


REVIEW

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Rice virus disease in Indonesia: epidemiology and varietal resistance

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Abstract

The geographical location of Indonesia in the tropical region, characterized by high temperatures and humidity, is favorable for the development of viral diseases in rice. Climate change and intensive rice production systems further exacerbate the detrimental effects of viral diseases on rice sustainability. Three major rice virus diseases in Indonesia—rice tungro disease (RTD), rice rugged stunt virus (RRSV), and rice grassy stunt virus (RGSV)—have affected more than 170,000 ha of rice from 2010 to 2022. Key factors contributing to viral disease epidemics in the country include the extensive planting of high-yielding varieties twice a year, intensive use of fertilizers, asynchronized planting, and erratic climatic conditions. Cultivating rice varieties that are resistant to both viruses and their vector insects is the most effective and efficient strategy for the integrated pest management of rice viral diseases. The development of RTD-resistant rice varieties has been relatively successful in Indonesia, as demonstrated by the release and adoption of 18 resistant varieties. However, the development of RRSV and RGSV-resistant varieties remains challenging due to a lack of genetic resources for improving rice resistance. Progress has been achieved only by developing varieties resistant to brown planthoppers as vectors of these virus diseases. To address these challenges, the potential use of genetic technology to develop rice that is resistant to viral diseases is discussed.

Keywords Rice tungro disease, Dwarf viruses, Green leafhopper, Brown planthopper

Background

Indonesia is an archipelago country located right of the equatorial line, where most of the region receives rainfall due to the influence of the Asian Monsoon and the Pacific Ocean (Loo et al. 2015). Paddy fields with natural

volcanic soils and monsoon climatic influences suit rice growth. The rice area planted yearly is more than 10 million hectares of paddy fields consisting of different agro-ecosystems, including irrigated, rainfed, tidal swamp, and flood-prone areas (Rumanti et al. 2016; FAO 2024). Indonesia is currently the fourth largest rice-producing country in the world after China, India, and Bangladesh (FAO 2024). However, domestic rice demand continues to increase with population growth and relatively high per capita consumption. In 2022, rice per capita consumption was approximately 81 kg of milled rice per year (BPS–Statistics Indonesia 2023).

Under irrigated conditions, there are usually two rice planting seasons in Indonesia, which enable rice to grow throughout the year. The first season, or the wet season crop, is from October to December and is harvested from

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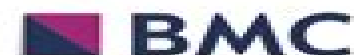
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Epidemiology Maangement Rice T

Dennis L. Stevens, Edward L. Kaplan



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Allele Mining for Genomic Designing of Cereal Crops Chittaranjan Kole, Sharat Kumar Pradhan, Vijay K.

Tiwari, 2024-05-30 This book deliberates on the concept strategies tools and techniques of allele mining in cereal crops and its application potential in genome elucidation and improvement including studying allele evolution discovery of superior alleles discerning new haplotypes assessment of intra and interspecific similarity and studies of gene expression and gene prediction Available gene pools in global germplasm collections specifically consisting of wild allied species and local landraces for almost all major crops have facilitated allele mining Development of advanced genomic techniques including PCR based allele priming and Eco TILLING based allele mining are being widely used now for mining superior alleles Allele s discovery has become more relevant now for employing molecular breeding to develop designed crop varieties matching consumer needs and with genome plasticity to adapt the climate change scenarios All these concepts and strategies along with precise success stories are presented in the chapters dedicated to the major cereal crops The first book on the novel strategy of allele mining in cereal crops for precise breeding Presents genomic strategies for mining superior alleles underlying agronomic traits from genomic resources Depicts case studies of PCR based allele priming and Eco Tilling based allele mining Elaborates on gene discovery and gene prediction in major cereal crops This book will be useful to the students and faculties in various plant science disciplines including genetics genomics molecular breeding agronomy and bioinformatics the scientists in seed industries and the policymakers and funding agencies interested in crop improvement

Vector-borne Disease Control in Humans Through Rice Agroecosystem Management, 1988 Overview Impact of engineering agronomy and water management practices on disease vectors Strategies for vector borne disease control Integrated vector control strategies Rhizoctonia Species: Taxonomy, Molecular Biology, Ecology, Pathology and Disease Control Buruch Sneh, 1996-09-30 A comprehensive reference on the soil borne fungi of the anamorph genus Rhizoctonia species of which are responsible for diseases of many important crops The topics include the dolipore parenthesome septum in modern taxonomy the molecular analysis of the fungi s ribosomal RNA genes mechanisms of significance for translocation and transfer the initial steps of the infection process patch dynamics and bare patch diseases of forage and oil seed legumes controlling disease by soil solarization and bacterial and fungal cell wall hydrolytic enzymes in relation to biological control For professionals and students of plant pathology and crop protection Annotation copyrighted by Book News Inc Portland OR

Compendium of Phytopathogenic Microbes in Agro-Ecology Natarajan Amaresan, Krishna Kumar, 2025-05-24 This book offers an in depth exploration of phytopathogenic viruses and viroids within the context of agroecology Each chapter meticulously details the introduction taxonomy and diseases caused by these pathogens alongside their pathogenic mechanisms economic significance and strategies for identification and control By providing comprehensive insights into these topics the book empowers researchers to manipulate these pathogens to suit their needs The chapters investigate key

concepts such as pathogen taxonomy disease cycles and control measures addressing critical questions about their economic impact on crop yield Expert contributors present a thorough analysis of 104 plant pathogens organized into distinct microbial groups This volume is an essential resource for understanding the complex interactions between pathogens and their host plants offering practical solutions for disease management This book is an invaluable resource for postgraduate students research scholars post doctoral fellows and educators across disciplines such as Plant Microbiology Plant Pathology Entomology Virology and Nematology As the second volume in a comprehensive three part series it provides crucial insights into the economic importance of bacteria fungi viruses viroids and nematodes This compendium is a must have for anyone seeking to deepen their understanding of plant pathogens and their impact on agriculture **Integrated Pest And Disease Management** K. G. Mukerji Rajeev H. Upadhyay, O B. P. Chamola, P. Dueby, 2009 The present book consists of 30 reviews on important pest and diseases of cash cereals oilseed vegetables fodders fruits and pulses etc Most of these articles have been prepared by authorities in their receptive areas There is worldwide swing to the use of ecologically safe environment friendly methods of protecting crops from pests and pathogens *Rice Pest Science and Management* P. S. Teng, Kong Luen Heong, K. Moody, 1994 Revised and updated selected papers from the 1992 International Rice Research Conference

Infection Control in the ICU Environment Robert A. Weinstein, Marc Bonten, 2012-12-06 Infection Control in the ICU Environment provides the details of the most common infection control problems facing intensive care units Authors include noted scientists intensivists and epidemiologists from the United States and Europe as well as infection control experts from the Centers for Disease Control and Prevention *Acinetobacter methicillin resistant staphylococcus aureus and vancomycin resistant enterococci* are examined in detail This volume also includes cutting edge information regarding the potential for prophylactic and pre emptive therapy of fungal infections in intensive care units Innovations in vascular catheter care and prevention of bloodstream infections are discussed in this volume as well as the newest information in mathematical modeling to understand the epidemiology and control of infections in intensive care units **Current Topics in Vector Research**, 2012-12-06 Vector transmission of pathogens affecting human animal and plant health continues to plague mankind both in industrialized and Third World countries The diseases caused by these pathogens cost billions of dollars annually in medical expenses and lost productivity Some cause widespread of food and fiber producing plants and animals whereas others destruction present direct and immediate threats to human life and further development in Third World countries During the past 15 years or so we have witnessed an explosive increase in interest in how vectors acquire carry and subsequently inoculate disease agents to human animal and plant hosts This interest transcends the boundaries of anyone discipline and involves researchers from such varied fields as human and veterinary medicine entomology plant pathology virology physiology microbiology parasitology biochemistry molecular biology genetic engineering ultrastructure biophysics bio systematics biogeography ecology behavioral sciences and others Accompanying and perhaps generating this

renewed interest is the realization that fundamental knowledge of pathogen vector host interrelationships is a first and necessary step in our quest for efficient safe methods of disease control

Viral Diseases of Field and Horticultural Crops L. P. Awasthi, 2023-09-20 *Viral Diseases of Field and Horticultural Crops* details the fundamental and applied aspects of the viral diseases of field and horticultural crops The book opens with a historical introduction to plant virology important plant virologists and landmarks It continues with systematic coverage of viral diseases their economic significance disease symptoms host range mode of transmission diagnostic techniques geographic distribution epidemiology yield losses and control and management of the disease Contributions from an international group of virologists with a wide range of academic research professional and specialized backgrounds in plant virology makes *Viral Diseases of Field and Horticultural Crops* a comprehensive and must have resource for those engaged in the study and research of plant virology microbiology and plant pathology particularly viral diseases and their impact on field and horticultural crops Provides virus characterization according to the disease pattern and symptoms they cause Covers viral diseases of cereals oil seeds legumes commercial crops spices and condiments medicinal and aromatic crops forage crops vegetable crops fruit crops tree nuts among others Discusses advances like applications in nanotechnology molecular techniques for the detection and characterization of plant viruses and the development of technologies for detecting plant viruses

Plant Viruses C.L. Mandahar, 2018-01-18 Plant viruses are of considerable interest to the science of biology and their study has contributed significantly to the elucidation of several mysteries of traditional and molecular biology

Bibliografia Sobre Sanidad Vegetal , **Advances in postharvest management of cereals and grains** Prof. Dirk E. Maier, 2020-08-25 Reviews latest research on causes of cereal postharvest losses Comprehensive review of the strengths and weakness of different technologies to control postharvest insect pests of cereals Covers latest research on the detection and control of fungal contaminants

Virus and Virus-like Diseases of Major Crops in Developing Countries Gad Loebenstein, George Thottappilly, 2013-12-18 It appears that a comprehensive and up to date book on the impact of virus diseases on the major crops in developing countries is now much needed especially as there have been rapid advances in the biological and molecular characterization and detection of the pathogens and possible approaches for their control On the other hand the economic losses caused by many of these diseases are tremendous and much of the accumulated knowledge to diminish the crop losses has not filtered through or cannot be applied This book is focused on the important crops Each chapter on a specific crop will include inter alia geographical distribution the viruses symptoms damage detection a brief description of the viruses concerned and present and future ways for their control Experts from India Nigeria UK USA France Germany Peru Japan Australia Netherlands Venezuela Kazakhstan and Israel many of them from the International Research Institutions have contributed chapters to this book

Flavivirus Encephalitis Daniel Ruzek, 2011-10-03 Encephalitis is an inflammation of the brain tissue associated with clinical evidence of brain dysfunction The disease is of high public health

importance worldwide due to its high morbidity and mortality Flaviviruses such as tick borne encephalitis virus Japanese encephalitis virus Murray Valley encephalitis virus or St Louis encephalitis virus represent important causative agents of encephalitis in humans in various parts of the world The book Flavivirus Encephalitis provides the most recent information about selected aspects associated with encephalitic flaviviruses The book contains chapters that cover a wide spectrum of subjects including flavivirus biology virus host interactions role of vectors in disease epidemiology neurological dengue and West Nile encephalitis Special attention is paid to tick borne encephalitis and Japanese encephalitis viruses The book uniquely combines up to date reviews with cutting edge original research data and provides a condensed source of information for clinicians virologists pathologists immunologists as well as for students of medicine or life sciences

Infection Control Christopher Sudhakar,2012-02-22 Health care associated infection is coupled with significant morbidity and mortality Prevention and control of infection is indispensable part of health care delivery system Knowledge of Preventing HAI can help health care providers to make informed and therapeutic decisions thereby prevent or reduce these infections Infection control is continuously evolving science that is constantly being updated and enhanced The book will be very useful for all health care professionals to combat with health care associated infections

Streptococcal Infections Dennis L. Stevens,Edward L. Kaplan,2000 Streptococcal Infections Clinical Aspects Microbiology and Molecular Pathogenesis offers an in depth examination of the spectrum of hemolytic streptococcal infections and their complications Additionally the volume incorporates and discusses aspects of pneumococcal enterococcal and oral streptococcal disease The recent resurgence of rheumatic fever concomitant outbreaks of severe systemic group A streptococcal infections often accompanied by toxic shock an increasing incidence of multiple antibiotic resistance among streptococcal species and an intensified effort to develop effective streptococcal vaccines have brought renewed attention to the continuing role of streptococci for causing significant medical and public health problems in both industrialized and developing countries Addressing clinical and epidemiological aspects and microbiological and other approaches of the research scientist this volume is the first to comprehensively address these clinically important organisms in many years The contributors are internationally recognized for their expertise making this book invaluable for infectious disease physicians internists pediatricians and family physicians microbiologists epidemiologists and basic scientists with an interest in streptococcal infections and their complications

Viruses and Virus Diseases of Poaceae (Gramineae) Hervé Lapierre,Pierre-A. Signoret,2004 Many well known specialists have contributed to this book which presents for the first time an in depth look at the viruses their satellites and the retrotransposons infecting or occurring in one plant family the Poaceae Gramineae After molecular and biological descriptions of the viruses to species level virus diseases are presented by crop barley maize rice rye sorghum sugarcane triticales wheats forage ornamental and lawn A detailed index of the viruses and taxonomic lists will help readers in the search for information

Chickpea Breeding and Management Shyam S. Yadav,W. Chen,2007 The

chickpea is an ancient crop that is still important in both developed and developing nations This authoritative account by international experts covers all aspects of chickpea breeding and management and the integrated pest management and biotechnology applications that are important to its improvement With topics covered including origin and taxonomy ecology distribution and genetics this book combines the many and varied research issues impacting on production and utilization of the chickpea crop on its journey from paddock to plate

Impact of irrigation on poverty and environment in Ethiopia: draft proceedings of the symposium and exhibition, Addis Ababa, Ethiopia, 27-29 November 2007

Makonnen Loulseged, Aster Deneke, 2011-07-21

Fungal diversity, ecology and control management Vijay Rani Rajpal, Ishwar Singh, Shrishail S. Navi, 2022-06-02 This edited volume provides comprehensive and latest information on the fungal biodiversity in its morphological characters bioactive molecules pathogenicity and virulence and its impacts on crop production and sustainable management of agricultural productivity towards resolving global food security issues The increasing number of infectious fungal diseases are regarded as threats to agricultural productivity and global food security The efforts done by scientists to inventory the fungal diversity and identification of fungal species contributing as pathogens towards many plant and human diseases have been compiled in the present volume The identification of the potential fungal pathogens is a prerequisite for an effective disease control management program Also important is to understand the complex interactions between the host pathogen and the environment The book dwells on insights on the aforementioned aspects The book also includes articles on ecological significance of fungi and fungal antagonists used as biocontrol agents on other pathogens This compilation is useful to scientists working in similar areas as well as to undergraduate and graduate students keen on getting updated information on the subject Scientists involved in agricultural research crop management and industries that manufacture agrochemicals may also find it useful read

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