

Functional Plant Biology

Contents

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Rapid communication: A comment on scaling methane emissions from vegetation and grazing ruminants in New Zealand

Francis M. Kelliher, Harry Clark, Zheng Li, Paul C. D. Newton, Anthony J. Parsons and Gerald Rys

613–615

The authors test an extrapolation inspired by Keppler *et al.* (2006), whereby Lowe (2006) postulated that forests may produce as much methane as pasture grazed by ruminants. They compile and analyse vegetation, ruminant and soils data from New Zealand. Their test complements the paper by Kirschbaum *et al.* published in the previous issue of FPB (*Functional Plant Biology* 33, 521–530).

Monitoring programmed cell death triggered by mild heat shock in soybean-cultured cells

Anna Zuppini, Valentina Bugno and Barbara Baldan

617–627

This work shows that programmed cell death (PCD) plays a role in plant response to heat stress. Mild heat treatment on soybean-cultured suspension cells induced cell death involving H₂O₂ production, caspase-like activation, cytoplasmic shrinkage, cytochrome *c* release and nuclear alterations. This suggests the occurrence of PCD through a caspase-like-dependent pathway.

Transformation of cambial tissue *in vivo* provides an efficient means for induced somatic sector analysis (ISSA) and gene testing in stems of woody plant species

Kim S. Van Beveren, Antanas V. Spokevicius, Josquin Tibbits, Qing Wang and Gerd Bossinger

629–638

This paper describes how transgenes can be efficiently introduced directly into mature cambial cells of a diverse range of tree species (poplar, eucalypts and pines), and how transgenic somatic tissue sectors can be created. This presents an opportunity to study specific gene function during secondary growth processes as well as determining cell fate and pattern formation during these late stages of plant development.

Phylogenetic relationship of potato *CAT1* and *CAT2* genes, their differential expression in non-photosynthetic organs and during leaf development, and their association with different cellular processes

Isabel Santos, Helena Pires, José M. Almeida, Fernanda Fidalgo, Ana Confraria, Márcia Duarte, Júlio Borlido and Roberto Salema

639–651

Santos *et al.* characterise two potato catalase genes (*CAT1* and *CAT2*), providing evidence that the genes are not closely related. This contradicts the closeness previously ascribed to these genes, which arose through construction of phylogenetic trees based on wrongly identified cDNA. It shows, for the first time, that the expression of catalase genes is dependent on leaf age, and confirmed their organ-dependent expression, allowing their association with different cellular processes.

Potential organic and inorganic N uptake by six *Eucalyptus* species

C. R. Warren

653–660

This paper is a significant advance on previous studies examining plants growing in their natural habitat, which may have confounded adaptation with acclimation. Warren tackles the topic of nitrogen preferences and amino acid utilisation in *Eucalyptus* spp. While previous studies have demonstrated that nitrate is poorly absorbed by many tree species, this is the first to examine N uptake in two common gardens. The experimental design permits analysis of acclimation versus adaptation in plant 'preference' for different N forms.

Cover illustration: Immunolocalisation of catalase 2 (CAT2) of potato. Fluorescent microscopy image showing CAT2 (yellow-green spots) localised in perivascular mesophyll cells of mature leaf. Immunoelectron microscopy image shows that inside the cells CAT2 is restricted to the crystalline inclusion of peroxisome. (See Santos *et al.* pp. 639–651.)

AtMHX is an auxin and ABA-regulated transporter whose expression pattern suggests a role in metal homeostasis in tissues with photosynthetic potential
Ora David-Assael, Irina Berezin, Noa Shoshani-Knaani, Helen Saul, Talya Mizrachy-Dagri, Jianxin Chen, Emil Brook and Orit Shaul 661–672

David-Assael *et al.* report expression analysis of AtMHX, which encodes a vacuolar transporter that can carry Mg^{2+} , Zn^{2+} , and Fe^{2+} ions. Detailed analysis of AtMHX expression is important for understanding the molecular mechanisms that regulate the homeostasis of these metals. Very little is known about transporters involved in Mg^{2+} balancing in plants. A GUS reporter gene is used to determine the tissue distribution of expression, and to show regulation by auxin and abscisic acid. In addition, the authors make the interesting observation that an intron in the 5' UTR is essential for expression.

Cadmium tolerance and hyperaccumulation by *Thlaspi caerulescens* populations grown in hydroponics are related to plant uptake characteristics in the field
Catherine Keller, Saliou Diallo, Claudia Cosio, Nevena Basic and Nicole Galland 673–684

This work contributes to the understanding of heavy metal hyperaccumulation and Cd tolerance to Cd in *Thlaspi caerulescens* populations originating on non-metalliferous soils using field data, and experiments in controlled conditions with various metalliferous and non-accumulator *Thlaspi* populations. The authors found a strong correlation in Cd accumulation between the non-metalliferous plants in their native soil and the behavior of plants in hydroponic solution.

Molecular and biochemical characterisation of polyphenol oxidases in developing kernels and senescing leaves of wheat (*Triticum aestivum*)
Aravind K. Jukanti, Phil L. Bruckner and Andreas M. Fischer 685–696

Jukanti *et al.* build on their recent discovery of the wheat polyphenol oxidase (PPO) multigene family, and reports substantial, novel findings on the developmental regulation of these enzymes at the transcriptional and posttranscriptional level. The authors characterised the expression of PPO genes in wheat, confirming that the gene AY596268 largely controls PPO levels and activities in both maturing kernels and senescing leaves.

Cryptochrome 2 is involved in betacyanin decomposition induced by blue light in *Suaeda salsa*
Wang Chang-Quan and Liu Tao 697–702

This paper reports analyses of the molecular and biochemical dynamics of betacyanin in *Suaeda salsa* in relation to morphogenetic effects of blue light. Betacyanin causes the red colour in dark-grown *S. salsa* seedlings, accumulating in darkness and degraded under blue light. The photoreceptor is Cryptochrome 2 (a flavoprotein), which reacts to blue and UV-A light, and the authors report on its light regulation mechanism.

Short communication: A genetic mutation that reduces calcium oxalate content increases calcium availability in *Medicago truncatula*
Paul A. Nakata and Michele M. McConn 703–706

In this *Short communication* Nakata and McConn demonstrate improvement of the nutritional quality of plants through the genetic manipulation of its oxalate content (an antinutrient and potential toxin). The authors have produced and identified an edible plant with a decreased level of oxalate. While the extent to which a plant can be nutritionally improved through genetic alterations has yet to be determined, the recent identification and isolation of near-isogenic lines of the forage legume, *Medicago truncatula*, differing in calcium oxalate content begins to fill this gap in our knowledge.