

Maize Improvement


Shabir Hussain Wani
Zahoor Ahmad Dar • Gyanendra Pratap Singh
Editors

Maize Improvement

Current Advances in Yield, Quality,
and Stress Tolerance under Changing
Climatic Scenarios

 Springer

Editors

Shabir Hussain Wani 
Mountain Research Center for Field Crops,
Khudwani
Sher-e-Kashmir University of Agricultural
Sciences and Technology
Srinagar, Jammu and Kashmir, India

Zahoor Ahmad Dar
Dryland Agriculture Research Station
Sher-e-Kashmir University of Agricultural
Sciences and Technology
Srinagar, Jammu and Kashmir, India

Gyanendra Pratap Singh
ICAR-National Bureau of Plant Genetic
Resources
New Delhi, India

ISBN 978-3-031-21639-8 ISBN 978-3-031-21640-4 (eBook)
<https://doi.org/10.1007/978-3-031-21640-4>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer Nature Switzerland AG 2023

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors, and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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

Contents

Genome Diversity in Maize	1
Deepu Pandita, S. Parthasarathy, D. Dhivyapriya, R. Premkumar, Anu Pandita, and Shabir Hussain Wani	
Advancement in QTL Mapping to Develop Resistance Against European Corn Borer (ECB) in Maize	25
Asifa Shahzadi, Samra Farooq, Ali Razzaq, Fozia Saleem, Gelyn D. Sapin, Shabir Hussain Wani, and Vincent Pamugas Reyes	
Dissection of QTLs for Biotic Stress Resistance in Maize	41
Rajkumar U. Zunjare, K. T. Ravikiran, Firoz Hossain, Vignesh Muthusamy, Rahul D. Gajghate, Jayant S. Bhat, Mukesh Choudhary, and Nivedita Shettigar	
Genome-Wide Association Studies (GWAS) for Agronomic Traits in Maize	83
Baljeet Singh, Shabir Hussain Wani, Sarvjeet Kukreja, Vijay Kumar, and Umesh Goutam	
Genomic Selection in Maize Breeding	99
Vishal Singh and Amita Kaundal	
Transcriptional Factor: A Molecular Switch to Adapt Abiotic Stress Mechanisms in Maize	109
Muhammad Qudrat Ullah Farooqi, Sanathane Sachchithanathan, Muhammad Afzal, and Zahra Zahra	
Physiological and Biochemical Responses in Maize under Drought Stress	117
Suphia Rafique	

Current Biotechnological Approaches in Maize Improvement	137
Moutoshi Chakraborty, Saurab Kishore Munshi, Ashrafal Haque, Md. Abul Kalam Azad, Tofazzal Islam, Mobashwer Alam, and Muhammad J. A. Shiddiky	
Advances in Genome Editing for Maize Improvement	181
Samra Farooq, Asifa Shahzadi, Ali Razzaq, Fozia Saleem, Shabir Hussain Wani, and Karansher Sandhu	
Genetic Engineering to Improve Biotic and Abiotic Stress Tolerance in Maize (<i>Zea mays</i> L.)	195
Seema Sheoran, Manisha Saini, Vinita Ramtekey, Mamta Gupta, Mohd Kyum, and Pardeep Kumar	
Genetic Improvement of Specialty Corn for Nutritional Quality Traits	235
Firoz Hossain, Rajkumar U. Zunjare, Vignesh Muthusamy, Ashwani Kumar, Jayanthi Madhavan, Gopinath Ikkurti, Ashvinkumar Katral, Zahirul A. Talukder, Rashmi Chhabra, Gulab Chand, Vinay Bhatt, Irum Gul, Subhra J. Mishra, Hriipulou Duo, Suman Dutta, Nisrita Gain, Priyanka Chauhan, Shalma Maman, Shashidhar B. Reddappa, and Ravindra Kumar Kasana	
Advances in High-Throughput Phenotyping of Maize (<i>Zea Mays</i> L.) for Climate Resilience	259
P. S. Basavaraj, Jagadish Rane, M. D. Prathibha, K. M. Boraiah, and Mahesh Kumar	
Maize Improvement Using Recent Omics Approaches	289
Gopal W. Narkhede and K. N. S. Usha Kiranmayee	
Fungal Pathogen-Induced Modulation of Structural and Functional Proteins in <i>Zea mays</i> L.	303
Ankit Singh, Shalini Sharma, Gourav Choudhir, and Sushil Kumar	
Role of Plant Growth-Promoting Rhizobacteria Mitigating Drought Stress in Maize	323
Shifa Shaffique, Muhammad Imran, Shabir Hussain Wani, Anjali Pande, Waqas Rahim, Muhamad Aaqil khan, Sang-Mo Kang, and In-Jung Lee	