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BOOK REVIEW

S. B. Chincholkar and K. G. Mukerji (eds): Biological Control of Plant Diseases

The Haworth Press Inc., New York, 426 pp, US$49.95 (softcover: ISBN-10-1-56022-328-6), US$69.95 (hardcover: ISBN-10-1-56022-327-8)

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Biological disease control continues to increase in significance as chemical pesticides are withdrawn and environmental pressures stimulate the search for alternate disease control measures. Consequently, a book that aims to "act as a catalyst in ushering newer ideas to provide meaningful solutions to intricate problems in plant disease biocontrol technology" should be a valuable addition to the literature. Its purported target readership is very wide including "scholars, scientists, agriculturalists, plant pathologists, administrators and enlightened farmers" and so much was expected.

The first chapter by Berg is highly focused on the control of soilborne pathogens in strawberries. Perhaps an odd choice when some form of introductory overview of biological control of plant disease may have been expected. Nevertheless, the author skilfully brings in relevant information from other systems to provide a good balanced review of the organisms identified and used for biocontrol in this plant species, particularly the rhizosphere, as well as outlining the screening procedures and application techniques for biological control agents (BCAs) on strawberry. There are then two chapters on the role and use of arbuscular mycorrhizal fungi (AMF) for disease control. Chapter 2 (Demir and Akkopru) has seven pages of background before the main subject is reached and then the rest of the time is spent describing mechanisms of disease biocontrol with AMF. This is odd as the topic of the following Chapter 3 (Sharma et al.) is also concerned with mechanisms of AMF biocontrol. Together the basic concepts associated with the use of AMF fungi for biocontrol of plant diseases are covered but there are few references quoted after 2000 and the information may not be fully up-to-date. I also find it strange that there are two chapters on AMF as biocontrol agents whereas there is no mention in either of these chapters, or elsewhere in the book, concerning the large literature on the use of ectomycorrhizal fungi for control of plant diseases.

Chapter 4 (by Rosas) is entitled "The role of rhizobacteria in biological control of plant disease". This topic is enough for a book on its own and, not surprisingly, the review has to focus, and mechanisms involved in rhizobacterial biocontrol is the topic selected. Aspects concerning the role of antibiotics, siderophores, extracellular enzymes and induced resistance are all covered superficially but provide a good basic introduction to the area. The following Chapter 5 is unique in the book in both having the greatest number of authors (13) and a strange combination of part review and part research paper considering bacterial root tip colonisation associated with biological control of tomato foot and root rot. It outlines the procedures used by the team over 15 years of studying the mechanisms associated with

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bacterial colonisation of roots and reviews the latest (and suggested last) results found from analysis of gene changes in knock-out mutants with decreased ability to colonise the root tip.

Chapter 6 (Stewart and McLean) switches emphasis from general studies of microorganisms associated with biocontrol involving activities in the rhizosphere, to biological control of a single plant pathogen, *Sclerotium cepivorum*, the causal agent of white rot of alliums. This review is truly comprehensive, up-to-date with several very recent personal communications which inform the reader of latest activities and advances world-wide in control of this major onion pathogen. Chapter 7 (Scala et al.) effectively reviews the information on the use of two well-known BCAs *Agrobacterium* and *Trichoderma*. The *Trichoderma* section discussing developments in the "omics" era clearly illustrates the way that study of fungal biocontrol agents is going. However, rather surprisingly the introduction drifted periodically into weed biocontrol which seemed to have no place in this book. Chapter 8 (Kapooria) attempts the impossible task of providing an overview of biological control of fruit and vegetable diseases. By necessity the chapter is selective, with cursory mentions of many aspects covered elsewhere in the book (e.g. AMF again), although a general coverage of the topic is achieved. It relies heavily on old literature with only 12% of approximately 180 references from 2000 or later. Chapter 9 (Taguchi and Hyakumachi) returns to the consideration of a single BCA, *Bacillus subtilis* IK-1080. This strain of *B. subtilis* is registered in Japan as a biocontrol agent for grey mould and powdery mildew and this paper reviews its use, including data either unpublished or difficult to access. Chapter 10 (Zhou et al.) considers strategies for biocontrol of fungal diseases of temperate fruits. This thorough review successfully outlines the BCAs available, the control achieved on a range of fruits, and the strategies for enhancing biocontrol efficacy. Chapter 11 (Lee and Lee) reviews biological control of major vegetables in Korea. Several BCAs commercially available in Korea are described and data either unpublished or difficult to access is included. Chapter 12 (Cortes-Penagos et al.) has the title "The nature of fungal mycoparasitic biocontrol agents" which is unusual in itself in that mycoparasitism generally refers to parasitism of one fungus by another. Some commercially available fungal BCAs are listed, and a number of mechanisms of disease control used by fungi are described, including some recent work where the genetic basis for mycoparasitism is beginning to be elucidated.

Chapter 13 (Wilhelm) stands alone in the book as it is concerned with the use of plant tissue culture for studies of fruit tree defence mechanisms. This well-written chapter explores the techniques used for tissue culture and its use in identifying material resistant to plant pathogens and the mechanisms involved in resistance. However, there is no linkage to any other chapter whatsoever and no attempt to place it in the context of disease biocontrol. The following unrelated Chapter 14 (Chandran et al.) suggests that microbial chitinases should be considered as BCAs. Whether an inanimate protein should be considered a BCA is a moot point, but details of production of chitinases, their activities associated with plant disease biocontrol, and potential for their commercialisation as BCAs is explored. The final Chapter 15 (Chincholkar et al.) examines the potential of siderophore-producing microorganisms to control fungal plant pathogens. This very brief chapter simply lists siderophores produced by microorganisms and outlines competition for iron and induced resistance as mechanisms involved with their biocontrol activity.

Thus the book comprises 15 chapters each one differing in style, length and quality and it is very difficult to see any clear theme to the content resulting in an eclectic mix of unrelated chapters. Indeed, there is virtual duplication in some (e.g. Chapters 2 and 3 concerned with AMF) and the complete absence of some areas of plant disease biocontrol such as control of viral diseases. Similarly, some exciting expanding topics such as the use of endophytes for plant disease control are not covered. It almost seems that the editors gave the contributing authors complete freedom to write whatever they wanted rather than guiding authors to write chapters ultimately leading to a coherent book covering key aspects of plant disease biocontrol.

The actual production and editing of the book could be much improved. In my softback copy, the quality of photographs throughout was poor and in places (e.g. Chapter 11) the images had been resized resulting in some very bizarre results, and in Chapter 6 the figure legends had become associated with the

incorrect photographs. However, perhaps the most frustrating aspect was the very poor indexing particularly of species names. Long lists of micro-organism names are given but the genus is almost never supplied at first mention. For example, the first index entry is *A. brassicicola* and reference to the text must be made to find that the genus is *Alternaria*. The omissions are just as bad. *Coniothyrium minitans* is frequently mentioned in the text and does not appear in the index whereas there is an entry for *Coniothyrium infirmo-minitans*. The text relating to this entry actually states *C. infirmo-miniatus*, which, based on prior text entries should relate to the Genus *Cryptococcus*. There are tedious lists of entries under "Biocontrol" and "Biological Control" which serve little purpose as this is the subject of the book whereas much more time could have been spent on indexing relevant content. There are also a large number of typographical errors throughout, particularly with microorganism names that should really have been spotted during the editing process. It would also have been nice to have the author affiliations given in the chapter itself rather than having to search for the information in a contributors list.

So, did the editors succeed in their specified aims and produce a book that is appropriate for their wide target audience? The answer would seem to be no, but much like the curate's egg it's good (or very good) in parts. However, it is relatively inexpensive (only US$49.95 for the soft bound version) and could provide a taster of some aspects of biological control of plant diseases.