

Functional Plant Biology

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Contents

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Review: Integrated plant proteomics — putting the green genomes to work
Joshua L. Heazlewood and A. Harvey Millar 471–482

This review paper is a useful introduction to the area of proteomics as applied to plants. It covers all of the technical aspects of proteomics as applied to model plants, and outlines the current status of the field.

Soil strength and rate of root elongation alter the accumulation of *Pseudomonas* spp. and other bacteria in the rhizosphere of wheat
Michelle Watt, Margaret E. McCully and John A. Kirkegaard 483–491

These authors compared wheat roots in a field and in a controlled environment to demonstrate that slow-growing roots in hard soil accumulate bacteria in the rhizosphere, while fast-growing roots in looser soil escape this accumulation. The results are important for the understanding of interactions between abiotic and biotic factors and root growth in soil.

Physiological roles for aerenchyma in phosphorus-stressed roots
Mingshou Fan, Jinming Zhu, Christina Richards, Kathleen M. Brown and Jonathan P. Lynch 493–506

Low phosphorus availability induces the formation of cortical aerenchyma in roots; these aerenchyma may help P-deficient plants reduce root respiratory and P requirements, thus increasing the metabolic efficiency of soil exploration. Substantial intraspecific variation in aerenchyma formation is reported in two major crop species, raising the possibility of breeding for this trait to enhance crop P efficiency.

Effect of calcium on root development and root ion fluxes in salinised barley seedlings
Sergey Shabala, Lana Shabala and Elizabeth Van Volkenburgh 507–514

This paper describes the impact of salinity on various physiological processes and characteristics in barley plants, and discusses amelioration of salt stress symptoms by supplemental Ca. The authors investigate mechanisms by which salinity inhibits root and shoot performance, and discuss underlying cellular and ionic mechanisms by which supplemental calcium ameliorates the salt stress.

Response of *chlorina* barley mutants to heat stress under low and high light
Katya Georgieva, Ivanka Fedina, Liliana Maslenkova and Violeta Peeva 515–524

This paper explores the combined effect of heat stress and light intensity on photosynthetic activity in wild type and two separate *chlorina* mutants barley plants. High light had a protective effect on photosynthetic activity when plants were exposed to high temperature, where heat stress at low light strongly reduced the functional activity of several factors.

Cytokinin metabolism in *Narcissus* bulbs: chilling promotes acetylation of zeatin riboside
David S. Letham, Noel G. Smith and David A. Willcocks 525–532

This paper addresses the question of endogenous cytokinin involvement in *Narcissus* bulb dormancy and post-dormant development. The data make novel contributions to the field, especially in the demonstration of metabolism of O-acetyl compounds, the finding of low temperature enhancing the formation of acetyl zeatin riboside, a rare cytokinin metabolite, and measurement of endogenous levels.

Cover illustration: Aerenchyma in low phosphorus roots reduces the metabolic cost of soil exploration; illustration shows high (left) and low (right) phosphorus models (see Fan *et al.*, pp. 493–506).

Capacity of protection against ultraviolet radiation in sun and shade leaves of tropical forest plants

G. Heinrich Krause, Alexander Gallé, Rolf Gademann and Klaus Winter 533–542

Tropical forest plants experience high levels of UV radiation. This study utilizes a novel, non-invasive technique to examine the capacity for UV protection. The authors show that sun leaves of tall forest trees are generally well protected, whereas shade leaves from both the forest canopy and forest understory are only modestly protected.

Cold-induced photoinhibition and winter leaf-loss in the broad-leaved tree *Aristotelia serrata* (Elaeocarpaceae)

Roger J. Dungan, David Whitehead, Matt McGlone, Richard P. Duncan and Robert B. Allen 543–550

This research investigates cold-induced photoinhibition of photosynthesis and leaf loss in the broadleaved native New Zealand tree *Aristotelia serrata*. The authors investigated the extent of leaf loss in various parts of the canopy, and the effects of cold leaf temperatures and high irradiance during winter frosts. Their results contribute to a model of canopy carbon uptake.

Growth, carbon allocation and proteolytic activity in the seagrass *Zostera noltii* shaded by *Ulva* canopies

Fernando G. Brun, Ignacio Hernández, Juan J. Vergara and J. Lucas Pérez-Lloréns 551–560

This paper explores the low capacity of short seagrasses to survive under low light conditions, possibly due to a lack of sucrose mobilisation throughout the plant, and low starch reservoirs to meet the increase in carbon demands. The authors examined the activity of the enzymes implied in the carbon partitioning, sucrose synthase and sucrose phosphate synthase.

Describing and modelling ozone-dependent variation in flavonoid content of bean (*Phaseolus vulgaris* cv. Bergamo) leaves: a particular dose–response relationship analysis

Myriam Kanoun, Philippe Goulas and Jean-Philippe Biolley 561–570

These authors compare ozone exposure indices as predictors of the appearance of foliar symptoms and accumulation of a particular flavonoid in bean grown in open-top field chambers. They show that the phenolic response can be linearly related to a well-computed external ozone dose. The choice of the best predictor is dependent on leaf type.

A possible origin of the middle phase of polyphasic chlorophyll fluorescence transient

Ban-Dar Hsu and Kuen-Lin Leu 571–576

This paper provides a rather unusual explanation for the middle phase of polyphasic chlorophyll fluorescence kinetics. To date, only a few groups have attempted to analyse the complex chlorophyll fluorescence transients; these authors provide convincing evidence that the J to I phase may be contributed to by pigments located far from the illuminated leaf surface.