

Functional Plant Biology

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Contents

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Review: Mechanisms of anoxia tolerance in plants.

I. Growth, survival and anaerobic catabolism

Jane Gibbs and Hank Greenway 1–47

This is the first of a two-part review of adaptation to anoxia, and focuses on mechanisms of anoxia tolerance in plants. More specifically, it discusses growth, survival, interaction between anoxia tolerance and other environmental factors and development of anoxic cores within plant tissue. Part 1 also examines anaerobic carbohydrate catabolism and its regulation.

Influence of nitrogen and phosphorus supply on foliage growth and internal recycling of nitrogen in conifer seedlings (*Prumnopitys ferruginea*)

Fiona E. Carswell, Peter Millard, Graeme N. D. Rogers and David Whitehead 49–55

This paper describes a study of the internal cycling of nitrogen in a conifer with an indeterminate growth habit. It specifically considers the responses of nitrogen cycling in *Prumnopitys ferruginea* to fluctuations in nitrogen and phosphorus supply over two years, and relates these responses to growth habit.

Effect of cadmium stress on nitrogen metabolism in nodules and roots of soybean plants

Karina B. Balestrasse, María Patricia Benavides, Susana M. Gallego and María L. Tomaro 57–64

As anthropogenically-derived heavy metal pollution accumulates in agricultural areas, it is important to understand how plant metabolism and symbiosis respond to this chemical challenge. This assessment of the impact of cadmium stress on various aspects of nitrogen assimilation and metabolism in soybean shows that, in general, roots are affected more severely than nodules.

Hydraulic and chemical signals in the control of leaf expansion and stomatal conductance in soybean exposed to drought stress

Fulai Liu, Christian Richardt Jensen and Mathias Neumann Andersen 65–73

These authors show for the first time that how chemical signals, i.e. root-originated ABA and xylem pH, affect leaf growth and stomatal behaviour in soybean under drought conditions. The pattern of interaction between hydraulic and chemical signals and the time-courses of the signalling events during progressive soil drying are also presented.

The maize epicuticular wax layer provides UV protection

Lacy M. Long, H. Prinal Patel, Wendy C. Cory and Ann E. Stapleton 75–81

These authors address the interesting question of whether epicuticular waxes of maize help protect the plant from UV. They show, using a variety of UV-specific measures of plant response, that a maize mutant deficient in the outer waxy layer is more sensitive to ultraviolet radiation than the wild-type.

Developmental regulation of the gibberellin pathway in pea shoots

John J. Ross, Sandra E. Davidson, Carla M. Wolbang, Emma Bayly-Stark, and James B. Reid 83–89

This paper reports evidence that in mature pea tissue (i) gibberellins can be synthesised, *in situ* (contrary to previous suggestions); (ii) the low level of GA₂₀ and GA₁ is attributable to their rapid deactivation; and (iii) this rapid deactivation is not attributable to the low level of a second plant growth regulator, auxin.

Cover illustration: Development of the aquatic monocot *Potamogeton pectinatus* from tubers (each the size of a small pea) submerged under anaerobic (anoxic) conditions for 7 days (photograph provided by Dr M Jackson) (see Gibbs and Greenway, pp. 1–47).

Production of reactive oxygen species during non-specific elicitation, non-host resistance and field resistance expression in cultured tobacco cells

Amanda J. Able, Mark W. Sutherland and David I. Guest

91–99

This paper examines physiological differences between several forms of disease resistance in plant–pathogen systems. The authors focus on differences in timing, intensity and extent of reactive oxygen species production and hypersensitivity, and highlight the use of non-specific elicitation as a descriptor for functional analysis of events that may occur in other forms of disease resistance.

Elevated chloroplastic glutathione reductase activities decrease chilling-induced photoinhibition by increasing rates of photochemistry, but not thermal energy dissipation, in transgenic cotton

Dmytro Korniyev, Barry A. Logan, Paxton R. Payton, Randy D. Allen, and A. Scott Holaday

101–110

This manuscript describes a study examining the mechanism underlying enhanced chilling tolerance of transgenic cotton overproducing chloroplastic glutathione reductase (GR+). GR+ cotton showed small but significant enhancements in the resistance to photoinhibition of PSII and PSI and maintained higher rates of photochemistry, but not thermal energy dissipation.

Review: Metabolome characterisation in plant system analysis

Alisdair R. Fernie

111–120

This review highlights methods of high-throughput metabolite analysis, with particular emphasis on those that allow the determination of the steady-state concentrations of a broad spectrum of metabolites. The author discusses possibilities for adopting metabolic flux analytical techniques from medicinal and microbial sciences for plant study, and defines future prospects for metabolome analyses within the wider context of systems biology.