

# Functional Plant Biology

## Contents

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*Editorial: New ventures in scientific publication*  
**Rana Munns**

iii

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*Viewpoint: A unique web resource for physiology, ecology and the environmental sciences:*

*PrometheusWiki*

**Lawren Sack, Will K. Cornwell, Louis S. Santiago, Margaret M. Barbour, Brendan Choat, John R. Evans, Rana Munns and Adrienne Nicotra**

687–693

**PRO**ocols, **METH**ods, **EX**planations and **UP**dated **ST**andards **WIKI** (*PrometheusWiki*) is an open access web resource containing protocols and methods for physiology, ecology and environmental sciences. Contributions can be uploaded by anyone, with attributed authorship and are open for wiki-style comment. This evolving resource is designed to facilitate standardisation, training and new collaborations in research.

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*Viewpoint: Elevated [CO<sub>2</sub>] and forest vegetation: more a water issue than a carbon issue?*

**Joseph A. M. Holtum and Klaus Winter**

694–702

The major responses of plants to elevated [CO<sub>2</sub>] are increased rates of CO<sub>2</sub> fixation and decreased stomatal conductance. We ask whether these plant responses persist and affect forest vegetation in the long term. Are they of similar importance? Have appropriate measurements of them been made in natural systems?

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*Quantifying genetic effects of ground cover on soil water evaporation using digital imaging*

**Daniel J. Mullan and Matthew P. Reynolds**

703–712

Rapid development of leaf area and/or aboveground biomass has the potential to improve water harvest of rain-fed wheat in Mediterranean-type environments through reduced soil evaporation. This paper estimates genetic differences in soil evaporation within four populations and identifies sufficient genetic variation to increase water harvest through targeting faster ground cover. Implications for improved wheat yields and breeding are discussed.

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*Effects of leaf development and phosphorus supply on the photosynthetic characteristics of perennial legume species with pasture potential: modelling photosynthesis with leaf development*

**Lalith D. B. Suriyagoda, Hans Lambers, Megan H. Ryan and Michael Renton**

713–725

Leaf age and phosphorus supply dependent changes in the photosynthetic characteristics of pasture legume species have not been reported and are not incorporated into leaf and canopy photosynthesis simulation models. We report that leaf photosynthetic characteristics change with leaf age, and when these age-dependent changes are incorporated into simulation models, leaf and canopy photosynthesis estimates are more precise than when leaf photosynthetic characteristics are assumed to be constant.

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*Cover illustration: PRO*ocols, *METH*ods, *EX*planations and *UP*dated *ST*andards *WIKI* (*PrometheusWiki*, <http://www.publish.csiro.au/prometheuswiki/>) is a new open access, fully searchable web resource that contains protocols and methods for plant physiology, ecology and environmental sciences (see Sack *et al.* pp. 687–693).

<p>Grazing winter wheat relieves plant water stress and transiently enhances photosynthesis  <b>Matthew T. Harrison, Walter M. Kelman, Andrew D. Moore and John R. Evans</b></p>	<p>726–736</p>	<p>Light-saturated photosynthesis of field-grown rain-fed wheat transiently increased over 2–4 weeks after livestock grazing due to increased Rubisco activity and a conservation of soil water. Grazing reduced leaf mass per unit area, increased stomatal conductance and increased intercellular CO<sub>2</sub> concentrations, but had little effect on leaf nitrogen content.</p>
<p>Effect of light and CO<sub>2</sub> on inorganic carbon uptake in the invasive aquatic CAM-plant <i>Crassula helmsii</i>  <b>Signe Koch Klavsen and Stephen C. Maberly</b></p>	<p>737–747</p>	<p>In the invasive aquatic plant, <i>Crassula helmsii</i>, CAM is controlled by the availability of light and CO<sub>2</sub> via acclimation during growth and on a daily basis by the resources affecting photosynthesis and the CAM cycle itself. The possession of CAM may be one of the reasons for the large ecological niche of this species.</p>
<p>Aerenchyma formation: programmed cell death in adventitious roots of winter wheat (<i>Triticum aestivum</i>) under waterlogging  <b>Zhen Jiang, Xue-Fang Song, Zhu-Qing Zhou, Li-Kai Wang, Ji-Wei Li, Xiang-Yi Deng and Hai-Yan Fan</b></p>	<p>748–755</p>	<p>This study determined the characteristics of cortical cell death in wheat (<i>Triticum aestivum</i> L.) roots by waterlogging. Observations suggest that cortical cell death during aerenchyma formation was a form programmed cell death (PCD) and acid phosphatases play an important role in PCD.</p>
<p>Effects of fruiting on vegetative growth and development dynamics of grapevines (<i>Vitis vinifera</i> cv. Semillon) can be traced back to events at or before budbreak  <b>Dennis H. Greer and Chris Weston</b></p>	<p>756–766</p>	<p>Semillon shoot development follows a plan set back in the dormant bud. Two flushes of leaves can emerge and the apical meristem supplies more leaves and internodes. The presence of floral primordia in the bud upsets this development plan and shoot growth is progressively delayed. Competition has a long arm.</p>
<p>Identification of the lipoxygenase gene family from <i>Vitis vinifera</i> and biochemical characterisation of two 13-lipoxygenases expressed in grape berries of Sauvignon Blanc  <b>Andriy Podolyan, Jackie White, Brian Jordan and Chris Winefield</b></p>	<p>767–784</p>	<p>For the first time, using a combination of bioinformatics and biochemistry, we have described the entire lipoxygenase gene family in wine grape. Focussing on LOXs present in Sauvignon blanc berries we have shown wound and pathogen responsive gene expression and interesting differences in biochemical activities of the LOXs examined. Lipoxygenases are predicted to play important roles in defence and in the formation of important wine flavours and aromas.</p>
<p>Comparative efficiency of subcellular targeting signals for expression of a toxic protein in sugarcane  <b>Mark A. Jackson, Kerry A. Nutt, Rachael Hassall and Anne L. Rae</b></p>	<p>785–793</p>	<p>For the <i>in planta</i> production of potentially toxic proteins, careful consideration of subcellular location is required in order to optimise yield and to avoid detrimental interaction with plant cellular processes. In this study a range of subcellular targeting signals was tested in sugarcane for their ability to effectively compartmentalise the glycoprotein and potential cell toxin avidin.</p>