

# Functional Plant Biology

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## Contents

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*Review:* Plant functional genomics: opportunities in microarray databases and data mining

**Gavin C. Kennedy and Iain W. Wilson**      295–314

The goal of this paper is to illustrate how microarray technology is advancing plant functional genomics, and that the effective application of microarray data is increasingly dependent on sophisticated data repositories to manage and analyse the enormous volumes of data being generated by plant research.

*Review:* Ethylene involvement in the regulation of Fe-deficiency stress responses by Strategy I plants

**Francisco J. Romera and Esteban Alcántara**      315–328

Plants have developed various strategies for the acquisition of iron (Fe), and are divided on the basis of strategy into two classes: Strategy I and Strategy II. This review provides an update on the potential role of ethylene in the physiological responses involved in the Fe deficiency-induced enhancement of Fe acquisition capability in Strategy I plants.

Responses of *Xanthoria parietina* thalli to environmentally relevant concentrations of hexavalent chromium

**Luigi Sanità di Toppi, Rita Musetti, Rosita Marabottini, Maria Grazia Corradi, Zulema Vattuone, Maria Augusta Favali and Maurizio Badiani**      329–338

Lichens can be exploited as bioindicators and biomonitors of heavy metal pollution. These authors investigate the response of a lichen to hexavalent Cr. They describe the effects of a low concentration of Cr on the activity of a variety of redox enzymes, pool sizes of ascorbate, GSH, and MDA, and the effects on cell ultrastructure.

Genetic control of lysine metabolism in maize endosperm mutants

**Ricardo A. Azevedo, Catherine Damerval, Peter J. Lea, Jacques Landry, Cláudia M. Bellato, Lyndel W. Meinhardt, Martine Le Guilloux, Sonia Delhaye, Alejandro A. Toro, Salete A. Gaziola, Vanderlei A. Varisi and Priscila L. Gratão**      339–348

This paper describes lysine metabolism and the synthesis of storage proteins in three maize mutants. High-lysine mutants showed differences in free lysine accumulation, storage protein composition, and the activities of enzymes controlling lysine metabolism. This provides useful information on the effects of the mutations on protein synthesis and lysine metabolism.

Molecular cloning, characterisation and expression of two catalase genes from peach

**Francesca Bagnoli, Susanna Danti, Valentina Magherini, Radiana Cozza, Anna M. Innocenti and Milvia L. Racchi**      349–357

These authors isolated two catalase genes from peach, and surveyed the localisation of RNA expression of these genes in different tissues. One of the catalases is associated with photorespiration and a role in stress response is suggested for the other. This is a solid first step in understanding the action of catalases in a woody perennial.

*Cover illustration:* Ferric reducing capacity of Fe-sufficient, Fe-deficient, and Co-treated Fe-deficient tomato plants. Pink colour is due to the Fe<sup>2+</sup>-ferrozine complex and the stronger the colour, the higher the ferric reducing capacity. (see Romera *et al.* pp. 315–328).

Role of hydrogen peroxide and the redox state of ascorbate in the induction of antioxidant enzymes in pea leaves under excess light stress

**Jose A. Hernández, Carolina Escobar, Gary Creissen and Phil M. Mullineaux** 359–368

These authors analysed physiological and molecular responses of two pea varieties to excess light stress. They measured lipid peroxidation, protein oxidation, reduced and oxidised ascorbate and H<sub>2</sub>O<sub>2</sub> levels, as well as levels of mRNAs encoding crucial enzymes of AOS metabolism. Roles for H<sub>2</sub>O<sub>2</sub> and the redox status of ascorbate in signalling of photooxidative stress are suggested.

Programmed cell death during microgenesis in a Honglian CMS line of rice is correlated with oxidative stress in mitochondria

**Shaoqing Li, Cuixiang Wan, Jin Kong, Zaijun Zhang, Yangsheng Li and Yingguo Zhu** 369–376

This paper describes the programmed cell death (PCD) that accompanies pollen development (or lack of it) in a Honglian CMS line of rice, and the interplay among cytoplasmic male sterility, PCD and oxidative stress. The authors correlate this with increasing ROS production by isolated mitochondria and lowering ROS defenses in mitochondrial extracts.

Tissue-specific changes in remobilisation of fructan in the xerophytic tussock species *Festuca novae-zelandiae* in response to a water deficit

**Greg T. Clark, Ellen Zuther, Heather A. Outred, Michael T. McManus and Arnd G. Heyer** 377–389

This paper describes responses of carbohydrate metabolism to drought in the xerophytic grass *Festuca novae-zelandiae*. During water deficit, the grass accumulated fructans in the apical meristem, which are converted to sucrose upon severe desiccation. These findings show that this species protects its meristem from drought by vitrification, and adds to the discussion of fructan involvement in abiotic stress tolerance.

Solute is imported to elongating root cells of barley as a pressure driven-flow of solution

**Nick Gould, Michael R. Thorpe, Peter E. H. Minchin, Jeremy Pritchard and Philip J. White** 391–397

This paper addresses the question of whether the flow of resources from phloem to sink tissues is driven by symplastic pressure gradient. Hydrostatic pressure difference between sieve tube and symplastically connected sink cells of barley is measured directly. Changes in this pressure difference are used to explain observed differences in solute import to elongating root cells.

Characterization of diurnal photosynthetic rhythms in the marine diatom *Skeletonema costatum* grown in synchronous culture under ambient and elevated CO<sub>2</sub>

**Xiongwen Chen and Kunshan Gao** 399–404

Changes in photosynthetic properties for the marine diatom *Skeletonema costatum* grown under ambient and slightly elevated CO<sub>2</sub> concentrations are characterised. The diurnal photosynthetic rhythms reported add to our understanding of these important marine primary producers. Changes in photosynthetic CO<sub>2</sub> affinity suggest a daily regulation of the affinity of cells for external inorganic carbon, regulating the extent to which external C<sub>i</sub> may limit photosynthesis.