

Functional Plant Biology

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Synthesis of complementary RNA by RNA-dependent RNA polymerases in plant extracts is independent of an RNA primer

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1091–1099

RNA-dependent RNA polymerases (RDRs) are a key element of RNA silencing. Surprisingly, plant extracts obtained from RDR1, RDR2 and RDR6 knockouts produced a very similar level of polymerase activity, which resulted in double-stranded RNA products by a primer-independent mechanism.

Characterisation of the gene family encoding acetoacetyl-CoA thiolase in *Arabidopsis*

Iván Ahumada, Albert Cairó, Andréa Hemmerlin, Víctor González, Irene Pateraki, Thomas J. Bach, Manuel Rodríguez-Concepción, Narciso Campos and Albert Boronat

1100–1111

Biosynthetic thiolases, also known as acetoacetyl-CoA thiolases (AACT), catalyse the condensation of two acetyl-CoA molecules to form acetoacetyl-CoA. *Arabidopsis thaliana* contains two genes, *ACT1* and *ACT2*, which encode two closely related AACT isoforms (AACT1 and AACT2, respectively) showing differential expression and subcellular localisation and participating in different metabolic processes.

The involvement of two epoxide hydrolase genes, *NbEH1.1* and *NbEH1.2*, of *Nicotiana benthamiana* in the interaction with *Colletotrichum destructivum*, *Colletotrichum orbiculare* or *Pseudomonas syringae* pv. *tabaci*

C. P. Wijekoon, P. H. Goodwin and T. Hsiang

1112–1122

In this study, expression of plant epoxide hydrolase genes increased following pathogen attack, but their importance in resistance is unknown. They may contribute to defences by detoxification, signalling or antimicrobial compound metabolism. Silencing of a pathogen-inducible epoxide hydrolase gene of *Nicotiana benthamiana* showed that it contributes significantly to basal resistance against pathogens.

A molecular approach to understanding plant–plant interactions in the context of invasion biology

Amanda K. Broz, Daniel K. Manter, Ragan M. Callaway, Mark W. Paschke and Jorge M. Vivanco

1123–1134

To investigate molecular responses induced by plant competition, the invasive weed *Centaurea maculosa* was grown alone or in competition with either a weak or a strong native competitor. Gene expression was analysed using cross-species hybridisation to microarray and quantitative PCR. Competition and plant-neighbour identity were both found to have significant effects on *Centaurea* gene expression.

Transient shade and drought have divergent impacts on the temperature sensitivity of dark respiration in leaves of *Geum urbanum*

Martijn Slot, Joana Zaragoza-Castells and Owen K. Atkin

1135–1146

The respiratory response of leaf respiration to temperature is a critical biotic feedback in the study of global climate change. In this study, we found that the temperature sensitivity of leaf respiration of *Geum urbanum* to changes in water supply and sustained reductions in growth irradiance was highly dynamic.

Cover illustration: Magnified view of water infiltrated into air spaces during conventional relative water content (RWC) measurements on salt-adapted wheat leaves (see Boyer *et al.* pp. 1172–1182). Leaves had osmotically adjusted to the salinity treatment, and turgor was fully maintained. Yet, leaf cells absorbed water after floatation on distilled water, and secreted it into inter-cellular air spaces, giving anomalously low RWC values. The leaf on the left is before floating, the middle one after 1.5 h, and the right one after 3 h of floatation. Photography and design by Carl Davies.

A model-based analysis of the dynamics of carbon balance at the whole-plant level in *Arabidopsis thaliana*
Angélique Christophe, Véronique Letort, Irène Hummel, Paul-Henry Cournede, Philippe D. Ereffye and Jérémie le Coeur 1147–1162

This paper reports a novel plant model for *Arabidopsis thaliana* integrating organogenesis, morphogenesis and carbon-partitioning processes. The work uses the modelling approach to estimate carbon repartition by optimisation processes. The results show that the model is a useful solver of biomass allocation and provide new insights into sink-source relationships and plant growth in this species. This approach constitutes a first step towards a dynamic structural–functional model.

Evidence from near-isogenic lines that root penetration increases with root diameter and bending stiffness in rice
Lawrence John Clark, Adam Huw Price, Katherine A. Steele and William Richard Whalley 1163–1171

Near-isogenic lines of rice were used to test the hypothesis that increased root diameter was associated with greater root bending stiffness. Greater bending stiffness corresponded to better root penetration of strong layers. However, penetration of a strong layer reduced the bending stiffness of roots.

Osmotic adjustment leads to anomalously low estimates of relative water content in wheat and barley
John S. Boyer, Richard A. James, Rana Munns, Tony (A. G.) Condon and John B. Passioura 1172–1182

Relative water contents are often used to measure plant water status by hydrating the tissue to generate ‘full turgidity’. But plants generally maintain their turgidity fully or partially, and hydrating the tissue causes abnormal turgidity. This article shows that the problem is substantial and suggests ways to minimise it.
