On the Cover: In each plant lineage, some pathways have evolved that diverge from primary metabolism and lead to the synthesis of specialized compounds (secondary metabolites) with diverse ecological roles, many of them involving defense. Some of these compounds can be toxic to a predatory organism through external or internal contact and are occasionally synthesized in dedicated cells such as glandular trichomes, perhaps because they divert primary metabolic pathways and also because they might be toxic to the plant itself. The background image shows the surface of a leaf of a wild tomato (Solanum habrochaites f. sp. glabratum) with its dense distribution of glandular trichomes and (out of focus) long, non-glandular trichomes. Superimposed is a scanning electron micrograph image of a single glandular trichome, which serves as the site of synthesis and accumulation of methylketones (mostly 2-tridecanone and 2-undecanone), compounds that are toxic to many insects. In this issue, Ben-Israel et al. (pp. 1952–1964) investigated the polygenic basis for the monophyletic divergence of this metabolic pathway (found in only one wild species of tomato) from fatty acid biosynthesis. Comprehensive analysis of progeny derived from an interspecific cross between the cultivated and wild species revealed tight correlation between the shape of the glandular trichomes and their methylketone content. In addition, the presence of a wild species-specific transcript for a novel thioesterase, named Methylketone Synthase2 (MKS2), showed significant correlation with methylketone accumulation as well as epistatic interactions with the previously identified gene MKS1 in this pathway. Cover design and leaf picture made by Eran Pichersky and Eyal Fridman. Photograph of the scanning electron micrograph taken by Jihong Wang.
SCIENTIFIC CORRESPONDENCE


RESEARCH ARTICLES

BIOCHEMICAL PROCESSES AND MACROMOLECULAR STRUCTURES

The Arabidopsis DCR Encoding a Soluble BAHD Acyltransferase Is Required for Cutin Polyester Formation and Seed Hydration Properties. David Panikashvili, Jian Xin Shi, Lukas Schreiber, and Asaph Alaroni

Deciphering Transcriptional and Metabolic Networks Associated with Lysine Metabolism during Arabidopsis Seed Development. Ruthie Angelovici, Aaron Fait, Xiaohong Zhu, Jedrzej Szymanski, Ester Feldmesser, Alisdair R. Fernie, and Gad Galili

BIOENERGETICS AND PHOTOSYNTHESIS

The Variegated Mutants Lacking Chloroplastic FtsHs Are Defective in D1 Degradation and Accumulate Reactive Oxygen Species. Yusuke Kato, Eiko Miura, Kunio Ido, Kentaro Iifu, and Wataru Sakamoto

A Cytoplasmically Inherited Barley Mutant Is Defective in Photosystem I Assembly Due to a Temperature-Sensitive Defect in ycf3 Splicing. Alejandra Mabel Landau, Heiko Lokstein, Henrik Vibe Scheller, Verónica Lainez, Sara Maldonado, and Alberto Raúl Prina

Effect of Rubisco Activase Deficiency on the Temperature Response of CO₂ Assimilation Rate and Rubisco Activation State: Insights from Transgenic Tobacco with Reduced Amounts of Rubisco Activase. Wataru Yamori and Susanne von Caemmerer

CELL BIOLOGY AND SIGNAL TRANSDUCTION

Arabidopsis FAB1/PIKfyve Proteins Are Essential for Development of Viable Pollen. Paul Whitley, Steven Hinz, and James Doughty

GTP Is Required for the Microtubule Catastrophe-Inducing Activity of MAP200, a Tobacco Homolog of XMAP215. Takahiro Hamada, Tomohiko J. Itoh, Takashi Hashimoto, Teruo Shimmen, and Seiji Sonobe

Peroxisomes Are Required for in Vivo Nitric Oxide Accumulation in the Cytosol following Salinity Stress of Arabidopsis Plants. Francisco J. Corsa, Makoto Hayashi, Shoji Mano, Mikio Nishimura, and Juan B. Barroso

The Association of the Arabidopsis Actin-Related Protein2/3 Complex with Cell Membranes Is Linked to Its Assembly Status But Not Its Activation. Simeon O. Kotchoni, Taya Zakharova, Eileen L. Mallery, Jie Le, Salah El-Din El-Assal, and Daniel B. Szymanski

DEVELOPMENT AND HORMONE ACTION

Untranslated Regions of a Mobile Transcript Mediate RNA Metabolism. Anjan K. Banerjee, Tian Lin, and David J. Hannapel

Phased Control of Expansin Activity during Leaf Development Identifies a Sensitivity Window for Expansin-Mediated Induction of Leaf Growth. Jennifer Sloan, Andreas Backhaus, Robert Malinovskii, Simon McQueen-Mason, and Andrew J. Fleming

Mechanical Stimuli Modulate Lateral Root Organogenesis. Gregory L. Richter, Gabriele B. Monshausen, Alexandra Krol, and Simon Gilroy


Distal Expression of knotted1 in Maize Leaves Leads to Reestablishment of Proximal/Distal Patterning and Leaf Dissection. Julio Ramirez, Nathalie Bolduc, Damon Lisch, and Sarah Hake

Continued on next page
Expression of the Arabidopsis Mutant ab1 Gene Alters Abscisic Acid Sensitivity, Stomatal Development, and Growth Morphology in Gray Poplars. Matthias Arend, Jörg-Peter Schnitzler, Barbara Ehlting, Robert Hänisch, Theo Lange, Heinz Rennenberg, Axel Himmelbach, Erwin Grill, and Jörg Fromm

ENVIRONMENTAL STRESS AND ADAPTATION TO STRESS

Altered Architecture and Enhanced Drought Tolerance in Rice via the Down-Regulation of Indole-3-Acetic Acid by TLD1/OsGH3.13 Activation. Sheng-Wei Zhang, Chen-Hui Li, Jia Cao, Yong-Cun Zhang, Su-Qiao Zhang, Yu-Feng Xia, Da-Ye Sun, and Ying Sun


Specific Domain Structures Control Abscisic Acid-, Salicylic Acid-, and Stress-Mediated SIZ1 Phenotypes. Mi Sun Cheong, Hyoeng Cheol Park, Mi Ju Hong, Jiyoung Lee, Wonkyun Choi, Jing Bo Jin, Hans J. Bohnert, Sang Yeol Lee, Ray A. Bressan, and Dae-Jin Yun


GENETICS, GENOMICS, AND MOLECULAR EVOLUTION

Extensive Structural Renovation of Retrogenes in the Evolution of the Populus Genome. Zhenglin Zhu, Yong Zhang, and Manyuan Long

Multiple Biochemical and Morphological Factors Underlie the Production of Methylketones in Tomato Trichomes. Imri Ben-Israel, Geng Yu, Michael B. Austin, Nazmul Bhuiyan, Michele Auldridge, Thuang Nguyen, Ines Schauvinhold, Joseph P. Noel, Eran Pichersky, and Eyal Fridman

Nucleotide Polymorphism in the Wheat Transcriptional Activator Spa Influences Its Pattern of Expression and Has Pleiotropic Effects on Grain Protein Composition, Dough Viscoelasticity, and Grain Hardness. Catherine Ravel, Pierre Martre, Isabelle Remeuf, Mireille Dardevet, Redouane El-Malki, Jacques Bordes, Nathalie Duchateau, Dominique Brunel, François Balfourier, and Gilles Charmet

PLANTS INTERACTING WITH OTHER ORGANISMS

Enhanced Nodulation and Nitrogen Fixation in the Abscisic Acid Low-Sensitive Mutant enhanced nitrogen fixation1 of Lotus japonicus. Akiyoshi Tominaga, Maki Nagata, Koichi Futsuki, Hidetoshi Abe, Toshiki Uchiumi, Mikiko Abe, Ken-ichi Kucho, Masatsugu Hashiguchi, Ryo Akashi, Ann M. Hirsch, Susumu Arima, and Akihiro Suzuki

Identification of Defense Compounds in Barbarea vulgaris against the Herbivore Phyllotreta nemorum by an Ecometabolomic Approach. Vera Kuzina, Claus Thorn Ekstrøm, Sven Bode Andersen, Carl Erik Olsen, and Søren Bak


An ABC Transporter Mutation Alters Root Exudation of Phytochemicals That Provoked an Overhaul of Natural Soil Microbiota. Dayakar V. Badri, Naira Quintana, Elie G. El Kassis, Hye Kyong Kim, Young Hae Choi, Akifumi Sugiyama, Robert Verpoorte, Enrico Martinova, Daniel K. Manter, and Jorge M. Vivanco

Native Plant and Microbial Contributions to a Negative Plant-Plant Interaction. Gurdeep Bains, Amutha Sampath Kumar, Thimmaraju Rudrappa, Emily Alff, Thomas E. Hanson, and Harsh P. Bais

Airborne Induction and Priming of Plant Defenses against a Bacterial Pathogen. Hwe-Su Yi, Martin Heil, Rosa M. Adame-Alearez, Daniel J. Ballhorn, and Choong-Min Ryu
WHOLE PLANT AND ECOPHYSIOLOGY

Stomatal Crypts Have Small Effects on Transpiration: A Numerical Model Analysis. Anita Roth-Nebelsick, Foteini Hassiotou, and Erik J. Veneklaas 2018

SYSTEMS BIOLOGY, MOLECULAR BIOLOGY, AND GENE REGULATION

[OA][W]DkMyb4 Is a Myb Transcription Factor Involved in Proanthocyanidin Biosynthesis in Persimmon Fruit. Takashi Akagi, Ayako Ikegami, Tomoyuki Tsujimoto, Shozo Kobayashi, Akihiko Sato, Atsushi Kono, and Keizo Yonemori 2028


[OA][W]Replication Protein A (RPA1a) Is Required for Meiotic and Somatic DNA Repair But Is Dispensable for DNA Replication and Homologous Recombination in Rice. Yuxiao Chang, Liang Gong, Wenyu Yuan, Xingwang Li, Guoxing Chen, Xianghua Li, Qifa Zhang, and Changyin Wu 2162


CORRECTIONS


[C] Some figures in this article are displayed in color online but in black and white in the print edition.

[W] Indicates Web-only data.

[OA] Open Access articles can be viewed online without a subscription.