

Functional Plant Biology

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Editorial

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| <p><i>Goldacre paper</i>: Localised and non-localised promotion of fruit development by seeds in <i>Arabidopsis</i>
Catherine M. Cox and Stephen M. Swain 1–8</p> | <p>This work, for which Steve Swain was awarded the Australian Society of Plant Scientists Goldacre Award for 2004 (sponsored by <i>FPB</i>), uses a transgenic <i>Arabidopsis</i> line overexpressing a GA 2-oxidase to reduce GA content. It provides a genotype with slowed pollen tube growth so that fertilisation is reduced but not eliminated. The authors investigate the effects on fertilisation and ovary growth, and show that seeds act in a local manner to promote fruit growth.</p> |
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| <p><i>Review</i>: The polyphasic chlorophyll <i>a</i> fluorescence rise measured under high intensity of exciting light
Dušan Lazár 9–30</p> | <p>In this timely review of polyphasic chlorophyll <i>a</i> fluorescence rise (FLR), Lazár dissects the extremely complex information contained in polyphasic FLR. He begins with a description of fluorescence signal and basic fluorescence values (F_o, F_m), followed by description of instrumental set-ups, nomenclature and samples used for FLR measurement. The review details current explanations for steps of the O–J–I–P FLR. Applications of the FLR are discussed, including the JIP test for vitality screening, remote sensing and pattern recognition in precision agriculture, and future perspectives of <i>in silico</i> photosynthesis for understanding photosynthetic regulations and limitations.</p> |
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| <p>A grapevine <i>TFL1</i> homologue can delay flowering and alter floral development when overexpressed in heterologous species
Paul K. Boss, Lekha Sreekantan and Mark R. Thomas 31–41</p> | <p>In order to gain a better understanding of grapevine reproductive biology and plant architecture, these authors isolated and characterised a grapevine homologue of the <i>Arabidopsis</i> gene <i>TFL1</i>. They explore its effects when overexpressed in <i>Arabidopsis</i> and tobacco, demonstrating that <i>VvTFL1</i> represses flowering. They also speculate on the interpretation of an unusual phenotype seen in some transgenic <i>Arabidopsis</i> lines.</p> |
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| <p>TaNAC69 from the NAC superfamily of transcription factors is up-regulated by abiotic stresses in wheat and recognises two consensus DNA-binding sequences
Gang-Ping Xue, Neil I. Bower, C. Lynne McIntyre, George A. Riding, Kemal Kazan and Ray Shorter 43–57</p> | <p>The NAC transcription factor family has been implicated in diverse physiological processes, although molecular characterisation is still in its infancy. These authors describe molecular characterisation of a drought/cold-inducible TaNAC69 transcription factor from wheat. They show that the gene is upregulated by stress, then investigate DNA-binding specificity, showing that it binds two sites. These results facilitate identification of the gene regulatory networks of this group of NAC transcription factors, and promote our understanding of their biological role in plant response to drought or cold stress.</p> |
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Cover illustration: In most plants seeds promote fruit growth. In *Arabidopsis*, seeds act locally with only minor effects on the growth of more distant regions of the fruit. (See Cox and Swain pp. 1–8.)

Variable desiccation tolerance in *Acer pseudoplatanus* seeds in relation to developmental conditions: a case of phenotypic recalcitrance?

Matthew I. Daws, Hazel Cleland, Pawel Chmielarz, Fabio Gorian, Olivier Leprince, Christopher E. Mullins, Costas A. Thanos, Vigdis Vandvik and Hugh W. Pritchard

59–66

Climatic effects on seed traits, in particular desiccation tolerance, were investigated in *Acer pseudoplatanus*. Climate impacted on seed traits, with warmer conditions allowing seeds to ‘jump’ seed storage classes (from ‘recalcitrant’ to ‘intermediate’). This finding may explain contradictory evidence regarding desiccation tolerance in this and other species.

Heat-induced oxidative activity protects suspension-cultured plant cells from low temperature damage

Andrew C. Allan, Ratrasin Maddumage, Joanne L. Simons, Samuel O. Neill and Ian B. Ferguson

67–76

Increases in reactive oxygen species (ROS), such as superoxide and hydrogen peroxide (H₂O₂), have been implicated in plant responses to temperature stress. Cellular increases in ROS can either act as secondary messengers, which switch on defence mechanisms, or can cause cell dysfunction and death. However, H₂O₂ is also a ubiquitous constituent of plant cells, and has been specifically implicated in low temperature responses in plants. This paper describes, for the first time, cross talk in apple and tobacco cell cultures between heat and low temperature-induced oxidative bursts. The work uses a new technique to measure H₂O₂ levels during abiotic stress.

A comparison of UV-B induced stress responses in three barley cultivars

Éva Hideg, Eva Rosenqvist, Gyula Váradi, Janet Bornman and Éva Vincze

77–90

To select biochemical and biophysical markers of UV tolerance, these authors measured the effects of UV-B radiation on reactive oxygen species and antioxidant capacity of three barley cultivars. One cultivar had previously shown salt tolerance, so the authors tested whether this was part of a more general tolerance to oxidative stress manifesting in relative tolerance to UV-B. They used a new technique in UV-B studies: free radical production in leaves as measured by spin trapping. The most UV-tolerant cultivar is also a model cultivar for barley transformation, due to its excellent ability to form regenerable tissues from immature zygotic embryos, opening up the possibility of functional genomics studies in future.

Isolation of a NaCl-tolerant mutant of *Chrysanthemum morifolium* by gamma radiation: *in vitro* mutagenesis and selection by salt stress

Zahed Hossain, Abul Kalam Azad Mandal, Subodh Kumar Datta and Amal K Biswas

91–101

In the present study, *in vitro* mutagenesis by gamma radiation has been used in tissue culture to develop mutants in *Chrysanthemum morifolium* with stable salt tolerance. Low gamma radiation treatment yielded plants that were more salt tolerant than high gamma radiation-treated plants. This enhanced tolerance was attributed to increased activities of antioxidant enzymes and to a lesser extent of membrane damage. Genetic differences between control and mutagenised plants were also detected, suggesting that altered genetic composition leads to enhance salt tolerance.