

## Book review

### PLANT PATHOLOGY AND PLANT DISEASES

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*CABI, Wallingford, Oxfordshire, UK, 2020, 438 pp., ISBN 9781789243178 (paperback)  
Price 50.00 GBP*

Plants just like man and animals, are affected by a huge number of pathogens causing many various diseases, while at the same time, plants play a crucial role in human life as a food. "Since pathogens must eat too, they compete with man for food supply and they sit down first at the table" – these words by Horsfall and Diamond (1959) were used in the introduction by authors of this book to underline its contribution to the "International Year of Plant Health 2020", declared by the United Nations (UN). During last few decades plant pathology has been a rapidly developing area of biological and plant sciences with strong overlap and relationships to various subjects of agricultural sciences, as well as plant breeding and practical agriculture, horticulture and forestry.

The book "Plant Pathology and Plant Diseases" represents a synoptical and illustrative overview of general plant pathology, as well as an introduction to some basic aspects of plant disease management. The whole book is divided into 23 chapters grouped into five parts that together provide a very strong coverage of the topic.

Part I is comprised of 3 chapters that provide an introduction to general plant pathology. They briefly and comprehensively outline what is plant disease, the history of plant pathology, and disease cycle and lifestyle. These chapters provide a very solid background for further reading.

Part II deals with plant pathogens and is logically structured into six chapters. The first five of these covering all the most important groups of plant pathogens (fungi, fungal-like pathogens, bacteria, viruses and nematodes) with each chapter providing basic information related to recent taxonomy, biology, symptoms, infection cycle and epidemiology. The final chapter of this part is aimed at the diagnosis of plant pathogens and plant diseases.

Part III covers the whole complexity of plant-pathogen interactions from genes to populations. Its five chapters logically described mechanisms of pathogenicity, plant defence mechanisms, race specificity and plant immunity, population genetics in plant pathogen interactions, and the epidemiology of disease in plant populations.

Part IV comprehensively covers practical aspects related to disease management. In eight chapters it clearly presents topics related to cultural practices for disease management, chemical control, biological control, disease management by using host resistance, biotechnology in plant disease control, disease assessment and decision support systems, integrated pest management and plant health legislation. This part provides an excellent overview of all most recent approaches to the control of plant disease.

Part V, a single chapter, showing perspectives and introducing plant pathology in a changing world. This part gives an exciting view into agriculture in the future – challenges in ensuring food security and in future plant disease management.

The book concludes with two appendices, i.e.: glossary; and molecular methods and terms relevant for plant pathology. There is also taxonomic index of pathogens, vectors and biocontrol agents; general index as well as online supplementary material. The whole book is accompanied by numerous colour photos, tables and illustrative figures. At the end of each chapter is a list of literature for further reading.

In conclusion, this book summarizes important recent information about plant pathology and plant pathogens, and in my view, is one of the best and most comprehensive textbooks in this field published in recent decades. It represents a highly valuable contribution to plant pathology, and will be of significant interest

<https://doi.org/10.17221/38/2021-PPS>

to university teachers, students in master and Ph.D. degree university programs, as well as professionals in phytopathology, plant protection and plant disease management.

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## **BREEDING CROPS WITH RESISTANCE TO DISEASES AND PESTS**

**(Third, revised edition)**

R.E. Niks, J.E. Parlevliet, P. Lindhout, and Y. Bai

*Wageningen Academic Publishers, Wageningen, The Netherlands, 2019, 204 pp.,*

*ISBN 978-90-8686-328-0 (paperback)*

*Price 63.74 USD*

The breeding of plants has a long history, more or less from the beginning of agriculture, ca. 10 000 years ago, when the first farmers started by selecting plants with desirable characteristics from their populations. This type of selection favored the plants best fitted to survive, with improved yields and products to meet farmers' needs. Also, during this process, plants susceptible to diseases and pests were eliminated. However, the scientific background of plant breeding was only established much later, in the second half of the 19<sup>th</sup> century, when J.G. Mendel discovered the basic laws of inheritance and created the first vision, based on peas as a model crop, of how to breed plants in a more sophisticated manner. The first application of scientific approaches to resistance breeding arrived at the beginning of the 20<sup>th</sup> century, when R. K. Biffen (UK, 1907) reported that resistance to yellow rust in wheat is controlled by a single recessive gene. That report stimulated plant breeders and geneticists to start searching for resistance genes, as well as to open an era of scientifically-based plant breeding for disease and pest resistance. At about that same time, cooperation among plant breeders, plant pathologists, and entomologists also began.

This newest edition of the textbook, "Breeding Crops with Resistance to Diseases and Pests," represents a very comprehensive treatment of all the most important aspects related to resistance breeding. In comparison with the previous two editions (2011, 2014), the third shows substantial innovation and overall improvement, especially with regard to our knowledge about plant-pathogen interactions. The book is divided into seven, well-organized chapters, which logically cover the entire subject as described in the book title.

Chapter 1 is a brief general introduction, focusing on the factors affecting crop yield and quality, including abiotic and biotic stressors. The end of this chapter includes some practical guidelines for the use and study of this textbook.

Chapter 2 introduces the reader to a multitude of attackers of plants, presenting a general classification of attackers, i.e., pathogens, parasites and herbivores (pests). Close attention is paid to the definition of disease and the classification of pathogens.

Chapter 3 deals with the whole complex of natural defences against pathogens and parasites. This chapter introduces details about three broad defence strategies: avoidance, resistance and tolerance; however, most of the rest of the book focuses on resistance.

Chapter 4 summarizes the fundamental concepts of plant-pathogen interactions and examines co-evolutionary processes between plants and their attackers. Defence mechanisms, such as PAMP-triggered immunity, effectors, basic compatibility, non-host resistance, and pathogen-specific resistance, are briefly described. This chapter provides sound theoretical background for the next chapter.

Chapter 5 broadly covers the diversity of resistance mechanisms. In a series of subchapters, details are provided about broad resistance, non-host resistance, and host resistance. The subchapter about host resistance gives extensive information about hypersensitive responses and partial resistance. This chapter provides a solid foundation for understanding host-pathogen interactions, as well as for the concepts of plant-resistance breeding that follow.

Chapter 6 is a comprehensive overview of the various types of plant attackers. Here one can find basic information on vertebrate pests, insects and mites, nematodes, parasitic plants, biotrophic and hemibiotrophic fungi and oomycetes, necrotrophs, vascular wilts, bacteria, phytoplasmas and rickettsias, and viruses and viroids. Each part gives basic information on their biology, potential resistance mechanisms of plants against them, and the most important examples relevant to crop breeding.

Chapter 7 examines the strategies leading towards the development of resistant cultivars. This is the most comprehensive chapter, covering about 70 pages (30%) of the book. In this well-organized chapter, there are step-by-step descriptions of the most crucial processes leading to successful resistance breeding, including the understanding of pertinent sources of resistance, strategies and methods for screening, methods to assess and evaluate resistance, the types of resistance to select (along with appropriate selection methods), potential applications of non-durable resistance, and effective ways to combine genetic resistance with biological control.

Because this is primarily a textbook, at the end of most chapters or important paragraphs, the authors provide pertinent questions and exercises. They serve to test the reader's knowledge and understanding of the subject. Answers are at the back of the book. At the end of the book, the reader will also find a list of the most important references.

The book includes many colour photos, tables and illustrations. In conclusion, this book summarizes important recent information, concepts and methodology related to resistance breeding for crops. Without any doubt, it is very well written and designed. This textbook is a valuable contribution to the teaching of resistance breeding and can serve as an important source of information for university instructors and students in master and Ph.D. programs, as well as for plant breeders and professionals in phytopathology, plant breeding, and crop and seed production.

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