



Current Trends in the Diagnosis and Management of Plant Diseases

**Pranab Dutta
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Preface

In recent decades, the agricultural landscape has transformed significantly due to rapid advancements in science and technology. In parallel, the growing challenges of climate change, emerging pathogens and pest resistance are posing significant threats to global food security. These challenges underscore the urgent need for effective, science-based approaches for diagnosing and managing plant diseases, which remain a critical barrier in achieving sustainable agricultural productivity. Against this backdrop, *Current Trends in the Diagnosis and Management of Plant Diseases* offers a comprehensive overview of modern strategies, tools and innovations in plant disease management, bringing together the latest research and insights from experts in the field.

This book delves into a range of topics essential for researchers, practitioners and students who are navigating the ever-evolving landscape of plant pathology. It opens with foundational aspects of plant disease diagnosis, presenting novel methods like molecular diagnostics, remote sensing and artificial intelligence (AI)-based detection systems. These innovative tools, such as the integration of AI in plant disease surveillance, allow for faster, more accurate disease identification, helping to curb outbreaks and reduce crop losses. Notably, advanced diagnostic approaches offer hope in improving early detection systems, especially in resource-limited areas where traditional diagnostics may not be feasible.

Equally important is the focus on sustainable disease management strategies, which are essential for minimizing dependency on chemical controls and reducing environmental impacts. This book explores various integrated management approaches, biocontrol agents and plant resistance breeding, highlighting eco-friendly techniques that align better plant management with sustainable agriculture goals. The role of biotechnology, particularly through genetic modifications and CRISPR-based gene editing, is also discussed, illustrating how genetic resistance can be built into crops, providing long-term resilience against key pathogens.

Throughout this book, readers will find practical guidance for the application of diagnostic and management tools, from laboratory techniques to field-based interventions. By bridging the gap between research and practice, *Current Trends in the Diagnosis and Management of Plant Diseases* aims to empower agricultural scientists, extension officers and most importantly scholars with knowledge to address plant diseases proactively and sustainably.

We hope this book serves as a valuable resource in advancing the diagnosis and plant health management, contributing to a resilient agricultural future where crop health is safeguarded, productivity is enhanced and the agricultural ecosystem thrives sustainably.

We would like to extend thankfulness to the Biotica Publication, Tripura for accepting the book plan and taking keen interest in bringing out the publication in time.

Editors

CONTENTS

Sl. No.	Chapter	Page
1.	Plant Disease Detection: Current Scenario, Emerging Challenges and Technology Advancement <i>B. Khamari</i>	1-14
2.	Use of RNAi in Plant Disease Management <i>Bandana Hijam, Oinam Washington Singh</i>	15-27
3.	Integrated Disease Management: Concepts and Applications <i>Tanjil Rahman, Madhusmita Mahanta, Dorodi Priyom Duarah, Anjumoni Devee</i>	28-40
4.	Exploring Genetic Resistance for Sustainable Management of Blast Disease in Rice <i>Hrishikesh Ojah, Shazmira Zaman, Nabajyoti Bhuyan</i>	41-55
5.	Mycotoxin Menace in Stored Agricultural Commodities <i>Shinee De, Ayan Pramanik</i>	56-68
6.	Advances in Fungal Disease Management: the Role of Succinate Dehydrogenase Inhibitors (SDHIs) <i>Gunadhya Kumar Upamanya, Pranamika Sharma</i>	69-77
7.	Host-Microbe Interplay to Exhibit Immune Response against the Phytopathogens <i>Alinaj Yasin, Pranab Dutta</i>	78-88
8.	Biological Control of Soil-Borne Pathogens <i>Tharringwon Marchang Ningshen, Pranab Dutta, Madhusmita Mahanta, Lydia Vanlaltani, Harshit Singh</i>	89-105
9.	Biointensive Management of Bacterial Blight of Rice <i>Pranamika Sharma, Gunadhya Kumar Upamanya</i>	106-117
10.	Exploiting Nanotechnology for Plant Pathogen Detection and Management <i>Sangeetha, C.G., N. Jhansirani, Rajeswari R., Manjunath Hubballi</i>	118-138
11.	Role of Plant Growth Promoting Rhizobacteria in Disease Management <i>Bandana Hijam, Oinam Washington Singh</i>	139-148
12.	Exploring the Role of Volatile Organic Compounds of <i>Trichoderma</i> in Plant Health Management <i>Madhusmita Mahanta, Pranab Dutta, Tanjil Rahman, Tharringwon Marchang Ningshen</i>	149-158
13.	Alien Invasive Weeds of North Eastern States of India: Ecology, Distribution and Management <i>Pranab Dutta, Samaritan Dutta, Madhusmita Mahanta, Munni Das, K.C. Puzari</i>	159-188

About the Book

It offers an in-depth exploration of modern plant pathology, showcasing the latest advancements and innovative strategies for disease control. The book covers molecular diagnostics, including cutting-edge tools for detecting killer pathogens and the use of DNA markers in disease management. It emphasizes eco-friendly management practices, biocontrol mechanisms of *Bacillus*, and the role of endophytes and microbial agents. The menace of mycotoxins in stored commodities and seed-borne pathogen detection are thoroughly discussed. Advanced topics include genomics, CRISPR gene editing, RNA interference and synthetic biology, highlighting their impact on plant immunity and resistance. The importance of phytobiomes, soil health and climate change adaptation in combating emerging diseases is examined. Readers will find insights into advanced detection techniques for fungi and bacteria, proteomics and nanotechnology applications. Integrated disease management, host plant resistance and tritrophic interactions are explored, alongside remote sensing and GIS for disease monitoring. The book also delves into biological control of post-harvest diseases, growth-promoting rhizobacteria and microbial volatile organic compounds. With its comprehensive coverage and focus on sustainable, eco-friendly practices, this book is an essential resource for researchers and students dedicated to advancing plant health and crop protection.



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