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volumes aimed at introducing to a wide audience the latest advances in methodology. The pitfalls and problems of new techniques are given due consideration, as are those small but vital details not always explicit in the methods sections of journal papers. In recent years, most

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biological laboratories have been invaded by computers and a wealth of new DNA technology and this will be reflected in many of the titles appearing in the series. The books will be of value to advances researches and graduate students seeking to learn and apply new

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techniques, and will be useful to teachers of advanced undergraduate courses involving practical or project work. This manual describes the broad array of techniques that are used in insect pathology. It will provide biologists, insect pathologists, entomologists, and

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those interested in biological control, with the necessary information to work on a variety of pathogen groups. This book will be an essential laboratory reference for insect pathologists. Features include: \* Step by-step instructions on how to isolate, identify, culture, bioassay

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and store the major groups of entomopathogens \* Details of the practical knowledge needed by beginners to apply the techniques \* Chapters written by an international group of experts \* Discussion of safety testing of entomopathogens in mammals and also broader methods

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such as microscopy and molecular techniques \* Provides extensive supplemental literature and recipes for media, fixatives and stains

The second edition of Plant Pathology: Techniques and Protocols covers diagnostic methods that are currently used in laboratories for a

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broad range of plant species and matrixes. These include serological and molecular methods that have one or more of the following characteristics: suitability for high-throughput testing, detection of a group of pathogens or of sometimes uncharacterized pathogens,



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detection and identification of specific pathogens, and high sensitivity. This volume discusses qualitative and quantitative tests, as well as recently developed diagnostic methods. It also provides background information on many pathogens, which are either endemic, non-

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endemic, or emerging and with different lifecycles that cause diseases of significant importance in a wide variety of hosts. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, background

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information on pathogens and the disease caused, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols and tips on troubleshooting and avoiding known pitfalls.

Informative and cutting-edge, Plant Pathology: Techniques and Protocols,

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Second Edition is the perfect book for plant pathologists and molecular biologists who will use this information to test out the latest research in their laboratories. The diagnoses of plant disease;the microscope;the autoclave;the preparation of media for fungal and

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bacterial growth ;detection of fungal pathogens in infected plant tissues;detection of bacterial pathogens in infected tissues;koch's postulates;inoculation techniques;the diagnosis of a nematode problem;viruses and plant virus diseases;mycoplasma as agent of

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plant disease.

Fungal plant pathogens can threaten food security, economic prosperity and the natural environment.

Changing factors such as pesticide usage, climate change and increasing trade globalization can bring new opportunities to plant

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pathogens, and new challenges to those attempting to control their spread. Covering the key techniques used when working with fungal plant pathogens, this practical manual deals with the recognition of disease symptoms, detection and identification of fungi and methods to

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characterize them, as well as curation, quarantine and quality assurance. It is unique in its practical focus, providing an overview of both traditional and emerging methods and their applications, and detailed protocols on techniques such as microscopy, antibody detection using



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ELISA methods and lateral flow devices, molecular methods using PCR and fingerprinting and preservation techniques including freeze drying. For postgraduate and advanced undergraduate students of mycology and plant pathology Fungal Plant Pathogens provides an

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invaluable guide to investigating fungal plant diseases and interpreting laboratory findings. It is also a useful tool for extension plant pathologists, consultants and advisers in agriculture, horticulture and the food supply chain

## Plant Disease Management

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Strategies for Sustainable  
Agriculture through Traditional and  
Modern Approaches  
Basic Plant Pathology Methods  
Diagnosing Hemp and Cannabis Crop  
Diseases  
Fungal Pathogens, Vol.1  
Manual on general laboratory

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handling techniques in plant  
pathology

**Plant diseases can have an enormous impact on our lives. In a world where total crop failure can quickly lead to human misery and starvation, accurate**

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**diagnostics play a key role in keeping plants free from pathogens. In Plant Pathology: Techniques and Protocols, expert researchers provide methods which are vital to the diagnosis of plant diseases**

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**across the globe, addressing all three categories of plant pathology techniques: traditional, serological, and nucleic acid. Chapters examine recent and developing issues with crop identity and**

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**authenticity, allowing workers to genotype samples from two major food groups. Composed in the highly successful Methods in Molecular Biology™ series format, each chapter contains a brief introduction, step-by-step**

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**methods, a list of necessary materials, and a Notes section which shares tips on troubleshooting and avoiding known pitfalls. Authoritative and reader-friendly, Plant Pathology: Techniques and Protocols is an**



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**incredible guide which will soon prove to be indispensable, both to novices and expert researchers alike.**

**This book provides detailed information on methodologies used in biological, serological**

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**and nucleic acid based assays for the detection, diagnosis and management of plant viruses. The content is divided into six main parts, the first of which presents techniques used in the biological characterization and**

**transmission of viruses, while Part II covers purification and techniques concerning the physico-chemical properties of viruses. In turn, Part III focuses on in vitro expression, production of polyclonal and**

**monoclonal antibodies; and on  
various serological assays  
including precipitin tests, ELISA,  
blot immunoassays,  
immunosorbent electron  
microscopy and lateral flow  
immunoassays. Part IV**

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**addresses the isolation of DNA and RNA from plants and nucleic acid based assays such as dot-blot, polymerase chain reaction, real-time PCR, loop-mediated isothermal amplification, rolling circle amplification,**

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**recombinase polymerase  
amplification, and next-  
generation sequencing  
approaches. Part V discusses  
cloning, sequencing, sequence  
analysis and the production of  
infectious clones, while the last**

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**part (Part VI) provides  
biotechnological approaches for  
the management of viruses.  
Given its scope, the book will be  
a valuable resource for every  
laboratory, student and teacher,  
and for everyone interested in**

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**plant virology, plant pathology,  
plant biology and molecular  
biology, offering them a practical  
manual on various aspects of  
plant viruses.**

**Morphological, biological,  
biochemical and physiological**



**characteristics have been used for the detection, identification and differentiation of fungal pathogens up to species level. Tests based on biological characteristics are less consistent. Immunoassays have**

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**been shown to be effective in  
detecting fungal pathogens  
present in plants and  
environmental samples.**

**Development of monoclonal  
antibody technology has greatly  
enhanced the sensitivity and**

**specificity of detection,  
identification and differentiation  
of fungal species and  
varieties/strains. Nucleic acid-  
based techniques involving  
hybridization with or  
amplification of unique DNA**

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**have provided results rapidly and reliably. Presentation of a large number of protocols is a unique feature of this volume. This work provides information on the detection, identification, and differentiation of all**

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**microbial plant pathogens -  
presenting modern protocols for  
rapid diagnosis of diseases  
based on biological, physical,  
chemical and molecular  
properties. It contains methods  
for the selection of disease-free**

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**seeds and vegetatively  
propagated planting materials  
and quarantine techniques for  
screening newly introduced  
plant materials.**

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Department of Plant Pathology**

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**at the University of Wisconsin-  
Madison  
Plant Pathologist's Pocketbook  
Strategy and Steps  
Laboratory Techniques in Plant  
Bacteriology  
Techniques and Protocols**

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Laboratory Techniques in Plant Bacteriology is ideal for scientists and students who seek a career in plant pathogenic bacteria. This book contains 41 chapters comprising practicable techniques from isolation of bacterial plant pathogens to their identification up



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to species and race/biotype level. It includes identification protocols of morphological, biochemical, immunological, and molecular-based techniques. This book comprises all technological aspects of plant bacteriological studies. Its content is ideal for graduate

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students and research scholars including bacteriological professionals or technicians. The book ultimately provides working technologies useful for controlling bacterial disease pathogens. This volume explores the latest methods used by researchers to

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study the detection, characterization, and various aspects of viroids. The chapters in this book are organized into seven parts and cover topics such as detection methods based on the biology of viroids; detection techniques based on

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electrophoresis and hybridization techniques; PCR-based techniques that provide high degrees of sensitivity; emerging area of nucleic acid sequence-based technology; and emerging techniques in viroid research such as RNA silencing, splicing, and

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viroid structure. Written in the highly successful Methods in Molecular Biology series format, chapters include introductions to their respective topics, lists of the necessary materials and reagents, step-by-step, readily reproducible laboratory protocols, and tips on

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troubleshooting and avoiding known pitfalls. Cutting-edge and comprehensive, *Viroids: Methods and Protocols* is a valuable resource for researchers and graduate students who are working with viroid diseases.

The papers contained in this book

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were presented at a NATO  
Advanced Research Workshop  
(ARW) held at Cape Sounion,  
Athens, Greece, 19-24 May, 1991.  
The twenty-eight more  
comprehensive papers represent  
the key subjects of the ARW  
covered by invited speakers. The

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thirty-four short papers presented in a research format are contributions of those invited to participate in the ARW. There was a total of 70 participants from 21 countries. The objectives of the ARW were as follows: to review current knowledge of biological



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control of plant diseases and plant parasitic nematodes, with emphasis on mechanisms at the molecular, cellular, organismal, and ecosystem level; to examine and expand on current concepts and synthesize new concepts; to identify and prioritize limitations in the use of

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biological control for plant diseases and nematodes and the scientific research needed to overcome these limitations; and to develop strategies for biological control through management of resident agents or introduction of natural or modified agents.

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Using molecular methods for plant disease diagnosis provides diagnosticians with a number of advantages over more traditional methods. They can allow the identification of morphologically similar species, for example, or the detection of infection prior to

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symptom formation. Not only can molecular tools help by increasing the efficacy, accuracy and speed of diagnosis; their common technological basis provides further benefits, especially where resources are limited and traditional skills are hard to sustain. This book

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provides protocols for nucleic acid-based methods currently applied to plant pathogen detection and identification. It takes the practitioner through the full range of molecular diagnostic and detection methods and, as these generic techniques are appropriate

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for use on any target with minimal modification, also provides a useful resource for students of plant pathology and plant pathologists. Beginning with the background and future directions of the science, it then addresses DNA barcoding, microarrays, polymerase chain

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reactions (PCR), quality assurance and more, forming a complete reference on the subject.

Citrus Tristeza Virus

Diagnosis of Plant Virus Diseases

Plant Pathology

Introduction to Plant Pathology

Fusarium wilt

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The second edition of this volume focuses on applied bioinformatics with specific applications to crops and model plants. Plant Bioinformatics: Methods



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and Protocols is aimed  
at plant biologists who  
have an interest in, or  
requirement for,  
accessing and  
manipulating huge  
amounts of data being

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generated by high  
throughput technologies.  
This book would also be  
of interest to  
bioinformaticians and  
computer scientists who  
would benefit from an

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introduction to the  
different tools and  
systems available for  
plant research. Written  
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and tips on

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avoiding known pitfalls.

Authoritative and  
thorough, Plant

Bioinformatics: Methods  
and Protocols helps

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researchers with the increasing volume and diversity of data from different plants and also the integration of multiple diverse forms of data.

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POSTHARVEST PATHOGENS  
AND DISEASE MANAGEMENT  
Postharvest diseases  
caused by microbial  
pathogens account  
formillions of dollars  
in losses of both

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perishable produce products every year. Moreover, with consumers increasingly demanding minimally processed vegetables and



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fruits--which can  
beinvaded by human  
pathogens--there is an  
imperative need  
forsuitable protective  
measures to provide  
pathogen-free

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commodities that are free from, or contain only acceptable levels of, chemical residues. Providing details of both conventional and modern

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moleculartechniques  
applicable for the  
detection,  
identification,  
anddifferentiation of  
field and storage  
microbial

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pathogens, Postharvest  
Pathogens and Disease  
Management: \* Discusses  
diseases of both  
durables and perishables  
during transit and  
storage \* Provides a

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basic understanding of  
the effects of handling  
and storage practices as  
well as field conditions  
and  
product susceptibility on  
the development of

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postharvest diseases \*

Reveals, as a cautionary  
note, the potential  
hazards of mycotoxins  
with carcinogenic  
properties that can  
contaminate fruits and

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vegetables \* Contains  
detailed information  
derived from elucidative  
evidence and disease data  
in order to explain the  
infection process  
and subsequent stages of

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disease development \*  
Helps readers to avoid  
conditions that favor  
disease incidence and  
spread \* Includes real  
life examples of disease  
management strategies



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to help readers develop  
effective disease  
management systems  
suitable for different  
ecosystems \* Emphasizes  
the importance of  
integrating several

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different effective  
methods in tandem,  
including the  
development of  
cultivars with resistance  
to postharvest diseases;  
the selection of

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suitable analytical  
methods; and the  
effective use of  
biocontrol agents  
and chemicals \* Presents  
protocols for numerous  
techniques and basic

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methods, making the book  
a distinctive and highly  
useful teaching  
and research tool  
Postharvest Pathogens  
and Disease Management  
offers readers

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insight into the  
principles and methods  
of avoiding and  
managing postharvest  
diseases of fruit and  
vegetable products in  
an efficient, economical,

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and environmentally  
feasible manner, allowing  
producers to sell safer,  
higher-quality produce  
to the public and prevent  
the losses associated  
with postharvest

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disease.

Laboratory Protocols in  
Fungal Biology presents  
the latest techniques in  
fungal biology. This  
book analyzes  
information derived

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through real experiments, and focuses on cutting edge techniques in the field. The book comprises 57 chapters contributed from internationally



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recognised scientists  
and researchers. Experts  
in the field have  
provided up-to-date  
protocols covering a  
range of frequently used  
methods in fungal

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biology. Almost all important methods available in the area of fungal biology viz. taxonomic keys in fungi; histopathological and microscopy techniques;

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proteomics methods;  
genomics methods;  
industrial applications  
and related techniques;  
and bioinformatics tools  
in fungi are covered and  
compiled in one book.

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step-by-step, readily  
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protocols, and notes on troubleshooting. Each chapter is self-contained and written in a style that enables the reader to progress from elementary concepts to

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advanced research

techniques. Laboratory  
Protocols in Fungal  
Biology is a valuable  
tool for both beginner  
research workers and  
experienced

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Soon in the Fungal  
Biology series: Goyal,  
Manoharachary / Future  
Challenges in Crop  
Protection Against  
Fungal Pathogens Martín,

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García-Estrada,  
Zeilinger / Biosynthesis  
and Molecular Genetics  
of Fungal Secondary  
Metabolites Zeilinger,  
Martín, García-Estrada /  
Biosynthesis and



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Molecular Genetics of  
Fungal Secondary  
Metabolites, Volume 2  
van den Berg,  
Maruthachalam / Genetic  
Transformation Systems  
in Fungi Schmoll,

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Dattenbock / Gene

Expression Systems in

Fungi Dahms / Advanced

Microscopy in Mycology

Wheat Blast provides

systematic and practical

information on wheat

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blast pathology,  
summarises research  
progress and discusses  
future perspectives  
based on current  
understanding of the  
existing issues. The

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book explores advance technologies that may help in deciding the path for future research and development for better strategies and techniques to manage the

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wheat blast disease. It equips readers with basic and applied understanding on the identification of disease, its distribution and chances

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of further spread in new areas, its potential to cause yield losses to wheat, the conditions that favour disease development, disease prediction modelling,

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resistance breeding  
methods and management  
strategies against wheat  
blast. Features:

Provides comprehensive  
information on wheat  
blast pathogen and its

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management under a  
single umbrella Covers  
disease identification  
and diagnostics which  
will be helpful to check  
introduction in new  
areas Discusses methods



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and protocol to study  
the different aspects of  
the disease such as  
diagnostics,  
variability, resistance  
screening, epiphytotic  
creation etc. Gives deep

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insight on the past,  
present and future  
outlook of wheat blast  
research progress This  
book's chapters are  
contributed by experts  
and pioneers in their

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respective fields and it provides comprehensive insight with updated findings on wheat blast research. It serves as a valuable reference for researchers, policy

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makers, students,  
teachers, farmers, seed  
growers, traders, and  
other stakeholders  
dealing with wheat.

Forest Pathology and  
Plant Health

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Laboratory Techniques

Molecular Methods in

Plant Disease

Diagnostics

Plant Fungal Pathogens

Manual of Techniques in

Insect Pathology

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Plant resistance to pathogens is one of the most important strategies of disease control. Knowledge of resistance mechanisms, and of how to exploit them, has made a significant contribution to agricultural

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productivity. However, the continuous evolution of new variants of pathogen, and additional control problems posed by new crops and agricultural methods, creates a need for a corresponding increase in our understanding of

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resistance and ability to utilize it.

The study of resistance mechanisms also has attractions from a purely academic point of view. First there is the breadth of the problem, which can be approached at the genetical,



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molecular, cellular, whole plant or population levels. Often there is the possibility of productive exchange of ideas between different disciplines. Then there is the fact that despite recent advances, many of the mechanisms involved have

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still to be fully elucidated. Finally, and compared with workers in other areas of biology, the student of resistance is twice blessed in having as his subject the interaction of two or more organisms, with the intriguing problems of recognition,

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specificity and co-evolution which this raises.

Hemp and cannabis, both belonging to *Cannabis sativa*, have emerged as some of the most valuable crops because of their multiple functionalities - industrial,

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medicinal, and recreational uses. Like all other crops, they are at risk of diseases and pests. In certain cases, an entire hemp field can fail due to unexpected disease. As a new and highly regulated crop, research on Cannabis crop

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diseases is scarce, and the science of plant diagnostics is not well covered in the literature. Taking hemp/cannabis as a model crop, the book illustrates how to diagnose a disease problem and how to manage it effectively. It presents

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real disease cases encountered during crop production, and explains methods of diagnosis, both in the field and in the lab, in order to find out the cause(s).

Over the course of evolution, fungi have adapted to occupy specific

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niches, from symbiotically inhabiting the flora of the intestinal tract of mammals to saprophytic growth on leaf litter resting on the forest floor. In Plant Fungal Pathogens: Methods and Protocols, expert researchers in the field detail

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many of the methods which are now commonly used to study fungal plant pathogens. These include methods and techniques for model systems such as *Arabidopsis thaliana* as well as crop plants, aspects of fungal biology, genome



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annotation, next-generation sequencing, and fungal transformation and molecular tools for disease and/or pathogen quantification that are critical for revealing the role for a fungal gene of interest in disease development.

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protocols, and key tips on troubleshooting and avoiding known pitfalls. Authoritative and practical, *Plant Fungal Pathogens: Methods and Protocols* seeks to aid scientists in the further study in current techniques that cover a

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wide-range of methods to study molecular aspects of pathogenesis. Provides an explanation of how plant diseases are diagnosed, the 'plant disease triangle', how to determine the cause of a specific disease, what 'biotrophs' and

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necrotrophs are, disease cycles and how they can be utilized. Specific chapters address plant diseases caused by fungi, bacteria, nematodes, viruses, parasitic flowering plants, abiotic factors of the environment including light,

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temperature, and atmospheric  
gases, pathogens, how people  
influence plant disease epidemics,  
the prevention or management of  
plant disease epidemics, and more.  
Mechanisms of Resistance to Plant  
Diseases

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Viroids

Wheat Blast

Food Security and Plant Disease  
Management

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Identification schemes; Gram-negative bacteria; Gram-positive bacteria; Cell wall-free prokaryotes.

Fusarium species are ubiquitous environmental fungi and can cause severe



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invasive infections in plants.

They are crop pathogens, and consumption of such infected crops can cause diseases in humans and animals.

Furthermore, they act as spoilage organisms in stored

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products, such as wheat, sorghum, rice, and corn (maize). *Fusarium* species are mycotoxin producers and contaminate food and grains. Therefore, their eradication and management have

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economic importance as they can cause enormous economic and agricultural production losses. Despite the fact that the genus *Fusarium* Link (1809) has been known for over 200 years, new scientific

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information is being revealed by rapid advancements and breakthrough findings of interdisciplinary studies. This book presents an introductory overview of an update to the scientific knowledge about

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Fusarium. It discusses various aspects of Fusarium, such as its genetic diversity, root rot incidence and severity, genetic resistance, molecular markers, mycotoxins, diseases caused by Fusarium, and their

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(especially forms of  
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antibodies, serological  
specific electron  
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different conditions that

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are essential for those who are interested in working in the field of plant pathology in a laboratory. The analysis in this book focuses on various circumstances like general requirements, laboratory

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equipments, sterilization techniques, the isolation of bacteria etc. When designing a laboratory there are many aspects to consider. It is important that work should be carried out in a logical order and, that particular

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parts of the diagnostic protocol are separated from one another. General plant protection laboratory may have the following different rooms and chamber as appropriate. The preparation room is used for preparing

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media, including sterilizing items in the autoclave, sterilizing petri dishes in an oven, washing glassware and storing glassware, chemicals and other basic items. This room should have an exhaust fan to remove hot

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air produced by the autoclave and the oven. The clean room is used for isolating fungi and bacteria from cleaned subsamples of diseased plant tissue into pure cultures. It is also used for growing cultures

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under clean conditions. The microscopes are located in this room for examining cultures and fungal structures. This room should be air-conditioned, if possible, to protect equipment and cultures. It



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should also be kept free from dust and insects. If, do not have an airtight clean room or humidity will be too high and fungus (mould) will develop on walls and equipment. A dehumidifier is useful in

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this room. No soil is allowed in the clean room as soil is a source of fungus-eating mites that can contaminate cultures.

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Closterovirus, family  
Closteroviridae. Thanks to  
the highly sensitive and  
specific diagnostic  
procedures developed,  
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