

Functional Plant Biology

Contents

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Review: Does susceptibility to heat stress confound screening for drought tolerance in rice?

Krishna S. V. Jagadish, Jill E. Cairns, Arvind Kumar, Impa M. Somayanda and Peter Q. Craufurd

261–269

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.

Chickpea genotypes contrasting for seed yield under terminal drought stress in the field differ for traits related to the control of water use

Mainassara Zaman-Allah, David M. Jenkinson and Vincent Vadez

270–281

Terminal drought-tolerant chickpea have lower leaf conductance and expansion rate under non-limiting water conditions at vegetative stage, an earlier transpiration decline and more restricted plant growth under progressive soil drying, than sensitive genotypes. These water-saving mechanisms are hypothesised to make more water available during reproduction and grain filling.

Physiology and gene expression of the rice landrace Horkuch under salt stress

Laisa A. Lisa, Sabrina M. Elias, M. Sazzadur Rahman, Saima Shahid, Tetsushi Iwasaki, A. K. M. Mahbub Hasan, Keiko Kosuge, Yasuo Fukami and Zeba I. Seraj

282–292

Horkuch, a rice landrace endemic to the coast of Bangladesh was shown to set adequate grains, maintain high Ca and Mg and partition toxic Na away from photosynthesising leaves under salt stress. This performance coincided with an increase in expression of photosynthesis-related genes and ROS scavengers at the molecular level.

UV-B-induced stomatal closure occurs via ethylene-dependent NO generation in *Vicia faba*
Jun-Min He, Zhan Zhang, Rui-Bin Wang and Yi-Ping Chen

293–302

The data presented in this paper show not only that both ethylene and NR source of NO participate in UV-B-induced stomatal closure, but also that ethylene acts upstream of NO in *Vicia faba* L. epidermal strips. These findings will help us to gain further insights into the complex UV-B signal transduction networks in plants.

Actin microfilaments and vacuoles are downstream targets of H₂O₂ signalling pathways in hyperosmotic stress-induced stomatal closure

Ai-Xia Huang and Xiao-Ping She

303–313

The mechanism underlying the perception and transduction of extracellular changes in osmotic pressure in guard cells was studied. Using epidermal strip bioassay and laser-scanning confocal microscopy, we provide evidence that stomatal closure in response to hyperosmotic stress may initiate H₂O₂ generation, and that reorganisation of microfilaments and the changing of vacuoles occurs downstream of H₂O₂ signalling processes.

Cover illustration: Environmental scanning electron microscope images of leaf rust (*Puccinia triticina*) on wheat leaves (see Bürling *et al.* 337–345). (Upper left): Wheat leaf with several leaf rust pustules, and release of spores to the environment; (Upper right): rupture of the cuticular membrane and formation of leaf rust pustule; (Lower left): detailed view of the newly formed *P. triticina* spores; (Lower right): germinated spores and germ tubes searching for stomata. Photographs by Knut Wichterich, Kathrin Bürling and Mauricio Hunsche.

Ecophysiological modelling of leaf level photosynthetic performance for three Mediterranean species with different growth forms
Nikos Markos and Aris Kyparissis 314–326

A leaf photosynthesis model, incorporating water potential effects and short- and long-term (acclimation) temperature effects is presented. The model estimates photosynthesis through four ecophysiological parameters (chlorophyll content, leaf mass per area, pre-dawn water potential, leaf temperature) and two meteorological parameters [PAR and average temperature of the 33-day period before measurement (T33)].

The production of flowers, fruit and leafy shoots in pruned macadamia trees
Trevor Olesen, David Huett and Glenn Smith 327–336

Most flowering and fruit production in young *Macadamia integrifolia* (var. ‘849’) was found in heavily shaded parts of the canopy, and on wood more than 3 years old; in contrast to shoot production, which occurred in the better-lit parts of the canopy. Even light pruning resulted in a penalty in fruit production.

UV-induced fluorescence spectra and lifetime determination for detection of leaf rust (*Puccinia triticina*) in susceptible and resistant wheat (*Triticum aestivum*) cultivars
Kathrin Bürling, Mauricio Hunsche, Georg Noga, Lutz Pfeifer and Lutz Damerow 337–345

This study revealed that UV-induced measurements of fluorescence spectra and lifetime are suited to detect wheat leaf rust as early as 2 days after inoculation. Moreover, discrimination between resistant and susceptible cultivars could be accomplished 3 days after inoculation. The combination of spectrally and time-resolved fluorescence could be used in breeding programs as additional tool for evaluation of the pathogen resistance of new genotypes.
