Book reviews

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Victor O. Sadras and Daniel F. Calderini (eds): Crop Physiology. Applications for Genetic Improvement and Agronomy

Elsevier. Academic Press, 2009, xi + 581 pp.,
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The importance of improvement in agricultural production increases rapidly over the previous years facing the problem of the overpopulation with regard to ecological and social outcomes. An integration of crop physiology and plant breeding plays here not only a very important part but also a multidisciplinary approach to the problems of crop production. This requires a close cooperation of breeders not only with physiologists but also with biochemists, pathologists, entomologists and statisticians. The editors of this book are Victor O. Sadras from South Australian Research and Development Institute, Adelaide, Australia and Daniel F. Calderini from Universidad Austral de Chile, Instituto de Produccion y Sanidad Vegetal, Valdivia, Chile.

This book is aimed at discussion and presentation of an integrated multidisciplinary approach to solve crop physiology and contemporary agriculture problems and promotes interdisciplinary synergy to increase productivity and provides and thoroughly discusses the major issues in the crop improvement; moreover, the book shows the crop physiology as a mature scientific discipline.

The number of contributors (59), including many leading international scientists, shows how seriously the problem is dealt with. The authors have a deep knowledge and experience in the presented issues, giving a comprehensive insight into the described problems of contemporary agriculture.

The book is divided into three Parts. Part 1: Farming Systems: Case Studies (chapters 2–5), Part 2: Capture and Efficiency in the Use of Resources: Quantitative Frameworks (chapters 6–8) and Part 3: Crop Physiology, Genetic Improvement and Agronomy (chapters 9–21).

Part 1 provides reader with the detailed description of farming systems and the specific challenges in agriculture in Australia (chapter 1), Argentina (chapter 2) and in Northern Europe. In part 2, problems and latest ideas on water (chapter 6), radiation (chapter 7) and nitrogen (chapter 8) use efficiency are presented. Part 3 is the core part of this textbook. It introduces various ideas and approaches in the field of crop physiology and its synergies with biotechnology, breeding, modeling and agronomy.

This book provides deep and detailed study of the latest research problems in crop physiology for breeders, geneticist, ecologists, ecophysiologists and physiologists; therefore, this book is recommendable to practitioners of all those who want to implement the most recent advances in crop technology. Moreover, this textbook is a valuable reference for physiology and agronomy students.

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Dmitri A. Belostotsky (ed): Plant systems biology, Methods in Molecular Biology 553, Springer protocols

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Systems biology is a fairly new and expansive area of study that focuses on the interactions between the many components of biological systems and tries to predict how these interactions give rise to the function and behavior of the system. System biology analysis strategies can provide new models and hypotheses as a part of discovery engine. At the cellular/organismic level, the systems biology integrates data derived from transcriptome, proteome, metabolome and phenome studies. With the existence of the large amount of “omic” data, understanding of the cell requires approaches to view the dynamic behavior as a reaction networks and complex system.

The book, *Plant Systems Biology*, addresses in a coherent manner the diverse and multiple aspects of Systems Biology and the multiplicity of its potential applications. Written by leading researchers in the field, the book details the major current advances in dynamically developing technologies, the new theoretical insights and the methods of data acquisition and analysis. In most cases, the methods and technologies are presented using *Arabidopsis* as a convenient model system.

The *Plant Systems Biology* is divided into four sections with 2–8 chapters. Each chapter starts with short introduction and finishes with additional comments and suggestions for researchers.

Section I: “System Biology of Plant Gene Expression” is an expert and detailed review on the experimental techniques used to investigate the interaction between proteins and DNA/RNA in the cell, to study of the genome-wide association that involves rapidly scanning markers across the complete sets of DNA, describes the sequencing technologies, application of ultra-high-throughput sequencing, methods to map transgene position effect, methods of global epigenetic control in response to developmental or externally applied cues and advances in microarray-based approaches.

Section II: “Networks, Pathways, Statistical Issues, and Novel Computation Tools” describes advances in technologies facilitated high-dimensional experiments that generate tremendous amounts of “omic” data, methods by

which cellular signaling networks can be assembled and modeled in predictive fashion, development of a set of statistical approaches that allow to test the relationship between phenotypic trait and transcript genetic architecture and investigate co-expression of genes involved in metabolic pathways, and finally, demonstrate algorithms for analyzing introns and their effects on gene expression.

Section III: “Imaging” discusses live-imaging methods with confocal microscopy, fluorescent reagents, image processing protocols that have been developed to visualize the regulatory dynamics of plant growth and computer algorithms allow extracting and quantifying information from digital images.

Section IV: “Chemical Genetic, Metabolomic, and Integrative Methods for Plant System Biology” introduces fundamental concepts of metabolomic experiments, describes tools to screen for low-molecular-mass chemicals that affect biological processes, reviews approaches to define the regulation of the flux through a metabolic or signaling pathways at many levels, including transcriptional, posttranscriptional, and allosteric regulation, and discusses genomic profiling techniques.

The presented technologies developed from high throughput platforms for cloning, DNA sequencing, robotics, high-density microarrays, 2D-gel electrophoresis, mass spectrometry and associated bioinformatics software offer the opportunity to carry out an analysis on a routine basis, understand the biological information contained within large-scale expression data sets and open door for novel questions to be addressed at the level of the entire biological system. Therefore, the book *Plant Systems Biology* is essential reading for all researchers currently performing the systematic study of complex interactions and the entirety of processes that happen in a biological system and is highly recommended for all students and scientists wishing to increase their understanding of this field. As a volume in the *Methods in Molecular Biology*TM series, this book provided detailed methodologies that are crucial for getting optimal results. Therefore, it is valuable guide provided both beginners and experienced practitioners with the necessary skills to develop and apply *Plant Systems Biology* tools.

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