

Functional Plant Biology

Continuing *Australian Journal of Plant Physiology*

Contents

Volume 32 Number 2 2005

Evans Review No. 2: The hot and the cold: unravelling the variable response of plant respiration to temperature
Owen K. Atkin, Dan Bruhn, Vaughan M. Hurry and Mark G. Tjoelker

87–106

This review deals with the temperature responses of plant respiration (R), focusing on variability of the Q_{10} of R and the degree to which R acclimates to long-term changes in temperature. The authors have examined the mechanisms underlying the variability in temperature responses and the impact of acclimation the balance between respiration and photosynthesis.

Photochemical efficiency is an important component of ecophysiological variation of *Cistus albidus* between habitats in south-east Spain

Olga M. Grant and Lynton D. Incoll

107–115

This paper documents differences among populations of a Mediterranean shrub exposed to different climatic regimes. Plants at the driest sites were less affected by summer drought than plants at wetter sites with cooler temperatures. These populations maintained higher photochemical efficiency through the summer. The authors explore the possibility that variation between plants from different habitats reflects differing selection in populations exposed to long-term differences in climate.

Leaf morphology, photochemistry and water status changes in resprouting *Quercus ilex* during drought
Karen Peña-Rojas, Xavier Aranda, Richard Joffre and Isabel Fleck

117–130

Increased likelihood of drought as a consequence of global warming prompted this study of functional and morphological characteristics of resprouting *Quercus ilex* leaves under drought stress. Stomatal limitation of photosynthesis in leaves of resprouting plants was less than in leaves of control plants, and resprouting plants maintained better water status under drought conditions than control plants. Changes in leaf structure modifying mesophyll conductance in response to drought also contributed to the superior water status of resprouting plants.

Photosynthetic activity of *Lolium perenne* as a function of endophyte status and zinc nutrition

Fabien Monnet, Nathalie Vaillant, Adnane Hitmi and Huguette Sallanon

131–139

Endophyte fungal infection can confer stress resistance on host grasses, but limited information about the related effects on photosynthesis is available. This paper examines the interaction between endophyte infection and zinc, one of the more common environmental pollutants, in relation to photosynthesis in *Lolium perenne*. Endophyte infection protected PSII from photodamage in the presence of zinc, potentially favouring endophyte infection of grasses at sites polluted by zinc.

Cover illustration: In gravitropism, the gravity signal is perceived by sedimentable amyloplasts in statocytes, and then transmitted to elongating cells, changing the direction of growth. The signal perception mechanism for growth regulation by gravity is independent of that for gravitropism. The signal may be directly received by mechanoreceptors on the plasma membrane of elongating cells, and utilised for regulation of the growth rate, after transformation and transduction within each cell. (See Soga *et al.* pp. 175–179).

Salinity-induced changes in the nutritional status of expanding cells may impact leaf growth inhibition in maize

Beatriz G. Neves-Piestun and Nirit Bernstein 141–152

These authors have characterised salinity-induced changes in localised mineral contents in the growing tissues of maize (*Zea mays*). Spatial profiles of nutrient elements (N, P, K, S, Ca, Mg, Fe, Zn, Mn, Cu), the salinity source (Na and Cl), and their deposition rates along maize leaves were investigated on the same temporal and spatial scale as localised growth intensity. Reduced Ca and K contents as well as accumulation of Fe were associated with salinity-induced inhibition of growth.

Plant phosphorus status has a limited influence on the concentration of phosphorus-mobilising carboxylates in the rhizosphere of chickpea

Madeleine Wouterlood, Hans Lambers and Erik J. Veneklaas 153–159

This paper reports the findings of two experiments investigating carboxylate exudation by chickpea (*Cicer arietinum*) in relation to phosphorus supply. Split-root experiments in sand culture showed that carboxylate exudation was independent of phosphorus supply and suggest that, unlike other species that exude carboxylates in response to low phosphorus availability, carboxylate exudation by chickpea may be constitutive.

A new group of plant-specific ATP-dependent DNA ligases identified by protein phylogeny, hydrophobic cluster analysis, and 3-dimensional modelling

Diego Bonatto, Martin Brendel and João Antonio Pêgas Henriques 161–174

This paper provides an analysis of a new group of plant-specific ATP-dependent DNA ligases. *In silico* sequence studies show that these proteins have distinct physico-chemical properties compared with those of animal and fungal DNA ligases, and two conserved domains within the DNA ligase I-like proteins were mapped by hydrophobic cluster analysis and 3-dimensional modelling. Microsynteny analysis indicates that these DNA ligase I-like genes are linked to known loci in *Brassica* spp. and *Arabidopsis*.

Short communication: Mechanoreceptors rather than sedimentable amyloplasts perceive the gravity signal in hypergravity-induced inhibition of root growth in azuki bean

Kouichi Soga, Kazuyuki Wakabayashi, Seiichiro Kamisaka and Takayuki Hoson 175–179

This study examines the perception of hypergravity signals by root cells in an effort to distinguish between mechanisms involving sedimentable amyloplasts in root columellar cells and those involving mechanosensitive ion channels (mechanoreceptors). Growth of primary roots of azuki bean was reduced by hypergravity and this effect was not alleviated by removal of the root cap. Lanthanum and gadolinium, blockers of mechanoreceptors, eliminated the inhibitory effect of hypergravity, suggesting that mechanoreceptors on the plasma membrane perceive the gravity signal.