

Functional Plant Biology

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Review: The roles of methyl jasmonate to stress in plants

*Xiaxia Yu, Wenjin Zhang, Yu Zhang,
Xiaoja Zhang, Duoyong Lang and Xinhui Zhang* 197–212

MeJA helps plants to cope with biotic and abiotic stress, and the role of MeJA in the defense responses and growth protection of plants provides a direct way of alleviating the stresses in a dose-dependent manner. Moreover, MeJA induces the accumulation of secondary metabolites and promotes the combination of plants with other induction factors.

Vertical patterns of photosynthesis and related leaf traits in two contrasting agricultural crops

*Petra D'Odorico, Carmen Emmel, Andrew Revill,
Frank Liebisch, Werner Eugster*

and Nina Buchmann 213–227

Plant canopies exhibit vertical variations in leaf structural, biochemical and physiological traits to adapt to availability of light and other resource gradients. We studied these variations for top and bottom canopy leaves of barley and rape seed crops. We find that although top leaves have higher photosynthetic capacity due to higher leaf mass, nitrogen and pigment content, the bottom canopy contributes the most to total photosynthesis.

Differences in hydraulic traits of grapevine rootstocks are not conferred to a common *Vitis vinifera* scion

Felipe H. Barrios-Masias, Thorsten Knipfer,

M. Andrew Walker and Andrew J. McElrone 228–235

Grapevine species used as rootstocks differ in susceptibility to drought induced embolism formation and refilling upon rewetting. We evaluated if these rootstock traits influence those of a common Cabernet Sauvignon scion, and conclude that the scion behaved similarly when grafted onto these rootstocks. Understanding water relations between rootstock and scion can help define novel water management strategies under drought.

Evolution and expression analysis of the sorghum ubiquitin-conjugating enzyme family

LiQiang Jia, QiuFang Zhao and Shu Chen

236–247

Ubiquitin-conjugating (UBC) enzymes (E2s) have diverse functions in plant growth and development. In this study, we identified *SbUBC* genes in sorghum and analysed their response to abiotic stress. The aim of the work was to give references to understand the function of *SbUBC* genes generally and serve as a reference for studies of UBC genes in other plants.

Distinction and characterisation of rice genotypes tolerant to combined stresses of salinity and partial submergence, proved by a high-resolution chlorophyll fluorescence imaging system

*Bhubaneswar Pradhan, Koushik Chakraborty,
Nivedita Prusty, Deepa, Arup Kumar Mukherjee,
Krishnendu Chattopadhyay and*

248–261

Accurate and fast phenotyping is of paramount necessity in stress-tolerant crop improvement programmes. A high-resolution chlorophyll fluorescence imaging technique was used to investigate the combined effect of salinity and partial submergence stresses in rice. The images of different chlorophyll fluorescence parameters were able to characterise the tolerant and susceptible genotypes distinctly under dual abiotic stress.

Cover illustration: Study site near Oensingen, Switzerland (see D'Odorico *et al.* pp. 213–227). At the long-term agricultural measurement station CH-Oe2, greenhouse gas exchange and meteorological variables are continuously measured with the eddy covariance technique. Measurement transects for light response curve (LRC) measurements at two canopy heights as well as leaf area index (LAI) measurements are shown for each field. Location and set-ups of photosynthetically active radiation (PAR) profiles are shown early in a crop seasonal cycle.

Comparative physiological responses of *Microcoleus vaginatus* and *Bryum argenteum* to enhanced UV-B radiation under field conditions

**Rong Hui, Rongliang Jia, Yang Zhao,
Guang Song and Yanhong Gao**

262–274

Effect of enhanced UV-B radiation on terrestrial organisms and ecosystems has caused concern. Here, physiological responses of two dominant species in BSCs to enhanced UV-B radiation were compared, and the results indicated that enhanced and prolonged UV-B lead to deleterious effects to both species. The findings imply the structure and function of BSCs may influence by increased UV-B radiation.

Promoter of the wheat lipid transfer protein, *TdLTP4*, drives leaf-preferential expression in transgenic *Arabidopsis* plants

**Héla Safi, Nebras Belgaroui, Khaled Masmoudi
and Faiçal Brini**

275–285

In previous research, a gene encoding a durum wheat lipid transfer protein, *TdLTP4*, was characterised as induced by abiotic and biotic stresses. Here we report that the promoter *PrTdLTP4* is an abiotic stress-inducible, age-dependent, and is tissue specific in the heterologous transgenic *Arabidopsis*. Taken together these data provide evidence that *PrTdLTP4* could be an excellent tool for future crop improvement.

Intraspecific variation in drought susceptibility in *Eucalyptus globulus* is linked to differences in leaf vulnerability

**Christopher J. Lucani, Timothy J. Brodrribb,
Greg Jordan and Patrick J. Mitchell**

286–293

Few studies assess the range in drought tolerance that exists among individuals of the same species, yet this is critical in accurately predicting the effect of climate change on plants. This may be the result of the labour intensive process of assessing drought tolerance, which typically requires multiple measurements per individual. Here we present an alternative approach for large-scale analysis that reduces the number of measurements, thereby improving efficiency and increasing our ability to assess a broader range of individuals.
