Control of Crop Diseases

Thoroughly revised and updated to reflect current and emerging practices, this book explores modern methods of disease control in field and glasshouse crops. It outlines the major crop diseases of the UK with a particular emphasis on those features of symptomology and life cycle that are most relevant to the development of control measures. Modern diagnostic techniques are considered, focusing on developments in nucleic-acid- and immunological-based procedures and their use in plant quarantine and certification schemes. The potential impact of these and other advances in molecular technology on plant breeding and disease resistance is also covered. Fungicides are an integral part of disease control in the EU and, as such, a comprehensive account of their use forms an important part of the text, along with strategies to minimise the incidence of fungicide resistance in pathogen populations. Looking to the future, the book also addresses legislative, environmental and food safety concerns.

W. R. Carlile lectured on pesticide selectivity and toxicology for many years at Nottingham Trent University, where he carried out research and contractual work on the mode of action of pesticides and fungicide resistance. From 2006 to 2011, Bill was Chief Horticultural Advisor to Bord na Mona in Ireland, and he now acts as Horticultural Advisor to the company.

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Control of Crop Diseases
Third Edition

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Preface to the third edition

An extensive revision of the chapter on chemical control of disease and expanded coverage of both diagnosis of disease and deployment of resistant cultivars form part of this new edition. Diagnosis of disease is becoming ever more sophisticated, and if transgenic crops become as acceptable in the European Union as elsewhere in the world, major advances in durable disease control without recourse to the extensive use of fungicides may at last be realised.

The author of previous editions [W. R. Carlile] has worked almost solely with protected horticultural crops over the period 2006–2011, and has admired the careful use of cultural practice, sanitation and adoption of non-chemical methods for pest and disease control: a very different scenario from arable crops, with the principal link being the extraordinary progress in disease diagnosis based on molecular technologies, and perhaps to be surpassed by developments in nanotechnology.

In this respect Bill Carlile would like to pay tribute to colleagues at Bord na Mona in Newbridge, including James Spillane, Dearbhail Ni Chualain, Colman Hynes and Sarah Lombard, for their good company and encouragement. Equally, he would wish to acknowledge the continued interest and help from past graduates of Nottingham Trent University, particularly Chris Danks, now at Forsite Diagnostics; Mark Stevens, at Brooms Barn research station of the UK BBSRC; and staff of Eurofins [Agrisearch] at Melbourne, Derbyshire, especially Owen Scrimshaw.

Anne Coules would like to thank colleagues at Nottingham Trent University, in particular Dave Jukes, Mark Oxenbury and
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Chris Terrell-Nield, for their support and encouragement. She would also like to acknowledge the support, encouragement and good humour of family, Tony and friends.

Finally the authors would like to acknowledge the patience and understanding of Sylvia and George.
Preface to the second edition

The second edition includes a chapter on disease diagnosis and expanded coverage of fungicides as well as problems of controlling pathogens in crops and produce entering international trade. In the latter case molecular techniques are likely to play an increasing role in disease diagnosis. Nucleic acid and antibody technologies may also be deployed in future to justify the application of control measures such as fungicides. Indeed, fungicides continue to play a dominant role in maintaining the high standards of disease control evident within the intensive farming systems of the European Union (formerly the European Community or EC) despite efforts to reduce the production of commodities surplus to EU requirements. However, impending economic and legislative pressures, as well as concerns over the long term toxicological and environmental effects of pesticides, may lead to reductions in the quantity of fungicides applied to crops and greater reliance on other methods of disease control.

The text overall is still intended to be a broad introduction to the practices of disease control currently used by farmers and growers within the EU, and particularly in the UK.

I am once again indebted to my colleague Gil Davies for his encouragement and constructive criticism of the text. I am very grateful to both Agrisearch UK and William Sinclair Horticulture, and Graham Partington and Chris Turner respectively for financial support towards the cost of the colour plates. As with the first edition I wish to acknowledge the help that many students from the (Honours) degree and BTEC (Science) sandwich courses in Applied Biology at Trent, as well as their supervisors in industry, NIAB and MAFF, have given in keeping me up-to-date with developments in
disease control in crops. Many of the photographs came from material provided by staff of Agrisearch UK and I wish to express my particular thanks to Chris Harrison, Andy Bailey and Stuart Atkinson. Other photographs have been kindly supplied by Ciba Agriculture, Ian Barker of the Central Science Laboratory, Roy Groom, Pete Fitsimons and Shahid Mian. I am greatly indebted to Maggie Martin of the Audio-Visual Unit in the Faculty of Science, who took most of the photographs, often at very short notice, and prepared many of the text figures.

Finally my thanks go to Sylvia for her patience and understanding throughout.
Preface to the first edition

The intensive nature of modern agriculture in the European Economic Community, with the demand for better standards of crop quality and yield has required a high degree of disease control. Increased attention to crop hygiene, the production of disease-resistance cultivars and particularly advances in fungicide technology and use have all contributed towards major improvements in crop yield and quality. However, yield increases have led to the accumulation of surpluses of certain agricultural commodities. The current revision of price support within the EEC for crops such as cereals may lead to an examination of input levels as part of an overall effort to reduce the costs of cultivation. This may be especially reflected in the selection and frequency of use of fungicides, and it is possible that with field crops such as cereals, greater reliance in the immediate future may be placed on innate host resistance to diseases. On the other hand, the demand for high quality fruit and vegetable produce is increasing. Strict hygiene, including the development of soilless growing systems for crops under glass, as well as the continued intensive use of fungicides to achieve consistent and thorough control of disease is likely to remain a feature of growing systems where quality is of prime importance. It is, however, in these systems that problems of fungicide resistance are most likely to occur, and the development of strategies to prevent fungicide resistance is recognised by many as a highly desirable objective.

Overall, the crop protection discipline is one of current development and change. This text provides a broad review of
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current practices adopted by farmers and growers to control diseases of major crops in the UK, describes some of the problems which have arisen following the deployment of these measures and indicates some of the future developments likely to occur in the sphere of crop disease control.
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