On the Cover: Roots have the challenging task of sourcing nutrients from the environment to fulfill the needs of a developing plant. This occurs in an environment where the supply of nutrients is both spatially and temporally variable. The root system responds to conditions of nutrient deficiency at both physiological and morphological levels. In this issue, Gruber et al. (pp. 161–179) have characterised the response of the root system architecture to 12 different nutrient deficiencies. The authors found a diverse response of plant roots to the deficiency of single nutrients, with individual root traits behaving differently. Nutrient-dependent changes in root system architecture were then visualised and quantified using novel root plasticity charts, an example of which is shown in the background of the cover image. Such plasticity charts allow the degree of root plasticity from all measured root traits to be compared across the nutrient deficiencies. Cover design and images: Ricardo F.H. Giehl and Benjamin D. Gruber.

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Peter V. Minorsky

JOINT PLANT PHYSIOLOGY/THE PLANT CELL EDITORIAL

Manipulation and Misconduct in the Handling of Image Data. Mike Blatt and Cathie Martin

TOPICAL REVIEWS

The Formation and Function of Plant Cuticles. Trevor H. Yeats and Jocelyn K.C. Rose

Recent progress in the biochemistry and molecular biology of cuticle synthesis and function highlights major questions that will drive future research in this field.

BREAKTHROUGH TECHNOLOGIES


A transposon-based insertional mutagenesis system potentially enables mutation of every potato gene.

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM


Phosphorylation of a membrane-bound receptor kinase is essential for brassinosteroid signaling and normal plant growth and development in tomato.

[OPEN]Metabolic Interaction between Anthocyanin and Lignin Biosynthesis Is Associated with Peroxidase FaPRX27 in Strawberry Fruit. Ludwig Ring, Su-Ying Yeh, Stephanie Hücherig, Thomas Hoffmann, Rosario Blanco-Portales, Mathieu Fouche, Carmen Villatoro, Béatrice Denoyes, Amparo Monfort, José Luis Caballero, Juan Muñoz-Blanco, Jonathan Gershenson, and Wilfried Schwab

Metabolite profiling and quantitative genetics analyses uncover a strawberry peroxidase gene as an important factor controlling the flux to soluble (flavonoids) and insoluble (lignin) polyphenols in fruits.

[C][OPEN]Probing Arabidopsis Chloroplast Diacylglycerol Pools by Selectively Targeting Bacterial Diacylglycerol Kinase to Suborganellar Membranes. Bagyalakshmi Muthan, Rebecca L. Roston, John E. Froehlich, and Christoph Benning

Specific targeting of bacterial diacylglycerol kinase within the chloroplast determines whether or not it impairs the growth of Arabidopsis.
Loss of Starch Granule Initiation Has a Deleterious Effect on the Growth of Arabidopsis Plants Due to an Accumulation of ADP-Glucose.

Paula Ragel, Sebastian Streb, Regina Sahrawy, Maria Grazia Annunziata, John E. Lunn, Samuel Zeeman, and Ángel Mérida

ADP-Glc in the starch-deficient mutant ss3/ss4 sequesters adenine nucleotides, which limits photophosphorylation, leads to photooxidative stress, and causes the chlorotic and stunted phenotypes.

The Identification of Two Arabinosyltransferases from Tomato Reveals Functional Equivalency of Xyloglucan Side Chain Substituents.

Alex Schultink, Kun Cheng, Yong Bum Park, Daniel J. Cosgrove, and Markus Pauly

Expression of xyloglucan arabinofuranosyltransferases, identified from tomato using a comparative genomics approach, rescues growth and mechanical defects of an Arabidopsis mutant deficient for xyloglucan galactosylation.

RNA Interference Suppression of Genes in Glycosyl Transferase Families 43 and 47 in Wheat Starchy Endosperm Causes Large Decreases in Arabinoxylan Content.

Alison Lovegrove, Mark D. Wilkinson, Jackie Freeman, Till K. Pellny, Paola Tosi, Luc Saulnier, Peter R. Shewry, and Rowan A.C. Mitchell

Suppression of either of two wheat genes decreases the amount of arabinoxylan, the major cell wall polymer in wheat flour, by 50%.


Rong Ma, Shito S. Kaundun, Patrick J. Tranel, Chance W. Riggins, Daniel L. McGinness, Aaron G. Hager, Tim Hawkses, Eddie McInlooe, and Dean E. Riechers

Multiple herbicide resistance in waterhemp is due to distinct biochemical mechanisms for herbicide detoxification.

CELL BIOLOGY

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Qi Liu, Qingqing Yan, Yin Liu, Fang Hong, Zhenfei Sun, Leilei Shi, Ying Huang, and Yuda Fang

Distinct double-strand RNA binding domains of Dicer-like1 are important in binding of primary microRNAs and protein-protein interactions.

Abscisic Acid- and Stress-Induced Highly Proline-Rich Glycoproteins Regulate Root Growth in Rice.

I-Chieh Tseng, Chuan-Yang Hong, Su-May Yu, and Tuan-Hua David Ho

A class of plasma membrane-localized and highly Pro-rich glycoproteins are essential for abscisic acid- and stress-mediated repression of rice root elongation.

ML3 Is a NEDD8- and Ubiquitin-Modified Protein.

Jana P. Hakenjos, Sarosh Bejai, Quirin Ranftl, Carina Behringer, A. Corina Vlot, Birgit Absmanner, Ulrich Hammes, Stephanie Heinzlmeir, Bernhard Kuster, and Claus Schwechheimer

A previously uncharacterized lipid-binding protein is modified by the ubiquitin-like protein NEDD8 and by ubiquitin.

The Endocytosis of Cellulose Synthase in Arabidopsis Is Dependent on μ2, a Clathrin-Mediated Endocytosis Adaptn.

Logan Bashline, Shundai Li, Charles T. Anderson, Lei Lei, and Ying Gu

The abundance of primary cellulose synthases at the plasma membrane is dependent on clathrin-mediated endocytosis through the μ2 adaptin protein.

New Evidence for Differential Roles of L10 Ribosomal Proteins from Arabidopsis.

María Lorena Falcone Ferreyra, Romina Casadevall, Marianela Dana Luciani, Alejandro Pezza, and Paula Casati

Arabidopsis RIBOSOMAL PROTEIN L10 family members are nonredundant and contribute differentially to male gametophyte functionality and UV-B stress responses.
Structural Changes in Senescing Oilseed Rape Leaves at Tissue and Subcellular Levels Monitored by Nuclear Magnetic Resonance Relaxometry through Water Status. Maja Musse, Loriane De Franceschi, Mireille Cambert, Clément Sorin, Françoise Le Caheré, Agnès Burel, Alain Bouchereau, François Mariette, and Laurent Leport

Changes in cell water distribution during leaf senescence in oilseed rape plants are uncovered using NMR relaxometry combined with micrographs and physiological characterization.

ECOPHYSIOLOGY AND SUSTAINABILITY


A systematic characterization of root system architecture and quantification of multiple root traits describes changes in overall root plasticity in response to nutrient deficiencies.

Molecular and Physiological Analysis of Al³⁺ and H⁺ Rhizotoxicities at Moderately Acidic Conditions. Yasufumi Koba-yashi, Yuriko Kobayashi, Toshihiro Watana-be, Jon E. Shaff, Hiroyuki Ohia, Leon V. Kochian, Tadao Waga-tsuma, Thomas B. Kiirnaïde, and Hiroyuki Koyama

Rhizotoxicities of Al³⁺ and H⁺ occur at moderately acidic soil conditions (pH [water] = 5–5.5), especially under conditions of low Ca supply.

In Situ Speciation and Distribution of Toxic Selenium in Hydrated Roots of Cowpea. Peng Wang, Neal W. Menzie, Enzo Lambi, Brig id A. McKenna, Martin D. de Jonge, David J. Paterson, Daryl L. Howard, Chris J. Glover, Simon James, Peter Kappen, Bernt Johannessen, and Peter M. Kopititke

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GENES, DEVELOPMENT, AND EVOLUTION

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Enlarging Cells Initiating Apomixis in Hieracium praecatum Transition to an Embryo Sac Program prior to Entering Mitosis. Takashi Okada, Yingkao Hu, Matthew R. Tucker, Jennifer M. Taylor, Susan D. Johnson, Andrew Spriggs, Tohru Tsu-chi, Karsten Oelkers, Julio C.M. Rodrigues, and Anna M.G. Koltunow

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The citrus CsMAF1 protein, an interacting partner of the transcription activator-like effector and citrus canker elicitor PthA4, functions as a suppressor of canker development in sweet orange.
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Dynamics of the Shade-Avoidance Response in Arabidopsis. Andrea Ciolfi, Giovanna Sessa, Massimiliano Sassi, MarcoPossenti, SamantaSalvucci, MonicaCarabelli, GiorgioMorelli, and IdaRuberti

Light signaling genes are dynamically regulated during shade avoidance with adaptation to a low red/far-red light environment mediated by enhancing the activity of HY5, a master regulator of seedling deetiolation.


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