

# Functional Plant Biology

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Effectiveness of the photochemical reflectance index to track photosynthetic activity over a range of forest tree species and plant water statuses

**F. Ripullone, A. R. Rivelli, R. Baraldi, R. Guarini, R. Guerrieri, F. Magnani, J. Peñuelas, S. Raddi and M. Borghetti**

177–186

In this study, we investigated the potential of the photochemical resistance index (PRI) to track photosynthetic activity of tree forest species under water stress conditions. PRI was able to provide a good estimate of the maximum CO<sub>2</sub> assimilation and  $\Delta F/F_m'$  for single species, while less reliable when all species were pooled together.

Plasticity tradeoffs in salt tolerance mechanisms among desert *Distichlis spicata* genotypes

**Brynne E. Lazarus, James H. Richards, Phoebe E. Gordon, Lorence R. Oki and Corey S. Barnes**

187–198

Screening rice for flowering stage drought tolerance during dry season could be confounded by heat stress. Hence caution should be taken as putative drought tolerant entries with high sensitivity to heat stress could be discarded. Dry season screening could help select for combined heat and drought tolerance for future climates.

Comparative genomics of two ecologically differential populations of *Hibiscus tiliaceus* under salt stress

**Guili Yang, Xiaoshu Chen, Tian Tang, Renchao Zhou, Sufang Chen, Weijing Li, Jianhua Ouyang, Lian He and Shuhua Shi**

199–208

*Hibiscus tiliaceus* L., a mangrove associate occupying the divergent environments of intertidal wetland and inland, is an ideal plant for the study of ecological adaptation and salt tolerance. In this study the responses of two ecological contrasting populations to salinity were compared combining a global transcriptional analysis and physiological analysis.

Root, shoot and leaf traits of the congeneric *Styrax* species may explain their distribution patterns in the cerrado sensu lato areas in Brazil

**Gustavo Habermann and Anna C. G. Bressan**

209–218

At the seedling stage, the high shoot and root growth of *Styrax camporum* illustrate its wide distribution in the cerrado sensu lato areas in Brazil, whereas the deep roots of *S. ferrugineus* explain its occurrence in the cerrado sensu stricto. Shade environments enlarge the SLA of *S. pohlii*, which could partially explain its occurrence in forest habitats.

Arbuscular mycorrhizas enhance plant interception of leached nutrients

**Hamid Reza Asghari and Timothy Richard Cavagnaro**

219–226

We investigated the effects of forming arbuscular mycorrhizas on plant growth and nutrition, nutrient depletion from soil, and nutrient leaching. Nutrient interception was proportionally greater than plant growth where plants were mycorrhizal. This indicates that mycorrhizas have an important role to play reducing the net loss of nutrients via leaching.

Cover illustration: Saltgrass (*Distichlis spicata*) growing in pots in a greenhouse study at the University of California, Davis (see Lazarus et al. pp. 187–198, Photo credit: Brynne Lazarus).

Anatomical and chemical characteristics of culm of rice brittle mutant *bc7(t)*

**Cunxu Wei, Peisong Xie, Yifang Chen, Huaguang Yu, Yanjing Su, Minghong Gu and Changjie Yan**

227–235

Brittleness culm is an important agronomic trait. This paper shows that rice brittle mutant *bc7(t)* exhibits higher area percentages of mechanical and conducting tissues, and lower cell wall thickness of sclerenchyma cells. The content of cellulose decreases, and the contents of hemicellulose, lignin and silicon increase in *bc7(t)*. These results shows that *bc7(t)* may have compensatory increases in non-cellulosic components and the area percentages of mechanical and conducting tissues.

The continuous accumulation of Na<sup>+</sup> in detached leaf sections is associated with over-expression of NTHK1 and salt tolerance in poplar plants

**Ying Zhang, Ying-Xia Yang, Xiangming Zhou, Yan-Hong Jia, Li-Li Nie, Yue Zhang, Shou-Yi Chen, Jing-An Wang and Zhong-Qi Liu**

236–245

Under salt stress environment, the higher capacity for Na<sup>+</sup> accumulation in transgenic poplar line 18-1 with much better salt tolerance than its WT may be due to stable Na<sup>+</sup> sequestration into the vacuoles, indicated by high activities of vacuolar-type H<sup>+</sup>-ATPase and H<sup>+</sup>-PPase, chlorophyll retention, K<sup>+</sup> content but low relative electrolyte leakage in its leaf sections.

Quantifying physiological determinants of genetic variation for yield potential in sunflower. SUNFLO: a model-based analysis

**Jérémie Lecoeur, Richard Poiré-Lassus, Angélique Christophe, Benoît Pallas, Pierre Casadebaig, Philippe Debaeke, Felicity Vear and Lydie Guilioni**

246–259

The present work is focused on the description, validation and uses of a process-based model for Sunflower (SUNFLO). The ability of the model to discriminate the genotypes was tested on a large set of commercial genotypes. Unlike classical statistical analysis, this modelling approach highlights some efficient combinations of genotypic parameters to improve yield performance.