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PREFACE

Plant dormancy, a mechanism involving assorted molecular, physiological, and cellular processes

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This preface to the Special Issue on plant dormancy provides an overview of articles related to our current understanding of molecular, physiological, and cellular processes involved with seed and bud dormancy, information related to the history of the International Symposium on Plant Dormancy (ISPD), highlights from the 4th ISPD, and perspectives on achievements and the direction of future plant dormancy research. In general, plant dormancy can be defined as a process that inhibits growth or germination in spite of suitable environmental conditions. Plant dormancy is typically manifested in numerous vegetative and reproductive tissues including seeds, tubers, bulbs, corms, rhizomes, stolons, and axillary, apical and adventitious buds. Temperature, photoperiod, phytohormones, nutrients, and myriad of genes and proteins, at some point in time, affect multifactorial regulatory networks involved in the orchestrated control of plant dormancy. As a result, plant dormancy confers various advantages to crop and other plants by synchronizing environmental cues to developmental processes which ensure survival. In turn, dormancy also imparts some negative impacts such as pre-harvest sprouting, non-uniform germination of crop and weed seeds, and fruit loss due to inappropriate bud break. Thus, our continued quest to gather, share, and disseminate information is important in moving our understanding of plant dormancy forward and to develop new ideas for improving food production and efficient weed control.

Participants of the ISPD have gathered approximately every four to five years since 1995. The 4th ISPD was held in Fargo, ND, USA, June 8–11, 2009, which followed those previously held in Corvallis, Oregon, USA, 1995; in Angers, France, 1999; and in Wageningen, The Netherlands, 2004. The goal of the symposium is to bring together experts and stakeholders in a forum for exchange of information, development of collaborations, and sharing of ideas on plant dormancy mechanisms from a variety of experimental plant systems ranging from agronomic, horticultural, and tree crops to model plants and weeds. The Local Organizing Committee for the 4th ISPD included Michael Foley (Chair), James V. Anderson, Wun S. Chao, David P. Horvath, Anne Y. Fennell, Jeffrey C. Suttle, and Karen K. Tanino. The Scientific Committee included James V. Anderson (Chair), Roberto Benech-Arnold, Christine Beveridge, Kent Bradford, Henk Hilhorst, Eiji Nambara, Etti Or, and Antje Rohde. The symposium included 85 participants from 17 countries (see Fig. 1) involved in diverse aspects of plant bud and seed dormancy research.

CAB International had published conference proceedings for the 1st (edited by G. A. Lang 1996) and 2nd (edited by J.-D. Viémont and J. Crabbé 2000) ISPD. It has been ten years since CABI's last publication on this topic. Thus, it is timely to publish this Special Issue with Plant Molecular Biology considering the vast amount of new information that has accumulated since 2000. This Special Issue includes five reviews and 13 research articles which were written based on data presented at the 4th ISPD. All contributors to this Special Issue were invited from the oral presenters of the meeting and articles were peer reviewed under the guidelines of Plant Molecular Biology. These articles cover a variety of topics including identification of various dormancy related genes and molecular mechanisms (articles 6, 7, 8, 9, 13, 14, and 18), new insights on temperature, photoperiod and/or circadian clock (articles 4, 5,

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Fig. 1 *Kneeling (left to right)*: Laila Karlsson, Michael Foley, Yelam Sreenivasulu, Naoto Kawakami, Hisayo Yamane, Francoise Corbineau, Maria Eriksson, Josefine Liew, Antje Rohde, Anne Fennell, Etti Or, Russell Johnson, Mark Roh, Eiji Nambara, James Chandler, Wun Chao. *Standing (left to right)*: Steven Penfield, José Campoy, Jorunn Olsen, Diego Batlla, Heng Ye, Eike Luedeling, Sheila Adimargono, Christine Beveridge, Kazumi Nakabayashi, Jeff Suttle, Kai Graeber, Sarah Kendall, Richard Horsley, Paul Werner, Wim Soppe, Drew Anderson, Tanja Gerjets, Mark Taylor, Kathy Mathiason, Roberto Benech-Arnold, Dani Eshel, Christophe Bailly, Arvind Subbaraj, Münevver Doğramacı, Chris Hawkins, James Anderson, Yordan Yordanov, Micha Ofir, Steven Footitt, Jan Kępczyński, Douglas Bielenberg, Marzenna Guzicka, Tomasz Pawlowski, David Horvath, Michael Campbell, Juihuan Feng, Cetin Yuceer, Li-Hua Zhang, Markku Aalto, Gerhard Leubner-Metzger, Karen Tanino, Peter Toorop, Kathryn Steadman, Bill Finch-Savage, Xing-You Gu

and 12), application of genomics tools to investigate dormancy (articles 2, 10, 11, 15, 16, and 17), involvement of strigolactone in branching inhibition (article 3), and conceptual basis for modeling seed dormancy in relation to environmental conditions (article 1). Taken together, the research and reviews presented in this Special Issue show that the majority of the authors have strived to identify genes involved in various aspect of dormancy. Additional work is still needed to confirm the involvement of these genes in signaling pathways and regulatory networks in vivo. In addition, many authors have highlighted connections between dormancy development and flowering competence. Thus, future research needs to focus on identifying molecular mechanisms that harmoniously govern these two seemingly distinct phenomena in plants. Furthermore, it appears that there are many resemblances between bud and seed dormancy. Comprehensive comparisons at the molecular and functional level between these two systems will undoubtedly shed additional insights on dormancy regulation.

Since dormancy is a broad subject, this Special Issue can not cover all aspects of dormancy research. In particular, it does not include articles related to the impact that global climate change may impart on plant dormancy. Future research on this particular topic should provide additional insights into the potential ecological impacts that global climate change could have on plant communities and cropping systems. Regardless, the collection of papers presented in this Special Issue provides an important summary of recent advances in our understanding of molecular, physiological, and cellular networks involved with dormancy and growth, and highlight several directions for future research in plant dormancy. We hope that this review will stimulate new lines of investigation and increase our understanding about these complex and important questions. Finally, we acknowledge the contributions of the authors and are grateful to Dr. Wilhelm Gruissem, the editor of Plant Molecular Biology, for agreeing to publish these articles in this Special Issue on Plant Dormancy.