

Functional Plant Biology

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Editorial

Goldacre Paper: Rapid cell expansion and cellulose synthesis regulated by plasmodesmata and sugar: insights from the single-celled cotton fibre

Yong-Ling Ruan

1–10

This work, for which Yong-Ling Ruan was awarded the Australian Society of Plant Scientists **Goldacre Award** for 2005 (sponsored by *FPB*), uses the single-celled cotton fibre as a model for studying the control of rapid cell elongation and cellulose synthesis. This review evaluates recent progress in understanding the roles of plasmodesmata and sucrose metabolism in cotton fibre development, and compares this model system with other fast-growing cell systems to propose new directions for future research.

Model-assisted physiological analysis of *Phyllo*, a rice architectural mutant

Delphine Luquet, You Hong Song, Sonia Elbelt, Dominique This, Anne Clément-Vidal, Christophe Périn, Denis Fabre and Michael Dingkuhn

11–23

This paper uses the EcoMeristem model published by the same authors in *FPB* in 2006. The work analyses the effect of a mutation in rice on crop physiological processes of an architectural rice mutant during vegetative growth, and uses a dynamic model to gain further insight into the complex interactions between processes. Although the *Phyllo* mutant doesn't appear (on current evidence) to elucidate a gene or process of key crop-performance usefulness, the approach is novel, and the work is an interesting use of cross-disciplinary techniques to investigate a morphological effect.

Leaf shrinkage decreases porosity at low water potentials in sunflower

An-Ching Tang and John S. Boyer

24–30

Because many leaves shrink when they wilt, gas exchange measurements many need correcting for the amount of tissue in the measurement chamber. In this paper, mathematical correction is compared to holding the leaves to prevent shrinkage. Held leaves exhibited more activity than the mathematically corrected ones, apparently because stomata failed to close completely.

Manganese toxicity in two varieties of Douglas fir (*Pseudotsuga menziesii* var. *viridis* and *glauca*) seedlings as affected by phosphorus supply

Tanja Dučić and Andrea Polle

31–40

Mn toxicity is an important limiting factor to plant growth in acidic soils. This paper deals with differences in Mn toxicity in two varieties of Douglas fir (*viridis* and *glauca*), a species native to North America but also frequently cultivated outside its natural range and highly valued for its wood and fast growth. The authors explored the influence of Mn and P availability on the tissue and sub-cellular accumulation of mineral nutrients and conducted corresponding growth measures. They found variety-specific differences in the capacity of Mn retention in roots and subcellular localisation.

Cover illustration: A mature cotton boll, showing cellulose-enriched long fibres. (See Ruan pp. 1–10.)

Ethylene modulates genetic, positional, and nutritional regulation of root plagiogravitropism

Paramita Basu, Yuan-Ji Zhang, Jonathan P. Lynch and Kathleen M. Brown

41–51

Basu *et al.* describe the plagiogravitropic behaviour of roots in *Phaseolus vulgaris*. Plagiogravitropic growth of roots affects root architecture, which is important for topsoil exploration and the acquisition of water and nutrients. The authors identify basal root whorl number as a novel architectural trait and show that ethylene mediates regulation of growth angle by interaction with position of root origin, genotype and phosphorus availability.

Transcriptional profiling of chickpea genes differentially regulated by salicylic acid, methyl jasmonate and aminocyclopropane carboxylic acid to reveal pathways of defence-related regulation

Tristan Coram and Edwin C. K. Pang

52–64

Microarray gene expression profiling of chickpea genotypes in response to defence-eliciting compounds is reported in this paper. It provides novel insight into the regulation of chickpea defence responses, particularly for ascochyta blight infection, at the molecular level. The authors have designed a useful microarray system for transcriptional profiling, based on the few available ESTs and unigenes in chickpea and the volume of regulated genes identified will be an important resource for researchers.

Early accumulation of non-enzymatically synthesized oxylipins in *Arabidopsis thaliana* after infection with *Pseudomonas syringae*

Christoph Grun, Susanne Berger, Daniel Matthes and Martin J. Mueller

65–71

Grun *et al.* investigate the accumulation of non-enzymatically formed hydroxy fatty acids and F₁-phytoprostanes in *Arabidopsis* leaves upon infection with virulent and avirulent strains of *Pseudomonas syringae*. Accumulation patterns of non-enzymatically and enzymatically formed oxylipins were compared, and the results suggest that esterified lipids may be the precursors for the synthesis of chemically oxidised fatty acids. In contrast, enzymatically generated oxylipins are not believed to originate from esterified precursors, but from already liberated fatty acids.

Phosphorus deficiency inhibits growth in parallel with photosynthesis in a C₃ (*Panicum laxum*) but not two C₄ (*P. coloratum* and *Cenchrus ciliaris*) grasses

Oula Ghannoum and Jann P. Conroy

72–81

This work addresses a limitation of earlier studies by comparing the effects of phosphorus (P) deficiency on closely related C₃ and C₄ grasses. The authors show that P deficiency inhibited photosynthesis more in the C₃ than the two C₄ grasses. They also show that P deficiency increased photosynthetic phosphorus-use efficiency (PUE) mainly in the C₄ grasses and whole-plant PUE mainly in the C₃ grass. They argue that this may have been due to a greater requirement for inorganic phosphate in C₄ relative to C₃ photosynthesis.

Corrigendum to:

Estimating the internal conductance to CO₂ movement

Charles Warren [Vol. 33, No. 5 (2006) pp. 431–442] 82