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The influence of nitrogen supply on antioxidant enzymes in plant roots

Leonardo Oliveira Medici, Ricardo Antunes Azevedo, Richard John Smith and Peter John Lea 1–9

Nitrogen is an essential plant nutrient and can be a major limitation for plant productivity. These authors have studied the response of three antioxidant enzymes, catalase, glutathione reductase and superoxide dismutase in the roots of three distinct plant species, maize, barley and *Arabidopsis*, submitted to growth in low and high nitrogen. Glutathione reductase exhibited major increases in total activity in high nitrogen, which was due to the appearance of new isoenzymes.

Fructosyltransferase activity and fructan accumulation during development in wheat exposed to terminal drought

Danica E. Goggin and Tim L. Setter 11–21

Fructans act as storage carbohydrates in wheat stems; these authors measure the activity of the enzymes involved in fructan synthesis, fructosyltransferases during development of three high-yielding wheat cultivars exposed to rainfed or irrigated conditions. They also determine stages of development in which fructan synthesis is most important, and evaluate differences in fructan synthesis and storage between different stem tissues.

Differences in the ROS-generating efficacy of various ultraviolet wavelengths in detached spinach leaves

Csengele Barta, Tamás Kálai, Kálmán Hideg, Imre Vass and Éva Hideg 23–28

Exposure of plants to ultraviolet (UV) radiation gives many responses. In laboratory experiments with detached spinach leaves irradiated, the potential of UV to induce reactive oxygen species depended on the wavelength (energy) of the radiation. This is the first direct observation of singlet oxygen production in UV damaged leaves. UV-induced superoxide production is also examined.

Structural changes in acclimated and unacclimated leaves during freezing and thawing

Marilyn C. Ball, Martin J. Canny, Chen X. Huang and Roger D. Heady 29–40

Structural responses to frost-freezing and thawing in leaves of *Eucalyptus pauciflora* are compared in acclimated and unacclimated plants. In both, extracellular ice accumulated in mesophyll spaces, xylem vessels and in zones along the midvein. On thawing, acclimated plants regained their former structure, whereas unacclimated plants showed permanent cell and tissue damage.

Stomatal conductance and root-to-shoot signalling in chestnut saplings exposed to *Phytophthora cinnamomi* or partial soil drying

Marion Maurel, Cécile Robin, Thierry Simonneau, Denis Loustau, Erwin Dreyer and Marie-Laure Desprez-Loustau 41–51

Understanding of the stomatal conductance regulation has improved greatly in the last decade, but pathogens are rarely considered. Here, the regulation of stomatal response of chestnut saplings infected by *Phytophthora cinnamomi* or exposed to soil drying was monitored; results suggest that both hydraulic and chemical signals are involved.

Cover illustration: Split-rooted chestnut saplings partially exposed to the root pathogen *Phytophthora cinnamomi* for the study of chemical and hydraulic signals involved in stomatal response to infection. Photograph provided by Xavier Capdevielle, INRA (see Maurel *et al.*, pp. 41–51).

Chlorophyll fluorescence of submerged and floating leaves of the aquatic resurrection plant *Chamaeigigas intrepidus*
Markus Voitke, Wolfram Hartung, Hartmut Gimmler and Hermann Heilmeyer 53–62

During the growing and reproductive periods, *Chamaeigigas intrepidus* plants endure extreme environmental stresses, through repeated cycles of desiccation and rewetting, and form submerged and floating leaves. These authors use chlorophyll fluorescence to determine whether these leaves differ in desiccation tolerance. In addition, the contributions of the two leaf types towards CO₂ fixation were estimated also using quantum yield measurements.

Analysis of the asparagus (*Asparagus officinalis*) asparagine synthetase gene promoter identifies evolutionarily conserved *cis*-regulatory elements that mediate Suc-repression
Somrutai Winichayakul, Richard L. Moyle, Simon A. Coupe, Kevin M. Davies and Kevin J. F. Farnden 63–72

This paper reports the cloning and analysis of the promoter region of the asparagus asparagine synthetase gene, which is activated during fern senescence and after tissue harvest. The authors also identified a sugar-responsive DNA *cis*-element in common with that of the β -amylase gene of rice, and suggest that this is an evolutionary conserved *cis*-regulatory element mediating sucrose repression.

Cloning and characterisation of the gene encoding HMG-CoA reductase from *Taxus media* and its functional complementation in yeast
Zhihua Liao, Qiumin Tan, Yourong Chai, Kaijing Zuo, Min Chen, Yifu Gong, Peng Wang, Yan Pi, Feng Tan, Xiaofen Sun and Kexuan Tang 73–81

The first step in the pathway for isoprenoid biosynthesis in plants is catalysed by 3-hydroxy-3-methylglutaryl coenzyme A reductase (HMGR). This is the first report on the isolation of a full-length cDNA encoding *Tm-HMGR* from a gymnosperm, *Taxus media*, and shows expression in roots, stems and needles. The functional complementation of *Tm-HMGR* in yeast was also investigated.

An experimental system for analysis of the dynamic sap-flow characteristics in young trees: results of a beech tree
Kathy Steppe and Raoul Lemeur 83–92

This paper describes an experimental system that combines almost all the possible sensors one can use to study the dynamic flow of water through young trees, including sap-flow sensors, linear variable displacement transducers, CO₂ and water vapour gas analysers. It also discusses some interesting results concerning the dynamic flow of water through a young beech.