

Book review

Forest Pathology – From Genes to Landscapes. Edited by John E. Lundquist and Richard C. Hamelin. 2005. 175 pp. APS Press, St. Paul, Minnesota, USA. ISBN 0890543348. US\$69.00.

With the title ‘Forest Pathology’ and an attractive front cover photograph of collapsing conifers, at first glance one might expect this book to be a welcome addition to the rather lean complement of books on tree diseases and to find a traditional treatment of the symptomatology, epidemiology and management of the high profile of pathogens and diseases affecting commercial forests. However that is the only photograph in the publication and the treatment of the topic is anything but traditional. The prominent subtitle accurately describes the true nature of the content which represents a comprehensive new look at the range of forest pathological problems. It can be regarded as introducing many forest pathologists to the relevance of molecular biology and the genetics of host pathogen interactions in their domain, something which long become commonplace in relation to annual crops. Up to now the molecular approach as regards forest diseases has been found in the many excellent individual contributions across many pathogens and across many continents but this book shows that there is an excellent core of fundamental research contributing across the whole area of forest pathology. The basis for the book was an APS symposium of similar title in 1999 and the contributors have expanded their themes and incorporated developments up to publication date to present the state of this art in a volume that seems to be well worth the listed price of US\$69. It must be said that the examples mentioned, to illustrate the topics, come largely from the North American range of hosts and pathogens but there is still ample inclusion of internationally well-established pathogens of major impact such as *Armillaria mellea*, *Heterobasidion annosum* and *Melampsora* spp. to give it international appeal.

I had hoped for more mention of *Phytophthora* spp., which are attracting so much attention at present, and while they surface in a number of chapters their dramatic increase in number and impact probably coincided with the preparation of this text.

Chapter one is an introduction to the progress and value of genomics across the broad world of microorganisms and pathosystems and acknowledges that while forest pathology is at an early stage in entering this world it can reap the benefits that have been laboriously streamlined in other areas. Chapter two reviews the range of molecular tools that can be and are now widely used to elucidate variation at genus, species or clonal level, a task which was previously established by tedious conventional taxonomic and cultural techniques, and which now clarify some of the mystery relating to virulence factors, host specificity and indeed origins of a very comprehensive panel of pathogens. The more mundane requirement of accurate and rapid diagnostics and information on geographic distribution of pathogens and pathotypes make this chapter very beneficial for the traditional forest pathologist who is wary or ignorant of the progress that has been made elsewhere. This theme is continued, but focusing at the population level, in chapter three, where evolutionary and geographic aspects are pursued largely in relation to the role of environmental factors in shaping population structure in ecosystems where the host is also subject to genetic change. The examples here are the ubiquitous *Armillaria mellea*, *Cronartium ribicola* and *Cryphonectria parasitica*.

The population genetics of bark beetles, their associated fungi and their tree hosts represent a complex three way system that is presented in chapter four where some patterns of behaviour and host or beetle preferences in relation to blue-stain and other beetle-vectored pathogens are partially explained but that is all that can be done in this difficult area. This might have been

better followed by chapter seven which addresses the biochemistry of melanin synthesis in the sap stain complex and variation in the *Ophiostoma* and *Ceratocystis* spp. Clearly the aim is to find clues as to chemical or biological opportunities for disruption of the staining pathways but this is an aspiration that requires further progress.

The movement of pathogens into and within ecosystems and the naturalisation of pathogens with particular emphasis on *Cronartium ribicola* in many geographic regions in addition to North America is thoroughly treated in chapter five where experiences from the medical and agricultural world are also invoked for illustration.

Analysis of pathogen virulence and pathogenesis and host response at a molecular level in conventional disease cycles have been well aired in relation to agricultural pathosystems but, in chapter six, forest pathogens are the focus though still of necessity drawing many examples from the non-woody host range. In the context of host response, the search for disease resistance in tree hosts is an ongoing task and two ends of this search are illustrated in chapters eight and nine. The former points to the benefits of genetic transformation as a means to accelerate the process, as exemplified by success with *Populus* spp., while chapter nine returns to the established benefits from seeking out unique provenances that exhibit climatic adaption with inherent resistance properties, a practice that has been a core tool in conifer selection for decades.

It is not common to extol the benefits of any plant disease except perhaps in relation to weed plants but in chapter ten there is a view that forest diseases enhance biodiversity whether by providing canopy gaps, root and soil disturbance or provision of ample supply of debris. Thus flora and fauna can benefit and management must decide if the forest is to be a profitable

timber producing activity or demonstration of a natural ecosystem. This theme is continued in chapter eleven in relation to a detailed study of changes in populations of small animals as a result of disturbance factors in a forest area.

The ongoing need to establish baseline parameters to interpret the relevance of health factors or other impacts is addressed in chapter twelve with the sobering message that a certain level of mortality is essential. This uncomfortable idea is continued in chapter thirteen which addresses the role of man in facilitating the advance of exotic pathogens in systems that might otherwise be in equilibrium. In this chapter the role of *Heterobasidion annosum* receives prominent attention.

The use of spatial statistics in analysis, illustrating and modelling of occurrence and impact of forest disease factors, with all the components of sampling methodologies and data analysis are competently outlined in chapters fourteen and fifteen. Then in the final chapter the concept of landscape pathology as opposed to tree or crop pathology is advanced to give us a broader view of the relevance of tree diseases than we might previously have adopted.

This book will not help you to identify a single disease of trees but if you can identify the pathogen and the host this book takes you deep below the symptomatology into fundamental areas of the host-pathogen encounter that will lead to more enlightened approaches to disease management. It is therefore a valuable companion to the range of traditional books on forest pathology and is relevant in a worldwide context.

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