

Functional Plant Biology

Contents

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The contrasting influence of short-term hypoxia on the hydraulic properties of cells and roots of wheat and lupin

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183–193

Hypoxia influences solute and water transport in roots depending on hydraulic properties and sensitivity to oxygen deficiency. Low external oxygen concentration caused leakage of solutes from lupin roots and cortical cells (greater in narrow-leaved than yellow lupin), but aquaporin inhibition did not reduce root hydraulic conductivity because bulk water flows around cells. Solute transport in wheat roots was not as sensitive to hypoxia as lupins, but aquaporins in the endodermis may control root hydraulic conductivity.

Cloning and characterisation of *ZmZLPI*, a gene encoding an endoplasmic reticulum-localised zinc transporter in *Zea mays*

Yao-Guang Xu, Bao-Sheng Wang, Jing-Juan Yu, Guang-Ming Ao and Qian Zhao

194–205

We characterize an ER-localised ZRT/IRT-like protein, *ZmZLPI*, found in *Zea mays*. This protein is responsible for the zinc transport from the lumen of the ER to the cytoplasm. Heat resistance was enhanced in *ZmZLPI* transgenic yeast cells, which is probably through the unfolded protein response pathway.

Heat stress affects flowering, berry growth, sugar accumulation and photosynthesis of *Vitis vinifera* cv. Semillon grapevines grown in a controlled environment

Dennis H. Greer and Chris Weston

206–214

High temperatures above about 40°C have a major effect on grapevines. If such temperatures occur around flowering time, reproductive growth is severely affected and all flowers drop off. If the high temperatures occur at or after veraison, then sugar will stop flowing into the berries and they will not ripen.

Comparison of sapling-level daily light capture and carbon gain between a temperate deciduous and a co-occurring evergreen tree species in the growing season and in winter

Yoshiyuki Miyazawa and Kyoichi Otsuki

215–222

Sapling-level carbon gain was higher in evergreen broadleaved tree species than co-occurring deciduous tree species in a temperate forest understory, due to different leaf morphology. This rank order was not reversed through changes in leaf physiological traits or light capture efficiency of the crown.

Elevated CO₂ atmosphere promotes plant growth and inulin production in the cerrado species *Vernonia herbacea*

Vanessa F. Oliveira, Lilian B. P. Zaidan, Márcia R. Braga, Marcos P. M. Aidar and Maria Angela M. Carvalho

223–231

Elevated [CO₂] promoted growth, photosynthesis and changes in fructan active enzymes in the cerrado species *Vernonia herbacea*. Fructan productivity was higher in plants under elevated [CO₂], due to their higher rhizophore biomass. Results indicate that plants of *V. herbacea* can benefit from elevated atmospheric [CO₂] by increasing carbon allocation for the production of inulin.

Cover illustrations: Anatomy (left) 10 cm and (right) 2 cm from the tip of 14-day-old seminal wheat roots grown in sand. Cortical cells are large enough to measure their hydraulic properties with a cell pressure probe (see Bramley *et al.* pp. 183–193). Freehand cross-sections were stained for 5 min with 0.05% toluidine.

Characterisation of an (*S*)-linalool synthase from kiwifruit (*Actinidia arguta*) that catalyses the first committed step in the production of floral lilac compounds
Xiuyin Chen, Yar-Khing Yauk, Niels J. Nieuwenhuizen, Adam J. Matich, Mindy Y. Wang, Ramon Lopez Perez, Ross G. Atkinson and Lesley L. Beuning 232–243

Volatile monoterpenes and sesquiterpenes are involved in the complex interactions between plants and insects, as well being of interest to the flavour and fragrance industries. This work describes the cloning and characterisation of a terpene synthase that is pivotal in producing the (*S*)-linalool precursor of the lilac alcohols and aldehydes in kiwifruit (*Actinidia arguta*) flowers.

Early effects of water deficit on two parental clones of *Populus nigra* grown under different environmental conditions
Claudia Coccozza, Paolo Cherubini, Nicole Regier, Matthias Saurer, Beat Frey and Roberto Tognetti 244–254

Drought stress in two parental clones of *Populus nigra* L. resulted in a decrease in plant size and predawn water potential. Proline accumulation, low values of $\delta^{13}\text{C}$ and ABA accumulation were induced to preserve plants from drought damages. The expression of aquaporin genes exhibited contrasting and clonal water transport strategies.

Stomatal conductance as a screen for osmotic stress tolerance in durum wheat growing in saline soil
Afrasyab Rahnama, Richard A. James, Kazem Poustini and Rana Munns 255–263

The change in stomatal conductance measured soon after wheat was exposed to salinity was verified as an indicator of osmotic stress tolerance. It was found to be a reliable and useful screening technique for identifying genotypic variation in salt tolerance. Differences between genotypes were long-lasting, translating into differences in shoot biomass and tiller number.

Quantification and modelling of the stomatal, cuticular and crack components of peach fruit surface conductance
Caroline Gibert, Michel Génard, Gilles Vercambre and Françoise Lescourret 264–274

A dynamic model describing the fruit conductance components was improved by measuring cuticular cracks, stomatal number, and wound healing on nectarine ‘Zephir’ fruits grown under contrasted conditions. Model tests were satisfactory. The model was highly sensitive to parameters related to cuticular crack development and to cuticular properties.