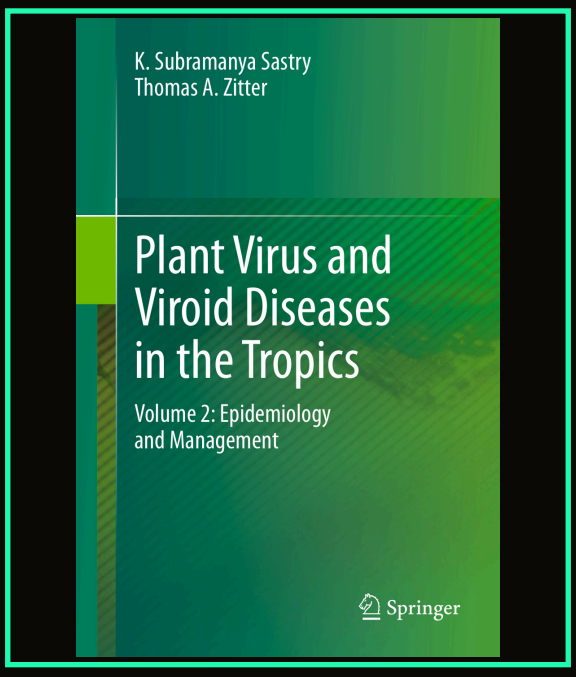
the Tropics Volume 2 Epidemiology and Management (K. Subramanya



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Plant Virus and Viroid Diseases in the Tropics

Volume 2: Epidemiology and Management

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Foreword



This textbook entitled "Plant Virus and Viroid Diseases in the Tropics-Volume 2: Epidemiology and Management" is an ideal introduction to the subject written for students, practitioners and researchers by Drs. K. Subramanya Sastry and T. A. Zitter. The authors focused on physical and biological factors that favor epiphytotics, including weeds that can constitute virus reservoirs as well as breeding foci for vectors. Virus properties, survival and spread by invertebrate vectors, nematodes and fungi, are followed by the description of spatial dynamics, disease gradients, forecasting, and mathematical modeling techniques. Seven important tropical diseases their ecology and epidemiological aspects are described in detail.

In the Chap. 1, the well organized overview of virus survival and spread, disease forecasting, disease gradients and progress curves, systems analysis and simulation models are covered.

The Chap. 2, the authors have presented the outlines of the management of tropical plant virus and viroid diseases, the selection of virus-free seed and propagules, techniques of production of virus-free plant materials by biotechnological strategies, barrier cropping, time of planting, eliminating of weeds, use of insecticides and use of transgenic plants-the most effective control measure.

The important role of plant quarantine is stressed. Certification schemes for seed-borne viruses in lettuce, barley, pea, beans, soybean, cowpea and peanuts, as well as production of virus-free plants and certification schemes through tissue culture techniques are discussed for cassava, citrus, potato, sugarcane and other plants. Cultural practices and phytosanitation in virus and viroid diseases, as well as cross-protection in fourteen virus diseases are described in detail.

Control of vectors by oil and insecticides are discussed in great detail, as is also the use of aluminum mulches for vector control. Sources of resistance and transgenic approaches to viral and viroid diseases, benefits and risks, are

enumerated. Technical guidelines for exchange of germplasm and breeding lines, with detailed descriptions of methods of plant importation are described.

This authoritative review will provide a unique education platform to the readers, so that they can keep in touch with the latest developments in the field of tropical plant virus diseases. Drs. K. Subramanya Sastry and T. A. Zitter have substantial practice in tropical plant viruses and this invaluable book is meticulously researched. It will appeal to all those with an interest in tropical plant virus diseases and their control.

New Brunswick, USA Karl Maramorosch

Preface

Many of the world's most important food crops are grown in the tropics and major crops like rice, maize, wheat, sorghum, barley, tomato, chillies, okra, peas, peanut, sunflower, cucurbits, pigeonpea, etc., are raised through true seed, whereas cassava, potato, sweet potato, sugarcane, cocoa, avocado, apples, banana, and other fruit crops are grown through vegetative propagated materials like tubers, sets, rhizomes, cuttings, budwood, etc. Almost all these crops are affected by important virus and viroid diseases besides fungal and bacterial diseases. However, emergence of new viruses and virus strains of existing viruses, along with changing contexts due to agricultural intensification and climate change have been creating new challenges and demanding an even greater effort to overcome hurdles to increase agricultural productivity, food availability, and economic development. These diseases are responsible for heavy yield losses. We have definite chemical measures against fungal and bacterial diseases, whereas until now no promising viricides have been developed to control virus spread.

Disease-free crops and plants are of great economic and social importance in feeding the world population. The thrust of the book Volume-2 is on virus and viroid disease in the tropics in order to provide the latest information on ecology, epidemiology, and management of virus and viroid diseases in southeastern Asian countries, the African, and South American continents, which fall within the tropical zone. Plant viruses are a matter of great concern globally, but effective management measures against plant viruses requires a clear understanding of their ecology and epidemiology.

Environmental factors like rainfall, wind velocity, soil conditions, temperature, and moisture play a major role in crop production. Among the major virus diseases that are encountered in tropical zones are tungro, yellow mottle and hoja blanca in rice, mosaic in sugarcane, mosaic in cassava, tristeza in citrus, swollen shoot in cacao, sterility mosaic in pigeonpea, rosette and bud necrosis in peanut, necrosis in sunflower and legumes (vegetables and ornamental crops), leaf curl in cotton and tomato, and ringspot in papaya. Key factors for emergence of new plant virus and virus-like diseases include the intensification of agricultural trade (globalization), changes in cropping systems (crop diversification), and climate change.

In this second volume, the list of plant virus genus and species according to 9th ICTV classification and the latest techniques of plant virus diagnosis are included. In the Chap. 1 along with information on various aspects of ecology and epidemiology

of plant viruses of tropics, we examine the physical and biological factors which are favorable for epiphytotics to develop. Various aspects related to survival and spread of virus and viroids are also presented as well. For an easier understanding of epidemiology, aspects of disease progress curves, mathematical modeling techniques, and systems analysis and simulation models are discussed.

In the Chap. 2, comprehensive information on plant virus management are included. The ultimate goal of plant pathologists is to effectively manage the virus and viroid diseases of tropical crops. This topic is quite extensively covered on various relevant aspects including integrated disease management practices. In this chapter, various aspects of disease management like the production of virus-free planting materials through certification schemes for crops like cassava, sweet potato, potato, citrus, banana, grapes, strawberry, pome, stone fruits, ornamental bulbous crops that helps in production of virus-free planting materials are discussed. Similarly, new steps on true seed certification schemes for certain legumes are provided. Cultural practices including rouging, border cropping, plant density, elimination of the virus sources, etc., are discussed. Vector control through the application of insecticides and oils or both are found to be effective in certain virus–host combinations are presented. Available success stories of different horticultural crops with cross-protection techniques are included. Development of pathogen-resistant transgenics for the management of virus and viroid diseases are also added. In the present world globalization, plant quarantines play a major role in almost all countries to exclude the entry of new diseases while importing the germplasm from other countries for research and agricultural purposes.

Information on the key factors of virus epidemiology in certain tropical countries is an important step towards the development of management measures against virus and viroid diseases. Identification of risk factors that contribute to virus outbreaks need to be intensified and integrated disease management (IDM) strategy in reducing the impact of these virus diseases needs to be continued throughout the tropical countries. Nevertheless, integrated control measures have evident benefits and should be fostered and promoted as a means of enhancing crop productivity to meet the increasing demands of burgeoning human population. Originally, the authors have planned to confine to the aspects of virus epidemiology and management of tropical zone only. But to provide more information and clarity of the subject, it was inevitable for us to include the research results of temperate crops also, since some of the crops are grown in both zones.

It is hoped that the information provided in this volume on various aspects of virus and viroid diseases of tropical crops would be useful to research scientists, seed companies, quarantine personnel and institutions of both research and teaching.

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