes Growth -- 4 Improves Photosynthetic Efficiency -- 5 Alters the Level of Phytohormone -- 6 Provides Resistance from Abiotic Stress -- 6.1 Salinity -- 7 Drought Stress -- 8 Metals -- 9 Temperature Stress.

10 Provides Resistance from Biotic Stress -- 11 Arbuscular Mycorrhizal Fungi (AMF) as (Agro) Ecosystem Engineers -- 12 Relationship Between Strigolactone and AM Fungi -- 13 Conclusions -- References -- Ally or Foe: Role of Soil Microbiota in Shaping Root Architecture -- 1 Introduction -- 2 Different Microorganisms that Modulate Root Architecture -- 2.1 Bacteria as Modulators -- 2.2 Fungi as Modulators -- 2.3 Nematodes as Modulators -- 2.4 Insects as Modulators -- 2.5 Parasitic Plants as Modulators -- 2.6 Viruses as Modulators -- 3 Different Levels of Modulation of Root Architecture -- 3.1 Anatomical and Structural Changes -- 3.2 Physiological Changes -- 3.3 Hormonal Changes -- 3.4 Molecular Changes -- 4 Evolutionary Pressure between the Plant and Rhizobiome -- 5 Strategies to Improve Plant Health by Manipulating Microbiome -- 6 Conclusion -- References -- miRNA Mediated Signaling Involved in Arabidopsis thaliana Root Development -- 1 Introduction -- 2 Role of miRNAs in Primary Root Development -- 3 miRNA Mediated Regulation of Lateral Root Development -- 4 Role of miRNA in Adventitious Root Development -- 5 Conclusion and Future Perspectives -- References -- Rooting the Right Way: Role of Glucose Signaling in Regulating Root Development in Plants -- 1 Introduction -- 2 Role of HXK1 Dependent Pathway in Regulating Root Development -- 3 Role of RGS1 Mediated Heterotrimeric G-protein Signalling (HXK1-Independent) in Regulating Root Development -- 4 Role of Glucose Mediated TOR-SnRK1 Energy Signalling in Regulating Root Development -- 5 Crosstalk Between Glucose and Phytohormones in Regulating Root Development -- 6 Conclusions -- References -- Plant Hormonal Crosstalk: A Nexus of Root Development -- 1 Introduction -- 2 Auxin and Its Crosstalk in Root Development -- 3 Gibberellins and Their Crosstalk in Root Development.

4 Strigolactones and Their Crosstalk in Root Development -- 5 Brassinosteroids and Their Crosstalk in Root Development -- 6 Conclusion -- References -- Dynamic Pool of Nitric Oxide (NO) in Rhizosphere Modulates Root Architecture, Nutrient Acquisition and Stress Tolerance in Plants -- 1 Introduction -- 2 Sources of NO Generation and Its Distribution in the Rhizosphere -- 3 Rhizosphere Composition Regulates Apoplastic and Symplastic NO Production in Roots -- 4 Rhizospheric Organic Matter Elevates NO Biosynthesis and Subsequent Upregulation of Plant Growth Hormones -- 5 Rhizospheric NO Regulates Nitrate Assimilation and Root Architecture in Plants -- 6 Nitric Oxide Mediated Abiotic Stress Tolerance in Plants is Partially Regulated by Rhizospheric Interactions -- 7 Rhizobacteria Mediated NO Formation in the Rhizosphere Regulates Abiotic Stress Tolerance in Plants -- 8 Future Perspectives: Rhizospheric NO Regulates Symbiotic Associations with Plant Roots -- References -- Role of Nitric Oxide as a Double Edged Sword in Root Growth and Development -- 1 Introduction -- 2 Chemical Nature of Nitric Oxide -- 3 Different Routes of NO Synthesis -- 4 Ways and Means

to Study NO in Plants -- 5 Where is NO Produced in a Plant Cell -- 6 Role of NO in Root Growth and Development -- 7 Role of NO in Adventitious Rooting -- 8 Role of NO in Lateral Root Formation -- 9 Role of NO in Root Hair Development -- 10 Role of NO During Different Stages of the Legume Rhizobium Interaction -- 11 Role of NO in Protecting Plant Roots from Stress -- 12 Crosstalk Between NO and Other Plant Hormones in Terms of Root Growth and Development -- 13 NO a Double Edged Secondary Sword -- 14 Conclusion -- References -- Interaction of Cytokinin and Ethylene in the Regulation of Primary Root Growth and Development -- 1 Introduction -- 2 Signal Transduction by Cytokinin, Ethylene, and Auxin. 2.1 Cytokinin Signaling -- 2.2 Ethylene Signaling -- 2.3 Auxin Signaling -- 3 Mechanisms for Crosstalk Between Cytokinin and Ethylene -- 3.1 Transcriptional Cross-Talk -- 3.2 Induction of Ethylene Biosynthesis by Cytokinin -- 3.3 Signaling by Ethylene Through the Multi-step Phosphorelay -- 4 The Arabidopsis Root System -- 5 Auxin-Dependent Mechanisms by Which Cytokinin and Ethylene Regulate Cell Proliferation in the Primary Root -- 5.1 Auxin-Dependent Mechanisms by Which Cytokinin Regulates Cell Proliferation in the Primary Root -- 5.2 Auxin-Dependent Mechanisms by Which Ethylene Regulates Cell Proliferation in the Primary Root -- 6 Regulation of the Cell Cycle by Cytokinin and Ethylene -- 6.1 Regulation of the Cell Cycle by Cytokinin -- 6.2 Regulation of the Cell Cycle by Ethylene -- 7 Auxin-Dependent Mechanisms by Which Cytokinin and Ethylene Regulate Cell Expansion in the Primary Root -- 7.1 Auxin-Dependent Mechanisms by Which Ethylene Regulates Cell Expansion in the Primary Root -- 7.2 Auxin-Dependent Mechanisms by Which Cytokinin Regulates Cell Expansion in the Primary Root -- 8 Ethylene and Cytokinin Regulate Cell Division in the QC -- 9 Conclusion -- References -- Role of Brassinosteroids in Root Growth and Development -- 1 Introduction -- 2 Brassinosteroids -- 3 Biosynthesis of Brassinolide -- 4 Brassinosteroid Signaling Pathway -- 5 Physiological Roles of Brassinosteroid -- 5.1 Maintenance of Meristem Size in Roots -- 5.2 Growth of Root by Cell Elongation -- 5.3 Root Hair Formation -- 5.4 Initiation of Lateral Roots -- 5.5 Gravitotropic Responses Shown by Roots -- 5.6 Nodulation and Mycorrhiza Formation -- 6 Crosstalk of BRs with Other Phytohormones Operating During Root Development -- 7 Conclusions -- References -- Precise Role of Strigolactones and Its Crosstalk Mechanisms in Root Development -- 1 Introduction. 2 Structure, Diversity and Biosynthesis of Strigolactones -- 3 Spatial Expression Analysis of SL Biosynthesis Genes in Roots -- 4 Strigolactones and Root Development -- 4.1 Strigolactones and Primary Root Development -- 4.2 Strigolactones and Lateral Root Development -- 4.3 Strigolactones and Adventitious Root Formation -- 4.4 Strigolactones and Root Hair Elongation -- 5 Conclusion -- References -- Crosstalk of Jasmonates with Phytohormones Accompanying Root Growth, Development and Microbe-Interaction -- 1 Introduction -- 2 Jasmonates -- 3 Biosynthesis of Jasmonates -- 4 Biosignalling of Jasmonates -- 5 Role of Jasmonates in Root Growth and Development -- 5.1 Gravitotropism Response -- 5.2 Inhibition of Primary Root Growth -- 5.3 Effect on Nodulation -- 5.4 Jasmonate Mediated Root Curling -- 5.5 Disruption of Root Mitochondria -- 5.6 Regulation of Beneficial Microbe-Root Interaction -- 6 Crosstalk of Jasmonates with Other Phytohormones During Root Development -- 7 Conclusions -- References -- Jasmonates: A Thorough Insight into the Mechanism of Biosynthesis, Signaling and Action in Root Growth and Development -- 1 Introduction -- 2 Initial Isolation

and Identification -- 3 Biosynthesis of Jasmonates -- 4 Regulation of JA Biosynthesis -- 5 Jasmonic Acid Metabolism -- 6 Jasmonic Acid Signalling -- 7 From JA-Ile Perception to Transcriptional Activation- Mechanism of JA-Induced Gene Expression -- 8 Role of Jasmonates in Modulating Root System Architecture (RSA) -- 9 Conclusions and Perspective -- References -- Serotonin and Melatonin: Role in Rhizogenesis, Root Development and Signaling -- 1 Introduction -- 2 Biosynthetic Pathway -- 3 Role of Melatonin and Serotonin in Rooting -- 4 Melatonin and Serotonin-Auxin like Function in Root Induction? -- 5 Insights from Gene Expression Patterns -- 6 Gravitropic Response- An Auxin Like Response to Melatonin. 7 Nitric Oxide, Auxin and Melatonin Signaling Pathways in Root Induction.

---