

Functional Plant Biology

Contents

Volume 36 Issue 9 2009

Enhancement in leaf photosynthesis and upregulation of Rubisco in the C₄ sorghum plant at elevated growth carbon dioxide and temperature occur at early stages of leaf ontogeny

**P. V. Vara Prasad, Joseph C. V. Vu,
Kenneth J. Boote and L. Hartwell Allen Jr**

761–769

Enhancements in leaf photosynthetic rates and upregulation of Rubisco activity in C₄ sorghum at elevated carbon dioxide (CO₂) occurred to a greater extent at early stages of leaf ontogeny and high growth temperatures. Such enhancements in photosynthetic capacity may contribute to greater vegetative growth at elevated CO₂ and high temperatures.

Photosynthetic features of non-Kranz type C₄ versus Kranz type C₄ and C₃ species in subfamily Suaedoideae (Chenopodiaceae)

**Monica E. Smith, Nouria K. Koteyeva,
Elena V. Voznesenskaya, Thomas W. Okita
and Gerald E. Edwards**

770–782

In two exceptional structural types of C₄ photosynthesis found in family Chenopodiaceae, carbon assimilation is accomplished within individual chlorenchyma cells (non-Kranz). Representative species of these forms were shown to be functionally similar in C₄ traits to related Kranz type species including their photosynthetic responses to light and CO₂, and water use efficiency.

Photosynthetic responses to chromosome doubling in relation to leaf anatomy in *Lonicera japonica* subjected to water stress

**Wei-Dong Li, Dilip K. Biswas, Hong Xu,
Chang-Qing Xu, Xian-Zhong Wang,
Jia-Kun Liu and Gao-Ming Jiang**

783–792

Effects of chromosome doubling were studied in Japanese honeysuckle (*Lonicera japonica* Thunb.) subjected to water stress. The tetraploid showed higher drought resistance than the diploid as represented by leaf anatomy and physiological traits. The effect of chromosome doubling on drought resistance could be attributed to the improvement of structure and photosynthesis-related traits.

Anthocyanin influence on light absorption within juvenile and senescing sugar maple leaves – do anthocyanins function as photoprotective visible light screens?

**Abby K. van den Berg, Thomas C. Vogelmann
and Timothy D. Perkins**

793–800

Light absorption profiles within red and green expanding and senescing sugar maple leaves were compared in order to evaluate whether anthocyanins in the palisade mesophyll function as photoprotective visible light screens. Although red leaves absorbed more green light than green leaves, anthocyanins did not attenuate light within leaves as predicted for an anthocyanic screen in the palisade mesophyll.

Irrigated Shiraz vines (*Vitis vinifera*) upregulate gas exchange and maintain berry growth in response to short spells of high maximum temperature in the field

**Chris J. Soar, Marisa J. Collins
and Victor O. Sadras**

801–814

The dynamics of berry growth and sugar accumulation in irrigated Shiraz were largely unaffected by three consecutive days with maximum air temperature elevated by 6–7°C above ambient. Stomatal conductance, photosynthesis and transpiration at a common vapour pressure deficit were higher in heated vines than in controls. This response might contribute to heat tolerance at the expense of short-term transpiration efficiency.

Cover illustration: Rising atmospheric carbon dioxide concentration and high temperature influences photosynthesis, growth and dry matter production of C₄ grain sorghum plants. At high temperature, elevated CO₂ (700 mmol m⁻² s⁻¹) progressively enhanced leaf area from sowing to anthesis. This was due to enhancements in leaf photosynthetic rates and upregulation of Rubisco, particularly at early stages of leaf ontogeny (see Prasad *et al.* pp. 761–769).

Starch-to-sugar conversion in wood parenchyma of field-growing *Laurus nobilis* plants: a component of the signal pathway for embolism repair?

Sebastiano Salleo, Patrizia Trifilò, Sara Esposito, Andrea Nardini and Maria A. Lo Gullo

815–825

The ability of stems of laurel to refill embolised xylem conduits was studied in plants both at optimal water supply and under conditions of soil drought. The data from this study suggests that starch depolymerisation acts as a signal to phloem unloading sugars to embolised conduits thus generating the necessary osmotic gradients driving refilling.

Changes in soil–plant P under heterogeneous P supply influence C allocation between the shoot and roots

Qifu Ma, Zed Rengel and Jairo Palta

826–831

The regulatory processes underlying root proliferation and nutrient uptake in the localised nutrient zones are still poorly understood. This study showed a rapid C signalling between the shoot and roots as influenced by changes in soil–plant P. Shoot P status exerted a greater effect than soil P supply on preferential C allocation to meet the demand of plant growth under heterogeneous P supply.

R-type anion channel activation is an essential step for ROS-dependent innate immune response in *Arabidopsis* suspension cells

Jean Colcombet, Yves Mathieu, Remi Peyronnet, Nicolas Agier, Françoise Lelièvre, Hélène Barbier-Brygoo and Jean-Marie Frachisse

832–843

Combined pharmacological and patch clamp studies on cell suspensions of *Arabidopsis thaliana* (L.) reveal similar pharmacological profiles for the inhibition of sulfate-permeable R-type channel and ROS formation. Treatment with R-type channel blockers accelerates cell death triggered by the non-specific plant pathogen *Xanthomonas campestris* leading to the hypothesis that the R-type channel is involved in innate immune response via antibacterial ROS production.