

T H E
PLANT
C E L L

Volume 32 Number 1 January 2020

The electronic form of this issue, available at www.plantcell.org, is the journal of record.

ON THE COVER



The fungal endophyte *Trichoderma virens* is well studied for its beneficial effects on its host plants, which include enhanced growth, destruction of soil-borne pathogens, and symbiont-induced systemic resistance (ISR) against foliar pathogens. Wang et al. (pages 166-185) identify the oxylipins 12-oxo-phytodienoic acid (12-OPDA), produced by the lipoxygenase LOX10, and α -ketol of octadecadienoic acid (KODA), produced by an unknown LOX enzyme, as important long-distance signals in maize required for ISR induction in response to *T. virens*. The cover image displays a lateral root of LOX10-YFP transgenic maize after treatment with *T. virens*, imaged on a Nikon FN1 C1si confocal microscope at 10x magnification, showing the accumulation of LOX10-YFP in root tissue in response to *T. virens*.

EDITORIAL

New at the Helm of *The Plant Cell*, a Journal for the Plant Science Community^[OPEN] 1
Blake C. Meyers

EDITOR PROFILE

Ralph Bock^[OPEN] 4
Tegan Armarego-Marriott

IN BRIEF

Phosphorus Sensing by LST8 Acts as a TOR Guide for Cell Growth in *Chlamydomonas*^[OPEN] 7
Gregory Bertoni

Ubiquitous Ubiquitin: The K63 Ubiquitinome^[OPEN] 8
Emily Breeze

Predicting Adult Complex Traits from Early Development Transcript Data in Maize^[OPEN] 10
Sunil K. Kenchanmane Raju

Stiffening Stems: Identification of the *stiff1* Gene Involved in Maize Stalk Strength^[OPEN] 12
Tegan Armarego-Marriott

Xylem-Mobile Oxylipins Are Critical Regulators of Induced Systemic Resistance in Maize^[OPEN] 13
Philip Carella

REVIEW

Celebrating 20 Years of Genetic Discoveries in Legume Nodulation and Symbiotic Nitrogen Fixation^[OPEN] 15
Sonali Roy, Wei Liu, Raja Sekhar Nandety, Ashley Crook, Kirankumar S. Mysore, Catalina I. Pislariu, Julia Frugoli, Rebecca Dickstein, and Michael K. Udvardi

Gene Expression in Nitrogen-Fixing Symbiotic Nodule Cells in *Medicago truncatula* and Other Nodulating Plants 42
Peter Mergaert, Attila Kereszt, and Eva Kondorosi

Editor in Chief

Blake C. Meyers

Senior Features Editor

Nancy A. Eckardt

Features Editor

Mary Williams

Science Editors

Greg Bertoni

Kathleen L. Farquharson

Nancy R. Hofmann

Jennifer Lockhart

Jennifer M. Mach

Managing Editor

Jennifer A. Regala

Production Manager

Susan L. Entwistle

Manuscript Manager

Annette Kessler

Publications Director

Nancy A. Winchester

Publisher

American Society of

Plant Biologists

Executive Director,

Crispin Taylor

Editorial Office

15501 Monona Drive

Rockville, Maryland 20855-2768

Telephone: 301/296-0908

Online at www.plantcell.org**BREAKTHROUGH REPORT****Phosphorus Availability Regulates TORC1 Signaling via LST8 in *Chlamydomonas***^[OPEN]

69

Inmaculada Couso, María Esther Pérez-Pérez, Megan M. Ford, Enrique Martínez-Force, Leslie M. Hicks, James G. Umen, and José L. Crespo

LARGE-SCALE BIOLOGY ARTICLES**Candidate Gene Networks for Acylsugar Metabolism and Plant Defense in Wild Tomato *Solanum pennellii***^[OPEN]

81

Sabyasachi Mandal, Wangming Ji, and Thomas D. McKnight

An Improved Recombineering Toolset for Plants

100

Javier Brumos, Chengsong Zhao, Yan Gong, David Soriano, Arjun P. Patel, Miguel A. Perez-Amador, Anna N. Stepanova, and Jose M. Alonso

Advanced Cataloging of Lysine-63 Polyubiquitin Networks by Genomic, Interactome, and Sensor-Based Proteomic Analyses

123

Natali Romero-Barrios, Dario Monachello, Ulla Dolde, Aloysius Wong, Hélène San Clemente, Anne Cayrel, Alexander Johnson, Claire Lurin, and Grégory Vert

RESEARCH ARTICLES**Transcriptome-Based Prediction of Complex Traits in Maize**^[OPEN]

139

Christina B. Azodi, Jeremy Pardo, Robert VanBuren, Gustavo de los Campos, and Shin-Han Shiu

A Large Transposon Insertion in the *stiff1* Promoter Increases Stalk Strength in Maize^[OPEN]

152

Zhihai Zhang, Xuan Zhang, Zhelong Lin, Jian Wang, Hangqin Liu, Leina Zhou, Shuyang Zhong, Yan Li, Can Zhu, Jinsheng Lai, Xianran Li, Jianming Yu, and Zhongwei Lin

Oxylipins Other Than Jasmonic Acid Are Xylem-Resident Signals Regulating Systemic Resistance Induced by *Trichoderma virens* in Maize

166

Ken-Der Wang, Eli J. Borrego, Charles M. Kenerley, and Michael V. Kolomiets

PHYTOCHROME INTERACTING FACTOR8 Inhibits Phytochrome A-Mediated Far-Red Light Responses in Arabidopsis

186

Jeonghwa Oh, Eunae Park, Kijong Song, Gabyong Bae, and Giltsu Choi

Arabidopsis ZINC FINGER PROTEIN1 Acts Downstream of GL2 to Repress Root Hair Initiation and Elongation by Directly Suppressing bHLH Genes^[OPEN]

206

Guoliang Han, Xiaocen Wei, Xinxu Dong, Chengfeng Wang, Na Sui, Jianrong Guo, Fang Yuan, Zhizhong Gong, Xuezhi Li, Yi Zhang, Zhe Meng, Zhuo Chen, Dazhong Zhao, and Baoshan Wang

AP2/ERF Transcription Factors Integrate Age and Wound Signals for Root Regeneration^[OPEN]

226

Bin-Bin Ye, Guan-Dong Shang, Yu Pan, Zhou-Geng Xu, Chuan-Miao Zhou, Ying-Bo Mao, Ning Bao, Lijun Sun, Tongda Xu, and Jia-Wei Wang

A Jasmonate-Activated MYC2-Dof2.1-MYC2 Transcriptional Loop Promotes Leaf Senescence in Arabidopsis

242

Mengna Zhuo, Yasuhito Sakuraba, and Shuichi Yanagisawa

Arabidopsis SINAT Proteins Control Autophagy by Mediating Ubiquitylation and Degradation of ATG13^[OPEN]

263

Hua Qi, Juan Li, Fan-Nv Xia, Jin-Yu Chen, Xue Lei, Mu-Qian Han, Li-Juan Xie, Qing-Ming Zhou, and Shi Xiao

CORRECTION

Waszczak, C., Kerchev, P.I., Mühlenbock, P., Hoeberichts, F.A., Van Der Kelen, K., Mhamdi, A., Willems, P., Denecker, J., Kumpf, R.P., Noctor, G., Messens, J., Van Breusegem, F. (2016). SHORT-ROOT deficiency alleviates the cell death phenotype of the *Arabidopsis catalase2* mutant under photorespiration-promoting conditions. *Plant Cell* 28: 1844–1859; DOI: <https://doi.org/10.1105/tpc.16.00038> 285

RETRACTION

Kim, T.-W., Youn, J.-H., Park, T.-K., Kim, E.-J., Park, C.-H., Wang, Z.-Y., Kim, S.-K., Kim, T.-W. (2018). OST1 Activation by the Brassinosteroid-Regulated Kinase CDG1-LIKE1 in Stomatal Closure. *Plant Cell* 30: 1848–1863; DOI: <https://doi.org/10.1105/tpc.18.00239> 286

[OPEN] Articles can be viewed without a subscription.



The Plant Cell (eISSN 1532-298X) is published monthly (one volume per year) by the American Society of Plant Biologists, 15501 Monona Drive, Rockville, MD 20855-2768, and is produced by Dartmouth Journal Services, Waterbury, VT. The institutional subscription price is based on type of institution; contact institution@aspb.org. Members of the American Society of Plant Biologists may subscribe to *The Plant Cell* for \$240. Nonmember individuals may subscribe for \$500. Students may subscribe for \$165. For matters regarding subscriptions, contact Suzanne Cholwek, ASPB, 15501 Monona Drive, Rockville, MD 20855-2768; telephone 301/296-0926; fax 301/251-6740; e-mail scholwek@aspb.org. Send all inquiries regarding display advertising to FASEB AdNet, 9650 Rockville Pike, Bethesda, MD 20814-3998; telephone 301/634-7791; fax 301/634-7153; e-mail adnet@faseb.org. The online version of *The Plant Cell* is available at www.plantcell.org.

Permission to Reprint: Permission to make digital or hard copies of part or all of a work published in *The Plant Cell* is granted without fee for personal or classroom use provided that copies are not made or distributed for profit or commercial advantage and that copies bear the full citation and the following notice on the first page: "Copyright American Society of Plant Biologists." For all other kinds of copying, request permission in writing from Nancy A. Winchester, Publications Director, ASPB headquarters.

This information is current as of September 19, 2020

Permissions	https://www.copyright.com/ccc/openurl.do?sid=pd_hw1532298X&issn=1532298X&WT.mc_id=pd_hw1532298X
eTOCs	Sign up for eTOCs at: http://www.plantcell.org/cgi/alerts/ctmain
CiteTrack Alerts	Sign up for CiteTrack Alerts at: http://www.plantcell.org/cgi/alerts/ctmain
Subscription Information	Subscription Information for <i>The Plant Cell</i> and <i>Plant Physiology</i> is available at: http://www.aspb.org/publications/subscriptions.cfm