Book Reviews

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Programmed cell death in plants.

This book is a timely and updated summary of the research that is ongoing in the subject of programmed cell death as it happens in plant systems. In the past 15 years, the necessity and conserved nature of an intrinsic suicide program in cells have been widely recognized by biologists and the study of cell death mechanisms and signal regulation have become intensive areas of research. As pointed out in the introductory chapter, it is ironic that in spite of the early recognition of the indispensable nature of cell death control in the life of vascular plants, the study of cell death mechanisms in plants has lagged far behind that in animal systems. This book attempts to integrate existing data in various experimental systems that seek to elucidate the molecular components that are dedicated to the cellular suicide program in plants. The ten chapters of this book can be categorized into three topics: Overviews (Chapters 1, 2 and 10), developmental cell death (Chapters 3 to 7), and induced cell death (Chapters 8, 9). The chapters contain some unavoidable overlaps. For example, the system of megaspore abortion (Chapters 3 and 4), and discussion of the role of salicylic acid in cell death during pathogen defence and development of vegetative tissues (Chapters 5 and 9). In most instances, however, the chapters are clearly defined and they all do an admirable job in summarizing the various facets of plant programmed cell death from formation of the embryo to senescence at the whole plant level. I especially enjoyed reading the well-presented introductory chapter by the editor, John Gray, who gives a broad overview of the evolutionary theory pertaining to the genesis of the cell death program during the speciation process. The value of comparative analyses of cell death mechanisms in diverse phyla cannot be overestimated. Two other chapters I also believe are exceptional. In the chapter by Daniel Gallie, the complex interplay between different hormonal signals in controlling cell death activation during seed development and germination is well-presented, while Huelskamp and Schnittger nicely contrast differences and similarities between plant and animals in the ways that they balance cell death and proliferation.

After reading the chapters of this book, it became obvious to me that there are several common links between these model systems of cell death control in plants. One recurrent theme is the intricate and diverse signalling that could trigger or suppress plant cell death in a specific or general manner. This can be seen in the roles of salicylic acid as both a signal for cell death as well as cell growth. In the case of ethylene, it appears to be a fairly general enhancer of cell death activation in pathogen defence, senescence or aerenchyma formation in cereal roots. Another commonality among the chapters is the obvious lack of a clear vision as to the nature of the cell death machinery in plants at the molecular level. As the final chapter by Mittler and Shulaev points out, the elucidation of the plant suicide mechanism will most likely require novel approaches and conceptual breakthroughs. However, the rewards from this endeavor should be well worth the effort since this understanding would probably impact on our ability to intelligently manipulate plant cell death to benefit agriculture on a global scale.

Aside from the special issue of Plant Molecular Biology in 2000 that was devoted to programmed cell death in plants, the only other competitor is a recent book on a similar subject area, Plant Cell Death Processes (2004. edited by Larry D. Nooden, published by Academic Press, Elsevier Science, USA). However, after reading through both of these books, the present volume by Gray is more focused and the flow of information is better designed. In the volume by Nooden, a clear emphasis is placed on various facets of the senescence phenomenon in plants with a large number of chapters devoted to this topic. In this way, I think the volume by Gray is a more concise overview of the topic for novices to this area or for experts in a particular plant cell death model to gain additional insights to other related systems. The presentation of the materials, as well as the illustrations in the various chapters, is clear and helpful. I highly recommend this book for all who have an interest in plant biology and programmed cell death in general.

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