On the Cover: Diatoms constitute a major phylum of phytoplankton biodiversity in ocean and freshwater ecosystems. They are known to respond to variations of the environment, in particular to nutrient shortage, by the accumulation of triacylglycerol (or oil). Oil is considered a plausible alternative resource to fossil hydrocarbons; therefore, its accumulation in diatoms has become a critical question in the current decade. Triacylglycerol biosynthesis is connected with membrane glycerolipids, but the fine remodeling of membrane glycerolipids and the balance with storage glycerolipids upon nutrient shortage have not yet been characterized in a model organism. Abida et al. provide a reference for the diatom Phaeodactylum tricornutum and an in-depth comparison of glycerolipid changes occurring after variations of nitrogen and phosphate, and they describe two distinct glycerolipid remodeling programs. The cover shows a confocal microscopy image of P. tricornutum cells, with both triradiate and fusiform morphotypes, grown in artificial seawater lacking nitrogen. Chloroplasts appear in red (chlorophyll autofluorescence), and triacylglycerol droplets appear in yellow (Nile Red staining). Cover image credits: Coline Mei (Laboratoire de Physiologie Cellulaire et Végétale, Grenoble).

THANK YOU TO REVIEWERS

Acknowledgment of Plant Physiology Reviewers.

ON THE INSIDE

Peter V. Minorsky

BREAKTHROUGH TECHNOLOGIES

Efficient Generation of Marker-Free Transgenic Rice Plants Using an Improved Transposon-Mediated Transgene Reintegration Strategy. Xiaoqing Gao, Jie Zhou, Jun Li, Xiaowei Zou, Jianhua Zhao, Qingliang Li, Ran Xia, Ruifang Yang, Dekai Wang, Zhaoxue Zuo, Jumin Tu, Yuezhi Tao, Xiaoyun Chen, Qi Xie, Zengrong Zhu, and Shaohong Qu

An improved transposon-mediated transgene reintegration system efficiently generates marker-free transgenic rice plants.

[OPEN]Automated Update, Revision, and Quality Control of the Maize Genome Annotations Using MAKER-P Improves the B73 RefGen_v3 Gene Models and Identifies New Genes. MeiYee Law, Kevin L. Childs, Michael S. Campbell, Joshua C. Stein, Andrew J. Olson, Carson Holt, Nicholas Panchy, Jikai Lei, Dian Jiao, Carston M. Andorf, Carolyn J. Lawrence, Doreen Ware, Shin-Han Shiu, Yanni Sun, Ning Jiang, and Mark Yandell

Reannotation of the maize genome using MAKER-P results in many revised and new gene models.

SCIENTIFIC CORRESPONDENCE

Direct X-Ray Microtomography Observation Confirms the Induction of Embolism upon Xylem Cutting under Tension. José M. Torres-Ruiz, Steven Jansen, Brendan Choat, Andrew J. McElrone, Hervé Cochard, Timothy J. Brodribb, Eric Badel, Regis Burlett, Pauline S. Bouche, Craig R. Brodersen, Shan Li, Hugh Morris, and Sylvain Delzon

Direct visualization shows enhanced embolism of xylem samples when they are collected under tension.

RESEARCH ARTICLES

BIOCHEMISTRY AND METABOLISM

[OPEN]Transgenic Perturbation of the Decarboxylation Phase of Crassulacean Acid Metabolism Alters Physiology and Metabolism But Has Only a Small Effect on Growth. Louisa V. Dever, Susanna F. Boxall, Jana Knečová, and James Hartwell

Blocking malate decarboxylation in a Crassulacean acid metabolism species leads to loss of carbon dioxide fixation in the dark, but has minimal impact on growth.

Continued on next page
Proteome Analysis of Cytoplasmatic and Plastidic β-Carotene Lipid Droplets in Dunaliella bardawil. Lital Davidi, Yishai Levin, Shifra Ben-Dor, and Uri Pick

Proteome analysis of two types of lipid droplets in Dunaliella bardawil uncovers enzymes involved in β-carotene biosynthesis and lipid droplet biogenesis.

Wax Layers on Cosmos bipinnatus Petals Contribute Unequally to Total Petal Water Resistance. Christopher Buschhaus, Dana Hager, and Reinhard Jetter

Cuticular waxes of petals are distinct from those of leaves and stems, and limit water loss from the flower surface as effectively as waxes from the fruits of many species, but less effectively than those of leaves.

The Last Step in Cocaine Biosynthesis Is Catalyzed by a BAHD Acyltransferase. Gregor Wolfgang Schmidt, Jan Jirschitzka, Tiffany Porta, Michael Reichelt, Katrin Luck, José Carlos Pardo Torre, Franziska Dolke, Emmanuel Varesio, Gérard Hopfgartner, Jonathan Gershenzon, and John Charles D’Auria

The terminal step in cocaine biosynthesis is catalyzed by an acyltransferase that utilizes benzoyl-CoA and methylecgonine as substrates and is localized to the spongy mesophyll.

Consequences of a Deficit in Vitamin B₆ Biosynthesis de Novo for Hormone Homeostasis and Root Development in Arabidopsis. Svetlana Boycheva, Ana Dominguez, Jakub Rolcik, Thomas Boller, and Teresa B. Fitzpatrick

Deficits in de novo vitamin B₆ biosynthesis impair hormone homeostasis and root development but are a consequence of differential regulation of the genes.

Membrane Glycerolipid Remodeling Triggered by Nitrogen and Phosphorus Starvation in Phaeodactylum tricornutum. Heni Abida, Lina-Juana Dolch, Coline Mé, Valeria Villanova, Melissa Conte, Maryse A. Block, Giovanni Finazzi, Olivier Bastien, Leila Tirichine, Chris Bowler, Fabrice Rébeillé, Dimitris Petroutsos, Juliette Jouhet, and Eric Marchal

Nitrogen and phosphorus limitations trigger distinct remodeling processes and adaptive responses at the level of membrane and storage glycerolipids in a marine model diatom.

CELL BIOLOGY

The Arabidopsis Vacuolar Sorting Receptor1 Is Required for Osmotic Stress-Induced Abscisic Acid Biosynthesis. Zhen-Yu Wang, Chris Gehring, Jianhua Zhu, Feng-Min Li, Jian-Kang Zhu, and Liming Xiong

A vacular receptor is required for osmotic stress regulation of abscisic acid biosynthesis by maintaining intracellular pH homeostasis.

Blocking Single-Stranded Transferred DNA Conversion to Double-Stranded Intermediates by Overexpression of Yeast DNA REPLICATION FACTOR A. Mery Dafny-Yelin, Avner Levy, Raz Dafny, and Tzvi Tzfira

Double-stranded intermediates play a significant role in the process of Agrobacterium T-DNA integration into the host genome.

Two Cytoplasmic Effectors of Phytophthora sojae Regulate Plant Cell Death via Interactions with Plant Catalases. Meixiang Zhang, Qi Li, Tingli Liu, Li Liu, Danyu Shen, Ye Zhu, Peihan Liu, Jian-Min Zhou, and Daolong Dou

Oomycete effectors hijack host catalases to regulate plant programmed cell death and H₂O₂ homeostasis.
ECOPHYSIOLOGY AND SUSTAINABILITY

Malate Synthesis and Secretion Mediated by a Manganese-Enhanced Malate Dehydrogenase Confers Superior Manganese Tolerance in *Stylosanthes guianensis*. Zhijian Chen, Lili Sun, Pandao Liu, Guodao Liu, Jiang Tian, and Hong Liao

The superior manganese tolerance of a tropical legume is achieved by the coordination of internal and external manganese detoxification via enhanced malate synthesis.

GENES, DEVELOPMENT, AND EVOLUTION


Wheat transcription factors located on chromosome group 2 drive the yield-related production of supernumerary spikelets.

Seed tissue-specific gene expression of pectin methylesterases mediates seed cell wall pectin alterations to control the seed coat permeability and germination.

MEMBRANES, TRANSPORT, AND BIOENERGETICS


A unique mitochondrial ion channel affects organelle physiology and its lack is associated with senescence in the model plant Arabidopsis.

Decreasing Electron Flux through the Cytochrome and/or Alternative Respiratory Pathways Triggers Common and Distinct Cellular Responses Dependent on Growth Conditions. Kristina Kühn, Guangkun Yin, Owen Duncan, Simon R. Law, Szymon Kubiszewski-Jakubiak, Paravinder Kaur, Etienne Meyer, Yin Wang, Catherine Colas des Francs Small, Estelle Giraud, Reena Narsai, and James Whelan

Diverse signaling pathways are activated by perturbation of mitochondrial function under different growth conditions.

SIGNALING AND RESPONSE


The secondary metabolite sulforaphane is produced during the hypersensitive response and is involved in protection against infections.

A nematode effector peptide is modified and processed in planta and the resulting glycopeptide interacts with a plant membrane-associated receptor to facilitate parasite infection.


An iron-binding protein causes degradation of proteins involved in the iron deficiency response.

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