

Preface

The advent of modern tools and techniques in genetics, cytogenetics, and molecular biology has revolutionized the plant breeding approaches to help overcome the limitations associated with the conventional plant breeding. The recent integration of advances in biotechnology, genomic research, and molecular marker applications with conventional plant breeding practices has created the foundation for molecular plant breeding, an interdisciplinary science that is revolutionizing twenty-first-century crop improvement. Molecular breeding offers opportunities to apply marker assisted selection (MAS) as compared to phenotypic selection in conventional breeding and is moving ahead at an unprecedented pace in all major crops and has become the standard practice in many.

Molecular breeding involves alien gene introgression to mobilize useful genetic variation to breeding programs to widen the genetic base of crop cultivars and relies on the use of molecular markers, and linkage, QTL, and association mapping of agronomic traits to identify candidate genes and to design functional markers for MAS. MAS coupled with marker assisted backcross breeding (MABB) that helps in gene pyramiding, next-generation sequencing (NGS) that generates genome-wide markers and screening of new alleles, and targeting induced local lesions in genomes (TILLING) or ecotype TILLING (EcoTILLING) for the screening of either mutant or natural germplasm collections are used to integrate genomic information into directional and selective breeding in crops to maximize genetic gains.

This book encompasses articles on the application of above-mentioned genomic approaches, tools, and resources in a precision breeding approach. Each chapter elucidates an authoritative account on the topic. We are sincerely grateful to all the authors for their valuable contributions. We would like to acknowledge cooperation, patience, and support of our contributors who have put in their serious efforts to ensure a high scientific quality of this book with up-to-date information. We sincerely thank Dr. K.G. Ramawat for motivating us to take up this assignment. Sincere thanks are due to Khushboo Arora for her help during the editing process. One of the editors, Vijay Rani Rajpal, is sincerely grateful to her daughter Navya and husband Susheel for their help, patience, and understanding. Without their

unconditional support and encouragement, this journey would have been even more difficult. This work could not be completed without the active support of Springer team who took pains in streamlining the production process. We particularly appreciate Dr. Valeria for her continued support.

Plant breeders, taxonomists, geneticists, cytogeneticists, molecular biologists, and biotechnologists will greatly benefit from this book. We sincerely hope that this book will serve as a milestone in the precision breeding of crops to achieve meaningful plant genetic improvement.

Vijay Rani Rajpal
S. Rama Rao
S.N. Raina

Molecular Breeding for Sustainable Crop Improvement
Volume 2

Rajpal, V.R.; Rao, S.R.; Raina, S.N. (Eds.)

2016, XI, 478 p. 56 illus., 12 illus. in color., Hardcover

ISBN: 978-3-319-27088-3