

Preface

Absciscic acid (ABA) is one of the five classic phytohormones, which regulates many aspects of plant growth and development, and is widely known as a ‘stress hormone’ that modulates plant response to a variety of environmental cues, including both abiotic and biotic challenges. Over the past 30 years, extensive studies with biochemical, molecular genetic and genomic approaches have revealed the main framework of ABA biosynthesis and catabolism pathways, and identified ABA transporters and more than a hundred signaling components of ABA signaling pathways. Especially, recent identification of ABA receptors allows to elucidate ABA signal transduction from the primary signaling events to downstream gene expression or effector activation, which deepens considerably our understanding of functional mechanisms of ABA. Additionally and importantly, numbers of the ABA-related genes have been engineered in crops for stress resistance improvement, which provides opportunities for the development of new crop varieties with enhanced stress resistance.

The objective of this book is to provide a comprehensive review of all aspects of the mechanisms of ABA metabolism, transport and signal transduction, covering the current state of knowledge of ABA and recent advances in this field. Chapters 1–5 deal with ABA metabolism and transport, which firstly introduce basic knowledge of chemical structure of ABA and its derivatives in relation to their physiological functions (Chap. 1), followed by critical reviews of ABA metabolic pathways (Chaps. 2 and 5) and ABA transport between cells and at the whole plant level in relation to its function (Chaps. 3 and 4). Chapters 6 and 7 review ABA signal perception by three classes of ABA receptors or candidate receptors with structural insights into how a family of PYR/PYL/RCAR soluble receptors function to perceive ABA, and signaling pathways downstream of the PYR/PYL/RCAR receptors and a chloroplast CHLH/ABAR candidate receptor. Protein kinases and phosphatases involved in ABA signaling are reviewed in Chap. 8, which helps to understand the critical roles of reversible protein phosphorylation in ABA signaling and especially in the PYR/PYL/RCAR-mediated signaling pathway. Some other key processes of ABA signaling, mediated by protein ubiquitination and sumoylation, reactive oxygen species (ROS) and transcription factors, are reviewed

in Chaps. 9–11. Crosstalk of signaling pathways between ABA and other phytohormones as well as between ABA and light attracts much attention in recent years, of which the advances are reviewed in Chaps. 12 and 13. Additionally, ABA has been shown to be a signal to promote ripening of fleshy fruits, and the advances in its metabolism and signaling in fleshy fruits are summarized in Chap. 14. The topics of Chaps. 15–20 are focused on advances in ABA regulation of a diversity of physiological responses, including stomatal movement (Chap. 15), plant responses to drought, salt (Chap. 16) and cold stresses (Chap. 17), the floral transition (Chap. 18), circadian clock (Chap. 19), and plant response to biotic stresses (Chap. 20). The principle and practice of ABA analysis are also addressed (Chap. 21). The last chapter discusses agricultural significance of the information on ABA metabolism and signaling and reviews actuality of improvement of stress tolerance in crops by genetic manipulation of ABA metabolism and signaling (Chap. 22).

I am very grateful to the authors for their excellent contributions to this book, which are of great value to the readers with interests in plant biology and agriculture.

Da-Peng Zhang

Absciscic Acid: Metabolism, Transport and Signaling

Zhang, D.-P. (Ed.)

2014, XII, 465 p. 49 illus., 23 illus. in color., Hardcover

ISBN: 978-94-017-9423-7