

Functional Plant Biology

Contents

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Review: Structure–function relationships of the plant cuticle and cuticular waxes — a smart material?

**Hendrik Bargel, Kerstin Koch, Zdenek Cerman
and Christoph Neinhuis** 893–910

This valuable and timely review surveys important aspects of the structure and functions of the cuticles of higher plants, concerning their structure, formation, multiple functions and surface properties. It covers ultrastructure, biosynthesis, molecular genetics and transport of cuticular components, the morphology, crystallinity and self-assembly of epicuticular waxes, multiple functions of plant surfaces, and the biomechanics of the cuticular membrane.

Viewpoint: How large is the carbon isotope fractionation of the photorespiratory enzyme glycine decarboxylase?

Guillaume Tcherkez 911–920

This viewpoint combines enzymatic properties and quantum chemistry to estimate the nature and value of the C isotope effect in enzymatic decarboxylation during photorespiration. C isotope fractionation during photorespiration in plants is poorly understood, lacking experimental techniques on the glycine decarboxylase system.

High temperature enhances inhibitor production but reduces faloover in tobacco Rubisco

**Stephen M. Schrader, Heather J. Kane,
Thomas D. Sharkey and
Susanne von Caemmerer** 921–929

Rubisco activity responds to high temperatures both *in vivo* and *in vitro*, and increased inhibitor synthesis occurs. As the slow inactivation of Rubisco (faloover) during *in vitro* assay is due to slow binding competitive inhibitors, these authors have analysed the involvement of inhibitors on Rubisco temperature response by measuring the rate and extent of faloover at several temperatures. They show the interplay of inhibitor synthesis and release from catalytic sites that determine the Rubisco temperature response.

Isoprene prevents the negative consequences of high temperature stress in *Platanus orientalis* leaves

**Violeta Velikova, Francesco Loreto, Tsonko Tsonev,
Federico Brilli and Aglika Edreva** 931–940

Velikova *et al.* investigate the importance of isoprene emission in heat tolerance of *Platanus orientalis*, and report results linking reactive oxygen species with thermotolerance. This topic is interesting and shows the significance of isoprene production in plants as an adaptive defence mechanism during heat stress by plants. The authors found that isoprene contributes to H₂O₂ detoxification, and the consequence may protect membranes from lipid peroxidation.

Influence of nutrient supply and water vapour pressure on root architecture of Douglas-fir and western hemlock seedlings

Timothy S. S. Conlin and R. van den Driessche 941–948

This paper describes the root architecture of seedlings of western hemlock and Douglas-fir. The authors compare root growth when seedlings were grown at different nutrient availabilities and vapour pressure deficits (VPD). Their results indicate that root architecture may be important in consideration of how these species are distributed in the field and how they respond to resource limitation. The work contributes to our understanding of plasticity of root response to environmental factors.

Cover illustration: Self-cleaning of plant surfaces: removal of the hydrophobic staining powder Sudan III from a lotus leaf by rinsing with water. (See Bargel *et al.* pp. 893–910.)

Refilling of embolised conduits as a consequence of
'Münch water' circulation

**Teemu Hölttä, Timo Vesala, Martti Perämäki
and Eero Nikinmaa**

949–959

'Münch water' is pushed from phloem to xylem during phloem sugar unloading. This paper presents calculations on how embolism refilling can be induced by 'Münch water' from the phloem. The authors estimate the environmental and structural conditions under which xylem refilling by the suggested mechanism can occur. The time needed for complete embolism refilling is calculated. The model incorporates a number of well-justified assumptions, and their findings provide an excellent framework for more practical research to follow on.

Development, photosynthetic activity and habitat
selection of the clonal plant *Fragaria vesca* growing in
copper-polluted soil

Sergio R. Roiloa and Rubén Retuerto

961–971

Little is known about the importance of physiological integration among ramets in many clonal plant species, and the underlying physiological mechanisms and controls on patterns of translocation among connected ramets. These authors show that assimilate demand from offspring ramets growing in contaminated environments increases chlorophyll content and photosynthetic efficiency of parents by a feed-back regulation process. Clonal integration also ameliorates toxic effects on the photochemical efficiency of the offspring ramets.

Physiological mechanisms of tolerance to high boron
concentration in *Brassica rapa*

**Sukhjiwan Kaur, Marc E. Nicolas, Rebecca Ford,
Robert M. Norton and Paul W. J. Taylor**

973–980

This study on boron uptake, accumulation and tolerance in *Brassica rapa* will be of interest to applied researchers. The authors examine various hypotheses for the physiological mechanisms allowing certain genotypes to tolerate high boron concentration in the soil. Tolerance to high soil boron was generally due to low net boron uptake by the roots. Active efflux of boron was probably responsible for differences in net boron uptakes between genotypes.

Corrigendum to:

Auxin is required for pollination-induced ovary growth in *Dendrobium* orchids

Saichol Ketsa, Apinya Wisutiamonkul and Wouter G. van Doorn [Vol. 33, No. 9 (2006) pp. 887–892] 981