

1. Record Nr.	UNINA9911040928203321
Autore	Jain S. Mohan
Titolo	Custom-Designed Crop Breeding, 2 Volume Set
Pubbl/distr/stampa	Newark : , : John Wiley & Sons, Incorporated, , 2025 ©2026
ISBN	1-394-19257-6 1-394-19259-2
Edizione	[1st ed.]
Descrizione fisica	1 online resource (879 pages)
Disciplina	631.52
Soggetti	Plant breeding Plant biotechnology
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Cover -- Volume 1 -- Half Title Page -- Title Page -- Copyright -- Contents - Volume-1 -- Contributors -- Editors -- Preface -- Acknowledgment -- Part I: Genomics-based Precision Breeding -- 1: Innovative Approaches in Crop Design -- 1.1 Introduction -- 1.2 A Brief Look into the History of Plant Breeding Technologies -- 1.3 New Plant Improvement Tools -- 1.4 Plant-Microbe Interactions toward Crop Improvement -- 1.5 Speed Breeding -- 1.6 Future Prospects -- 1.7 Conclusion and Prospects -- References -- 2: Enhancing Drought Tolerance and Crop Adaptability: Genomic Advances for a Sustainable Agriculture -- 2.1 Introduction -- 2.2 Genomic Innovation for Crop Drought Management -- 2.3 The Key Role of Advancing Genomics Tools -- 2.4 Genetic Improvement Technology -- 2.5 Novel Genomic Breeding Techniques -- 2.6 Breeding Based on Systems Biology -- 2.7 Rapid Breeding and Genomic Selection -- 2.8 CRISPR/Cas9 and CRISPR/Cas12a -- 2.9 DNA and RNA A Base Edit -- 2.10 DNA Prime Editing -- 2.11 Epigenome Editing -- 2.12 Conclusion and Prospects -- References -- 3: Progress of Functional Genomics in Crop Plants -- 3.1 Introduction -- 3.2 Branches of Genomics -- 3.3 Databases and Applications -- 3.4 History of Genomics -- 3.5 The Comprehensive Progress and Ranking of Functional Genomics and Systems Biology -- 3.6 Application of Functional Genomics -- 3.7 Current Status of

Genomics and Functional Genomics -- 3.8 Advances in Plant Functional Genomics -- 3.9 Functional Genomics for Precision Crop Breeding -- 3.10 Conclusion and Future Prospectus -- References -- 4: Breeding by Design: Interaction of Linkage Maps and Molecular Markers in Major Oilseed Crops under Abiotic Stress -- 4.1 Introduction -- 4.2 Conclusion and Prospects -- References -- 5 Stability Statistics in Multi-environment Trials -- 5.1 Introduction -- 5.2 Genotype and Environment Interaction. 5.3 Multi-environment Trials (METs -- 5.4 Stability Statistics -- 5.5 Conclusion and Prospects -- References -- Part II: Innovative Breeding Technologies -- 6: Crop Breeding for Climate Resilience: Integrating Genomics and Phenomics with Bioinformatics -- 6.1 Introduction -- 6.2 Genomic Approaches in Crop Breeding -- 6.3 High-throughput Phenotyping for Climate Adaptation -- 6.4 Bioinformatics Tools and Resources for Crop Breeding -- 6.5 Integrating Genomics and Phenomics in Crop Breeding -- 6.6 Future Prospects and Challenges -- 6.7 Conclusion and Prospects -- References -- 7: High-throughput Phenotyping of Traits Associated with Climate Resilience in Crop Plants -- 7.1 Introduction -- 7.2 The Phenomics Bottleneck -- 7.3 Plant Response Toward the Stress -- 7.4 HTP Techniques -- 7.5 Extraction of Phenotypic Data and its Analysis -- 7.6 Conclusion and Prospects -- References -- 8: Enroute to Climate-resilient Crops: QTL Mapping and Beyond -- 8.1 Introduction -- 8.2 QTL Mapping: Concept and Methods -- 8.3 Mapping-to-MAS Strategy -- 8.4 QTL Mapping versus GWAS: The Road Not Taken -- 8.5 QTL Mapping-to-MAS versus GS: When to Select Which Approach -- 8.6 QTL to Candidate Gene -- 8.7 Implementation of Mapping-to-MAS Strategy for Cultivar Development -- 8.8 Nature of Traits Associated with Climate Resiliency -- 8.9 Conclusion and Perspectives -- References -- 9: Crop Biofortification for Food Security under the Era of Climate Change -- 9.1 Introduction -- 9.2 Hidden Hunger and World Famine -- 9.3 Agricultural Production Challenges -- 9.4 Climate Change Effect on Crop Production -- 9.5 Synthetic Fertilizers and Their Role in Climate Change -- 9.6 Biofortification for Human Health -- 9.7 Biofortification Approaches (Conventional Breeding and Agronomic Tactics) -- 9.8 Genomic Approaches -- 9.9 Transgenic Approach -- 9.10 Genome Editing. 9.11 Nanoencapsulation Strategies for Advancing Biofortification -- 9.12 Microbial Biofortification -- 9.13 Successful Stories of Biofortified Crops, Challenges and Limitations -- 9.14 Conclusion -- References -- Part III: Artificial Intelligence and Machine Learning -- 10: Automated High-throughput Plant Phenotyping Systems -- 10.1 Introduction -- 10.2 Components of Automated High-throughput Plant Phenotyping Systems -- 10.3 Types of Automated High-throughput Plant Phenotyping Systems -- 10.4 Applications of Automated High-throughput Plant Phenotyping Systems -- 10.5 Positron Emission Tomography -- 10.6 Conclusion and Prospects -- References -- 11: Next-generation Artificial Intelligence in Plant Breeding -- 11.1 Introduction -- 11.2 The Evolution of Molecular Breeding Techniques -- 11.3 AI-powered Breeding: Revolutionizing Crops for a Sustainable Future -- 11.4 Beyond Traditional Breeding: Releasing the Power of AI for Next-generation Crops -- 11.5 Challenges -- 11.6 Conclusion and Prospects -- References -- 12: Prediction of Traits Using Artificial Intelligence Machine Learning -- 12.1 Introduction -- 12.2 Forms of Artificial Intelligence and Their Uses in Agriculture -- 12.3 Forms of ML and Their Uses in Agriculture -- 12.4 Challenges of Using ML in Agriculture -- 12.5 Future of AI and ML -- 12.6 Conclusion and Prospects -- References -- 13: Smart Plant Breeding -- 13.1 Introduction -- 13.2 Milestones and Importance of Plant Breeding --

13.3 Drones of Plant Breeding -- 13.4 Smart Germplasm Resources -- 13.5 Smart Approaches of GEI -- 13.6 Bioinformatics -- 13.7 Plant Breeding Objectives with Smart Breeding Technologies -- 13.8 Smart Plant Breeding Methods -- 13.9 Conclusion -- References -- 14: Autonomous Field Phenotyping: Revolutionizing Crop Breeding with Artificial Intelligence -- 14.1 Introduction -- 14.2 Historical Perspective and Evolution. 14.3 Phenotyping Robots -- 14.4 Significance of Autonomous Field Phenotyping in Modern Breeding -- 14.5 Technologies Driving Autonomous Phenotyping -- 14.6 Sensor Technologies for Field Data Collection -- 14.7 Advancements in Remote Sensing -- 14.8 Data Collection and Processing Methods -- 14.9 Applications in Crop Improvement -- 14.10 Accelerating Crop Development Cycles -- 14.11 AI Integration with Traditional Breeding Practices -- 14.12 Emerging Trends and Future Prospects -- 14.13 Conclusion and Prospects -- References -- 15: Integration of Machine Learning in Plant Breeding -- 15.1 Introduction -- 15.2 Plant Genomics and Phenomics -- 15.3 Phenotypic Selection -- 15.4 Genetic and Phenotypic Modeling: An Integrated Approach -- 15.5 Challenges in the Integration of ML and Phenotyping for Crop Improvement -- 15.6 ML in Plant Breeding -- 15.7 Conclusion and Prospects -- References -- Index -- Volume 2 -- Half Title Page -- Title Page -- Copyright -- Contents - Volume 2 -- Contributors -- Editors -- Preface -- Acknowledgment -- Part IV: Abiotic Stress Tolerance -- 16: Genetics and Genomics of Root Architecture Traits in Response to Environmental Stress in Plants -- 16.1 Introduction -- 16.2 Root Architecture -- 16.3 Impact of Environmental Stresses on RA -- 16.4 Plants' Molecular Response to Environmental Stress in RA -- 16.5 Conclusion and Prospects -- References -- 17: Physiological Tools for Drought-tolerant Crops Design -- 17.1 Introduction -- 17.2 Natural Crop Diversity as a Source for Drought-tolerance Genes -- 17.3 Some Physiological Tools to Improve Crop Tolerance to Drought Stress -- 17.4 Key Role of Physiology in DT Improvement -- 17.5 Conclusion and Future Prospects -- References -- 18: Customizing Crops for Salinity Tolerance: Toward Resilient Crop Production Systems -- 18.1 Introduction. 18.2 Plant Adaptation Responses to Salt Stress: Stress Management at Physiological and Molecular Levels -- 18.3 Introgressing Salt Tolerance in Crop Plants -- 18.4 Biotechnological Interventions: Genetic Manipulation for Salt Tolerance -- 18.5 Identifying Novel Genes Conferring Salt Tolerance -- 18.6 Conclusion and Prospects -- References -- 19: Haplotype-based Breeding for Stress Tolerance in Plants -- 19.1 Introduction -- 19.2 Haplotypes and Their Significance in Plant Breeding -- 19.3 The Journey from Traits to Haplotypes: A Comprehensive Roadmap for Stress Breeding -- 19.4 Challenges and Limitations -- 19.5 Conclusion and Prospects -- References -- 20: Designer Crops: Optimal Root System Architecture for Nutrient Acquisition -- 20.1 Introduction -- 20.2 Nitrogen -- 20.3 Phosphorus -- 20.4 Potassium -- 20.5 Conclusion and Prospects -- References -- 21: Genetic Gains in Crop Yield Through Genomic Selection Under Drought Stress -- 21.1 Introduction -- 21.2 Drought Stress and Plant Responses -- 21.3 Strategies to Overcome Drought Stress -- 21.4 The Fundamentals of Genetic Gain -- 21.5 GS and Its Role in Crop Improvement -- 21.6 Future Perspectives, Challenges, and Conclusion -- References -- Part V: Biotic Stress Tolerance -- 22: Designer Crops for Biotic Stress Tolerance: Technologies and Applications -- 22.1 Introduction -- 22.2 Influence of Biotic Stress on Crop Plants -- 22.3 Crop Designing Strategies -- 22.4 Developing Technologies for Biotic

Stress Management -- 22.5 Application and Commercialization -- 22.6 Conclusion and Prospects -- References -- 23: Designer Crops Developed Against Insect Pests -- 23.1 Introduction -- 23.2 Importance of Insect Resistance in Crops -- 23.3 Natural Mechanisms of Insect Resistance in Crops -- 23.4 Genetically Modified Insect-resistant Crops -- 23.5 Advantages of Genetically Engineered Insect-resistant Crops. 23.6 Genetic Engineering Techniques for Developing Insect-resistant Crops.

Sommario/riassunto

Discover strategies to develop crop plants with specific traits needed to meet the specific challenges. Climate change poses an existential threat to global food supplies, with even modest increases in global temperature potentially spelling disaster for crop productivity.
