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Volume 20

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Kishan Gopal Ramawat
Botany Department, M.L. Sukhadia University, Udaipur, India

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Editors

Genetic Enhancement of Crops for Tolerance to Abiotic Stress: Mechanisms and Approaches, Vol. I

Springer

Editors
Vijay Rani Rajpal
Department of Botany
Hansraj College
University of Delhi
Delhi, India

Deepmala Sehgal
CIMMYT Headquarters
El Batán, Veracruz, Mexico

Avinash Kumar
Vinoba Bhave University
Hazaribag, Jharkhand, India

S. N. Raina
Amity Institute of Biotechnology
Amity University
Noida, Uttar Pradesh, India

ISSN 2352-474X ISSN 2352-4758 (electronic)
Sustainable Development and Biodiversity
ISBN 978-3-319-91955-3 ISBN 978-3-319-91956-0 (eBook)
https://doi.org/10.1007/978-3-319-91956-0

Library of Congress Control Number: 2018951914

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface: Volume I

The changing climate change scenarios have gripped humanity for a long time and are expected to worsen in the coming decades. Agriculture is already feeling the effects of climate change by reduced crop productivity, heavy yield losses, scarcity of water for farming, reduced rate of precipitation, and the list goes on. In staple crops, particularly wheat, rice, maize, soybean, barley, and sorghum, research has shown about 30% of the yearly variation in agricultural yields due to changes in rainfall and temperature.

Of all the threats that agriculture is exposed to due to climate change, abiotic stresses such as drought (water deficit), extreme temperatures (cold, frost, and heat), and/or salinity (sodicity) are the most devastating ones, causing more than 50% of crop yield losses. Mineral (metal and metalloid) toxicity is an additional abiotic factor, which is becoming a big threat for both major and minor crops. Thus, improving tolerance to these abiotic stresses is a global plant breeding target. A lot of research has been conducted to investigate plants' responses to these stresses at the structural, physiological, transcriptional, and molecular level and on the resistance mechanisms allowing them to adapt and survive these stressful events. A major research target has also been cross talk among various mechanisms, in case of multiple stresses faced by plants.

Precise analysis of proteome and metabolome is essential for understanding the fundamentals of stress physiology and biochemistry. Scientists have utilized 'omics' platforms to unravel the influence of abiotic stresses on levels of different protein groups and metabolite classes and to pinpoint candidate genes underneath. In addition, chromatin modifications, nucleosome positioning, and DNA methylation have been recognized as important components in plants' adaptations to stresses. The potential of improving stress tolerance in crops by enhancing the stress memory through the activation of priming responses or the targeted modification of the epigenome has been a burning research topic.

This book provides a consolidated and an updated account of the research being conducted in above-mentioned areas by plant scientists all over the world. It is an invaluable resource for researchers and educators in the areas of tools and technologies to unravel plant's responses to abiotic stresses. The outcomes presented on

staple crops will be useful to a broad community of scientists working in similar areas and can provide useful leads to build strategies to generate abiotic stress tolerant varieties. Students will find this book handy to clear their concepts and to get an update on the research conducted in various crops at one place.

New Delhi, India — Vijay Rani Rajpal
El Batán, Mexico — Deepmala Sehgal
Hazaribag, India — Avinash Kumar
Noida, India — S. N. Raina

The original version of the book was revised: Book editor's affiliation has been updated in Copyright page. The correction to the book is available at https://doi.org/10.1007/978-3-319-91956-0_12

Acknowledgements

We sincerely thank all authors not only for agreeing to contribute chapters despite their hectic schedules and other work commitments but also for putting in their sincere efforts in providing up-to-date information. We are thankful to Prof. K. G. Ramawat for inspiring us to take up this assignment. All the three editors, Vijay Rani Rajpal, Deepmala Sehgal, and Avinash Kumar are thankful to their Mentor and Guide Prof. S. N. Raina for guidance and inspiration always. Vijay Rani Rajpal is also thankful to the two other co-editors for their active involvement from inception to compilation and editing process through the course of this book. The book would not have been possible without their active involvement and whole-hearted support. The editors Deepmala Sehgal and Avinash Kumar are also thankful to senior editors Profs. S. N. Raina and Vijay Rani Rajpal who had been their teachers and Ph.D. supervisors too for providing them the great opportunity to be an editor.

Last but not least, editors gratefully acknowledge their families for their understanding, patience, and emotional support. Our sincere thanks to the whole Springer team who was tirelessly involved in the production process. We particularly appreciate Dr. Valeria and Dr. Ineke for their continued support.

We are very hopeful that this book will attract readers who are crop scientists and to even undergraduates and postgraduates of agricultural universities and institutes that are interested in the genetic improvement of crop plants using modern tools.

Contents

Contributors

Nasheeman Ashraf Plant Biotechnology Division, CSIR-Indian Institute of Integrative Medicine, Srinagar, Jammu and Kashmir, India

Shoib Ahmad Baba Plant Biotechnology Division, CSIR-Indian Institute of Integrative Medicine, Srinagar, Jammu and Kashmir, India

Renu Deswal Molecular Plant Physiology and Proteomics Laboratory, Department of Botany, University of Delhi, Delhi, India

Om Prakash Dhankher Stockbridge School of Agriculture, University of Massachusetts, Amherst, MA, USA

Manoj K. Dhar Genome Research Laboratory, School of Biotechnology, University of Jammu, Jammu, India

T. R. Ganapathi Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai, India

Brijesh K. Gupta Plant Stress Biology, International Centre for Genetic Engineering and Biotechnology, New Delhi, India

Deepti Jain Department of Plant Molecular Biology, Interdisciplinary Centre for Plant Genomics, Delhi University, South Campus, New Delhi, India; Department of Botany, Bangalore University, Bangalore, India

Rohit Joshi Plant Stress Biology, International Centre for Genetic Engineering and Biotechnology, New Delhi, India

Prakriti Kashyap Molecular Plant Physiology and Proteomics Laboratory, Department of Botany, University of Delhi, Delhi, India

Sanjana Kaul Genome Research Laboratory, School of Biotechnology, University of Jammu, Jammu, India

J. P. Khurana Department of Plant Molecular Biology, Interdisciplinary Centre for Plant Genomics, Delhi University, New Delhi, India

Rakesh Kumar ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Smita Kumar CSIR-National Botanical Research Institute, Council of Scientific and Industrial Research (CSIR-NBRI), Lucknow, India

H. M. Mamrutha ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Manjari Mishra School of Life Sciences, Jawaharlal Nehru University, New Delhi, India

Shikha Mittal Division of Genetics, ICAR-Indian Agricultural Research Institute, New Delhi, India

Girish Chandra Pandey Department of Bioscience and Biotechnology, Banasthali University, Banasthali, India

Ashwani Pareek Stress Physiology and Molecular Biology Laboratory, School of Life Sciences, Jawaharlal Nehru University, New Delhi, India

Prashanti Patel Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai, India

Suprasanna Penna Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai, India

Asha Rani Department of Molecular Biology, Biotechnology and Bioinformatics, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India

Suchismita Roy School of Life Sciences, Jawaharlal Nehru University, New Delhi, India

Davinder Sharma ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Indu Sharma ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Rahul Sharma Genome Research Laboratory, School of Biotechnology, University of Jammu, Jammu, India

M. N. Shiva Kameshwari Department of Botany, Bangalore University, Bangalore, India

Mohan B. Singh Plant Molecular Biology and Biotechnology Laboratory, University of Melbourne, Parkville, VIC, Australia

Nidhi Singh Division of Genetics, ICAR-Indian Agricultural Research Institute, New Delhi, India

Rajender Singh ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Richa Singh Department of Molecular Biology, Biotechnology and Bioinformatics, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India

Sneh L. Singla-Pareek Plant Stress Biology, International Centre for Genetic Engineering and Biotechnology, New Delhi, India

Jyoti Taunk Department of Molecular Biology, Biotechnology and Bioinformatics, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India

Nepolean Thirunavukkarasu Division of Genetics, ICAR-Indian Agricultural Research Institute, New Delhi, India

Ratan Tiwari ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Prabodh Kumar Trivedi CSIR-National Botanical Research Institute, Council of Scientific and Industrial Research (CSIR-NBRI), Lucknow, India

Karnam Venkatesh ICAR-Indian Institute of Wheat and Barley Research, Karnal, India

Parivartan Vishal Genome Research Laboratory, School of Biotechnology, University of Jammu, Jammu, India

Karuna Yadav Nuclear Agriculture and Biotechnology Division, Bhabha Atomic Research Centre, Mumbai, India

Neelam R. Yadav Department of Molecular Biology, Biotechnology and Bioinformatics, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India

Ram C. Yadav Department of Molecular Biology, Biotechnology and Bioinformatics, Chaudhary Charan Singh Haryana Agricultural University, Hisar, India