

# Functional Plant Biology

## Contents

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|--|----------------|---|
| <p><i>Viewpoint:</i> Write ‘systemic small RNAs’: read ‘systemic immunity’<br/><b>Alireza Seifi</b></p>  | <p>747–752</p> | <p>The world of small RNAs (sRNAs) is expanding fast and the footprint of these molecules is revealed in many different biological processes. Here, I briefly review systemic gene silencing mediated by sRNAs, in parallel with systemic acquired resistance (SAR), and speculate the possibilities of contribution of systemic sRNAs to SAR.</p>  |
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| <p><i>Viewpoint:</i> Drought resistance – is it really a complex trait?<br/><b>Abraham Blum</b></p>  | <p>753–757</p> | <p>Drought resistance is being increasingly labelled in genomics research as being a ‘complex trait’. There is a danger that this label may turn into an axiom which is liable to damage education and research on the subject as well as the delivery of solutions to the farmer. This opinionated review examines whether there is grounds for such an axiom.</p>   |
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| <p>Identification of chromosomes controlling abscisic acid responsiveness and transcript accumulation of <i>Cor-Lea</i> genes in common wheat seedlings<br/><b>Julio C. M. Iehisa, Yumeto Kurahashi and Shigeo Takumi</b></p>          | <p>758–766</p> | <p>The chromosomes involved in the regulation of ABA responsiveness and <i>Cor-Lea</i> expression were identified using chromosome substitution lines of common wheat. Chromosomes 3A and 5A increased the ABA responsiveness, and were involved in the regulation of wheat <i>Cor-Lea</i> gene expression and stomatal response during leaf dehydration.</p>   |
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| <p>Ethylene inhibits darkness-induced stomatal closure by scavenging nitric oxide in guard cells of <i>Vicia faba</i><br/><b>Xigui Song, Xiaoping She, Juan Wang and Yichao Sun</b></p>  | <p>767–777</p> | <p>This study investigates the role and association between nitric oxide change and inhibition of darkness-induced stomatal closure by ethylene. It is concluded that ethylene reduces the levels of nitric oxide in <i>Vicia faba</i> guard cells via a pattern of NO scavenging, and then induces stomatal opening in darkness.</p>   |
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| <p>Soybean vegetative lipoxygenases are not vacuolar storage proteins<br/><b>Glenn W. Turner, Howard D. Grimes and B. Markus Lange</b></p>   | <p>778–787</p> | <p>The paraveinal mesophyll (PVM) of soybean is a distinctive layer of cells situated between the spongy and palisade chlorenchyma of leaves. Immuno-cytochemistry with isozyme-specific antibodies indicated that vegetative lipoxygenase (Vlx) isozymes VlxB and VlxC were localised to the cytoplasm and nucleoplasm of PVM cells, whereas VlxD was present in the cytoplasm and nucleoplasm of mesophyll chlorenchyma cells.</p>  |
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| <p><i>Arabidopsis</i> and <i>Lobelia anceps</i> access small peptides as a nitrogen source for growth<br/><b>Fiona M. Soper, Chanyarat Paungfoo-Lonhienne, Richard Brackin, Doris Rentsch, Susanne Schmidt and Nicole Robinson</b></p> | <p>788–796</p> | <p>Providing further evidence that plants can access complex organic nitrogen, this study demonstrates that <i>Arabidopsis thaliana</i> and <i>Lobelia anceps</i> can use peptides of 2–4 amino acids for biomass accumulation under axenic conditions. Growth responses were species- and source-specific and intact uptake and subsequent metabolism of peptides was detected. Additionally, supplied tetraglycine induced marked stimulation of root growth in <i>L. anceps</i>.</p> |

*Cover illustration:* Two lines of a double-haploid population of rice (IR68586) developed at IRRI and tested in the field at Bet Dagan, Israel (see Blum *et al.* pp. 753–757). Irrigation had been stopped 2 weeks before, in order to apply stress at the pre-flowering growth stage. Photograph by Abraham Blum.

Carbon gain, allocation and storage in rhizomes in response to elevated atmospheric carbon dioxide and nutrient supply in a perennial C<sub>3</sub> grass, *Phalaris arundinacea*

**Hannah Kinmonth-Schultz and Soo-Hyung Kim** 797–807

Reed canary grass gained significantly more carbon under elevated [CO<sub>2</sub>] with little photosynthetic down-regulation. This invasive species increased carbon allocation to rhizomes relative to roots under high nutrients. In autumn, fructan storage in rhizomes increased in response to elevated [CO<sub>2</sub>] under low nutrients. These results suggest continued success of this species under increasing CO<sub>2</sub> and eutrophication.

Impact of defoliation severity on photosynthesis, carbon metabolism and transport gene expression in perennial ryegrass

**Julia M. Lee, Puthigae Sathish, Daniel J. Donaghy and John R. Roche** 808–817

Perennial ryegrass (*Lolium perenne* L.) pastures were defoliated to 20, 40 or 60 mm in winter. At the one-leaf regrowth stage plants defoliated to 20 mm had greater abundance of photosynthesis-related genes in the stubble. This indicates that a greater capacity for photosynthesis in the outer leaf sheaths may be a potential mechanism used by severely defoliated plants to compensate for reduced residual lamina area.

Beyond the ionic and osmotic response to salinity in *Chenopodium quinoa*: functional elements of successful halophytism

**Francesco Orsini, Mattia Accorsi, Giorgio Gianquinto, Giovanni Dinelli, Fabiana Antognoni, Karina B. Ruiz Carrasco, Enrique A. Martinez, Mohammad Alnayef, Ilaria Marotti, Sara Bosi and Stefania Biondi** 818–831

Morphological and metabolic responses were analysed in *Chenopodium quinoa* Willd. after exposure to salinity (0 to 750 mM NaCl). Stomatal size and density decreased, salt bladder density did not change, inorganic ions (including K<sup>+</sup>) accumulated in aerial organs, putrescine efflux occurred, and ion excretion and proline accumulation were limited at higher concentrations of NaCl.