

# Functional Plant Biology

## Contents

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| <p><i>Review: Cell wall disassembly in ripening fruit</i><br/> <b>David A. Brummell</b> 103–119</p>   | <p>This review of cell wall metabolism in ripening fruit focuses on the changes to cell wall polysaccharides (both pectins and hemicelluloses) and cell wall structure, and the implications for cell wall properties and fruit firmness. Particularly useful for workers outside the field is the discussion of the fact that comparisons of reports from different groups are often made difficult by their use of differing analytical approaches. The author's focus on peach, tomato, melon and kiwifruit has allowed a more detailed discussion of the data and different approaches used and conclusions drawn.</p>   |
| <hr/> <p>Molecular targets of elevated [CO<sub>2</sub>] in leaves and stems of <i>Populus deltoides</i>: implications for future tree growth and carbon sequestration<br/> <b>Nathalie Druart, Marisa Rodríguez-Buey, Greg Barron-Gafford, Andreas Sjödin, Rishikesh Bhalerao and Vaughan Hurry</b> 121–131</p> | <p>Experimental evaluation of molecular- through ecosystem-level responses underpinning feedbacks in the biosphere is a matter of high priority. The development of predictive global change models requires that we build a clearer picture of how many parameters interact. This paper describes the first comprehensive analysis of the transcriptome of source and sink tissues of a woody perennial, cottonwood (<i>Populus deltoides</i>), to long-term exposure to elevated CO<sub>2</sub>. Results indicate significant modifications to transcript abundance in tree stems, associated with alterations in stemwood density, stemwood properties and biomass accumulation.</p>                                  |
| <hr/> <p><i>Agrobacterium</i>-mediated transformation of dormant lateral buds in poplar trees reveals developmental patterns in secondary stem tissues<br/> <b>Antanas V. Spokevicius, Kim S. Van Beveren and Gerd Bossinger</b> 133–139</p>  | <p>This paper describes a novel method for genetically transforming poplar trees using dormant lateral buds, through the creation of somatic transgenic tissue sectors. The authors use reporter genes to following gene expression and developmental patterns in bud tissues, and present the first results of the application of this method for studying pattern formation during secondary growth in poplar tree stems.</p>  |
| <hr/> <p>A second member of the <i>Nicotiana glauca</i> lipid transfer protein gene family, <i>NgLTP2</i>, encodes a divergent and differentially expressed protein<br/> <b>Kimberly D. Cameron, William A. Moskal Jr and Lawrence B. Smart</b> 141–152</p>   | <p>These authors have characterised four members of the LTP family in <i>Nicotiana glauca</i>. One sequence, <i>NgLTP2</i>, was obtained from genomic DNA, and characterisation of its expression pattern with a promoter::GUS fusion and northern analysis is presented. They noted that, although all five LTP genes examined share &gt;83% amino acid sequence homology, the deduced protein sequence of <i>NgLTP2</i> lacks the last five residues, including one of the cysteine residues thought to be important for function. It was concluded that differential expression of these genes provides evidence these genes have multiple functions in cuticle deposition, wound response, and pathogen defense.</p> |

*Cover illustration:* Perfect timing of fruit ripening is essential to maximising market price. Photograph by Tony Corbett, Crop and Food Research, New Zealand. (See Brummell pp. 103–119.)

Over-expression of the rice *OsAMT1-1* gene increases ammonium uptake and content, but impairs growth and development of plants under high ammonium nutrition

**Mohammad S. Hoque, Josette Masle,  
Michael K. Udvardi, Peter R. Ryan  
and Narayana M. Upadhyaya**

153–163

In a global environment of N-deficient ecosystems, it is important to find ways to improve nitrogen-use efficiency in plants, such as increasing nutrient transporter activity in roots. These authors studied the effect of over-expression of *OsAMT1-1* in terms of  $\text{NH}_4^+$  influx in roots and subsequent effect on biomass production. They characterised several *OsAMT1-1* over-expressing transgenic lines of two *japonica* rice cultivars. They show that over-expression increases ammonium uptake and tissue ammonium content, but impairs early growth and development of plants in the presence of millimolar concentrations of external ammonium.

Effects of *Eupatorium* yellow vein virus infection on photosynthetic rate, chlorophyll content and chloroplast structure in leaves of *Eupatorium makinoi* during leaf development

**Sachiko Funayama-Noguchi and  
Ichiro Terashima**

165–175

It has been recognised that pathogen infection has detrimental effects on the fitness of the host plant. These authors show that lowered growth rate in *Eupatorium* yellow vein geminivirus-infected *Eupatorium makinoi* plants was due to impaired photosynthesis in virus-infected leaves. The suppression of photosynthesis in infected leaves correlated well with Chl amount throughout leaf development. Their detailed analyses of photosynthetic properties of infected leaves allow a deeper understanding of the mechanisms underlying the impaired whole-plant performance.

Changes in photosynthetic parameters and antioxidant activities following heat-shock treatment in tomato plants

**Daymi Camejo, Ana Jiménez, Juan José Alarcón,  
Walfredo Torres, Juana María Gómez  
and Francisca Sevilla**

177–187

These authors compared two tomato genotypes *Amalia* (putatively heat-sensitive) and *Nagcarlang* (putatively heat-tolerant) for their response to short-term heat stress. They present comparative analyses for the genotypes after exposure to heat stress for 3 hours, examining parameters including photosynthetic activity, stomatal conductance, transpiration, and dark respiration. *Amalia* showed more pronounced changes in response to heat stress than did *Nagcarlang*. This is a good contribution to knowledge on physiological adaptation to heat stress.

*Research note:* Low-boron acclimation induces uptake of boric acid against a concentration gradient in root cells of *Olea europaea*

**Sotiria Stavrianiakou, Georgios Liakopoulos,  
Evangelos Karvonis, Evangelia Resta and  
George Karabourniotis**

189–193

Olive trees are frequently cultivated in poor soils where concentrations of B are limited, as they are considered tolerant to various soil stress factors. In order to elucidate the mechanisms whereby olive trees can tolerate such conditions, these authors investigated whether a concentrating mechanism for B uptake exists in olive and whether it is induced under low-B conditions. The processes of primary uptake by root cells and xylem loading were investigated, and the authors conclude that such a mechanism exists in olive tree root cells for primary root uptake of B, while xylem loading depends on diffusion equilibrium.

Differential response of vacuolar proton pumps to osmotic

**Fan S. Chiu, Shen H. Hsu, Jiun H. Chen, Yi Y. Hsiao,  
Yih J. Pan, Ru C. Van, Yun T. Huang, Fang G. Tseng,  
Wing M. Chou, Shih K. Fan and Rong L. Pan**

195–206

This paper shows the differential effects of sorbitol and sucrose on the volume of tonoplast vesicles extracted from *Vigna radiata*, and on the vectorial ( $\text{H}^+$  translocation) activities of V-ATPase and PPase. Data are interpreted as differential effects of membrane structure, as affected by osmotic pressure, on both types of proton-translocating pumps,  $\text{H}^+$ -ATPase and  $\text{H}^+$ -PPase, which supplement each other under stress conditions.

#### Corrigendum to:

Genetic mapping of basal root gravitropism and phosphorus acquisition efficiency in common bean  
**Hong Liao, Xiaolong Yan, Gerardo Rubio, Steve E. Beebe, Matthew W. Blair and Jonathon P. Lynch**

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