

# Functional Plant Biology

## Contents

Volume 35      Issue 4      2008

Editorial:

New editorial structure for *Functional Plant Biology*

**Rana Munns**

*Review: Medicago truncatula* as a model for understanding plant interactions with other organisms, plant development and stress biology: past, present and future  
**Ray J. Rose** 253–264

*Medicago truncatula* has come of age as a model legume. It has contributed to important advances in understanding the rhizobial and mycorrhizal legume symbiosis, but *M. truncatula* is more than a model for plant-microbe interactions. This review includes consideration of the increasing literature on the interaction with pests and pathogens, plant development and stress biology. *M. truncatula* has an important role to play in functional genomics and agricultural sustainability.

Regulation of Ku gene promoters in *Arabidopsis* by hormones and stress  
**Wen-Chi Chang, Yung-Kai Wang, Pei-Feng Liu, Yu-Fang Tsai, Lih-Ren Kong Chi-Kai Lin, Chang-Hsien Yang and Rong-Long Pan** 265–280

Regulation of *AtKu* promoters in *Arabidopsis* was extensively investigated in this study. Evidence revealed minimal lengths of about 400 bp and 600 bp upstream of transcription start site is presumably required for functional promoters of *AtKu70* and *AtKu80*, respectively. The expressions of *AtKu* genes could be regulated by developmental programs as well as by plant hormones and environmental stresses in various manners.

Exploring the sensitivity of thermal imaging for *Plasmopara viticola* pathogen detection in grapevines under different water status  
**Manfred Stoll, Hans R. Schultz and Beate Berkelmann-Loehnertz** 281–288

Due to the high spatial and temporal sensitivity, infrared thermography proved to be a suitable tool for analysis on the occurrence as well as on the effects of *Plasmopara viticola* under different plant water status and under controlled conditions in the greenhouse. Contrasting thermal effects due to the pathogen attack were found between measurements on well irrigated and water stressed plants.

Vessel wall vibrations: trigger for embolism repair?  
**Sebastiano Salleo, Patrizia Trifilò and Maria Assunta Lo Gullo** 289–297

Xylem embolism repair is preceded by starch depolymerisation in vessel-associated cells (VAC) of *Laurus nobilis* L. twigs. We tested the hypothesis that conduit wall vibrations during cavitation may be sensed by VAC inducing starch-to-sugar conversion. Sonication proved to be a good simulator of cavitation in inducing starch depolymerisation which suggests a possible bio-physical nature for the signal initiating embolism repair.

The role of phytochrome C in gravitropism and phototropism in *Arabidopsis thaliana*  
**Prem Kumar, Crystal E. Montgomery and John Z. Kiss** 298–305

The red-light-absorbing phytochromes (phy A–E in dicots) are one of the key families of photoreceptors in plants. This paper shows that phytochrome C, one of the more minor forms, has specific roles in both gravitropism and phototropism. This report also supports the growing body of evidence demonstrating cross talk between phytochromes and blue-light photoreceptors.

*Cover illustration:* Diagram of *in vitro* development of meristems in *Medicago truncatula* wild type Jemalong (Jem) and the Jemalong 2HA (2HA) embryogenic mutant (see Rose pp. 253–264). Photograph of *M. truncatula* flower courtesy Shih Chen, University of Newcastle.

Carbon partitioning in N<sub>2</sub> fixing *Medicago sativa* plants exposed to different CO<sub>2</sub> and temperature conditions  
**Iker Aranjuelo, Juan J. Irigoyen, Manuel Sánchez-Díaz and Salvador Nogués** 306–317

This study, conducted in exclusively atmospheric N<sub>2</sub>-fixing alfalfa plants grown in temperature gradient greenhouses (TGG), analysed C and N interaction between the plant and the bacterial symbiont during the photosynthetic acclimation of plants exposed to elevated CO<sub>2</sub> and temperature conditions. The isotopic <sup>13</sup>C/<sup>12</sup>C composition (δ<sup>13</sup>C) inside the TGG was modified in order to study C allocation. The experimental design also enabled the authors to harvest and analyse the key enzymes from the nodules' plant and bacteroid fractions that are involved in nodule C and N metabolism.

Regulation of sulfate uptake, expression of the sulfate transporters Sultr1;1 and Sultr1;2, and APS reductase in Chinese cabbage (*Brassica pekinensis*) as affected by atmospheric H<sub>2</sub>S nutrition and sulfate deprivation  
**Aleksandra Koralewska, C. Elisabeth E. Stuiver, Freek S. Posthumus, Stanislav Kopriva, Malcolm J. Hawkesford and Luit J. De Kok** 318–327

The activity and expression of sulfate transporters and APS reductase in Chinese cabbage are modulated by the plants' sulfur status, viz. atmospheric H<sub>2</sub>S and sulfate nutrition. However, the expression of the high affinity sulfate transporters, which are responsible the primary uptake of sulfate by the root, is differently regulated.

Is there a critical level of shoot phosphorus concentration for cluster-root formation in *Lupinus albus*?  
**Haigang Li, Jianbo Shen, Fusuo Zhang, Caixian Tang and Hans Lambers** 328–336

This study examined the effects of localised phosphorus supply on cluster-root formation and citrate exudation in white lupin in a split-root system with only one root half supplied with different phosphorus levels. The formation of cluster roots is regulated by shoot P concentration with a critical level of 2–3 mg g<sup>-1</sup>.

Putrescine enhancement of tolerance to root-zone hypoxia in *Cucumis sativus*: a role for increased nitrate reduction  
**Kai Shi, Xiao-Tao Ding, De-Kun Dong, Yan-Hong Zhou and Jing Quan Yu** 337–345

These authors investigated the potential role of nitrate reduction in the enhancement effects of putrescine on hypoxic stress tolerance in cucumber plants. They show that putrescine enhances tolerance to hypoxia by increasing the transcript levels of nitrate reductase and its cofactor binding domain genes, thereby stimulating the activities of nitrate reductase and nitrate reduction process to maintain the redox and energy status.

#### Erratum to:

A seed coat cyanohydrin glucosyltransferase is associated with bitterness in almond (*Prunus dulcis*) kernels  
**Tricia K. Franks, Abbas Yadollahi, Michelle G. Wirthensohn, Jennifer R. Guerin, Brent N. Kaiser, Margaret Sedgley and Christopher M. Ford**  
[Vol. 35, No. 3 (2008) pp. 236–246] 346