

Preface

As the earth makes its yearly elliptical orbit around the sun, the angle of its axis causes the northern and southern hemispheres to experience changes in photoperiod and temperature that result in the changing seasons. As a consequence of a plant's specific geographic location, these seasonal changes often induce cold-, heat-, and/or dehydration-related stress during an annual life cycle. Therefore, plants have evolved specific adaptive mechanisms for surviving periods of seasonally-induced stress. From a life cycle perspective, deciduous and annual plant species often sacrifice tissues as an adaptive response to environmentally-induced stress, whereas evergreens do not. However, in all cases, these diverse plant species respond to seasonal environmental cues to induce well-defined phases of dormancy within reproductive structures such as seeds and vegetative buds that can initiate a new life cycle once seasonal conditions are conducive for growth. Understanding how upstream plant receptors perceive these seasonal changes in photoperiod, temperature, and moisture to orchestrate the timing of downstream cellular, molecular, and physiological networks regulating dormancy induction, maintenance, and release are critical for global agricultural production; particularly in the context of global climate change.

Historically, a small group of experts and stakeholders interested in various aspects of plant dormancy has gathered, on average, every 4–5 years at an International Plant Dormancy Symposium (IPDS) to exchange information, develop collaborations, and share ideas on plant dormancy mechanisms. Presentations at these meetings generally cover updated research from experimental plant systems ranging from agronomic, horticultural, and tree crops to model plants and weeds. Previous presentations from IPDS meetings have resulted in a series of published documents. Presentations from the 1st IPDS held in Corvallis, Oregon, USA, in 1995 and the 2nd IPDS held in Angers, France, in 1999 were published as book chapters by CAB International in 1996 and 2000, respectively; whereas presentations from the 4th IPDS held in Fargo, North Dakota, USA, 2009 were published as peer-reviewed papers in a special issue of *Plant Molecular Biology* (Vol. 73, No. 1–2, 2010). This book includes proceedings from the 5th IPDS held on November 4–7, 2014 in Auckland, New Zealand, as well as other invited chapters. Based on several chapters covering comparisons between dormancy mechanisms common to buds

and seeds, it seems logical that the IPDS is often sponsored by or held in conjunction with the International Seed Science Society.

Collectively, the chapters in this book constitute reviews, research, and perspectives among scientists interested in disseminating advances in our understanding of cellular, genetic, molecular, and physiological mechanisms involved in plant dormancy processes in both buds and seeds. It was recognized that many previously published IPDS articles inadequately discussed the impact that global climate change may have on these plant dormancy processes. Consequently, numerous chapters contained in this book fill this gap by highlighting the potential for global climate change to impact not only dormancy, but also flowering processes. Because dormancy and flowering appear to share overlapping pathways, it will be particularly important to understand how global climate change will impact specific factors (e.g., chilling requirements and alternative chemicals) needed to break dormancy and uniformly induce flowering in horticultural crops and tree species. Although global climate change is not likely to affect seasonal changes in photoperiod, it is likely to impact seasonal changes in temperature. Thus, in crops where dormancy and flowering are known to be controlled by temperature alone (such as apple and pear), global climate change has the potential to change the geographic landscape for some of these horticultural species. Therefore, understanding how environmental and biochemical factors impact processes regulating the complex nature of dormancy in diverse plant systems and its overlap with flowering, covered by numerous chapters in this book, will be essential for ensuring crop production and food security for future generations.

I hope that the scientific community benefit from the information reported in this book and it raises a new level of interest in understanding plant dormancy. Finally, I want to give special thanks to all of the contributors and reviewers who helped to make this book a reality.

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