

Functional Plant Biology

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Isolation and differential expression of β -1,3-glucanase messenger RNAs, *SrGLU3* and *SrGLU4*, following inoculation of *Sesbania rostrata*

Chi-Te Liu, Toshihiro Aono, Misako Kinoshita, Hiroki Miwa, Taichiro Iki, Kyung-Bum Lee and Hiroshi Oyaizu

983–990

These are novel findings on the β -1,3-glucanase genes of *Sesbania rostrata*. The authors report the isolation and characterisation of two full-length β -1,3-glucanase genes (*SrGLU3* and *SrGLU4*), the expression of which was monitored in leaves, roots, seedlings, uninoculated and inoculated stem primordia. They suggest that *S. rostrata* makes use of *SrGLU4* to discriminate between symbionts and non-symbionts (mutants) in developing nodules.

Transgenic soybeans expressing siRNAs specific to a major sperm protein gene suppress

Heterodera glycines reproduction

Ryan M. Steeves, Tim C. Todd, Juliane S. Essig and Harold N. Trick

991–999

The RNAi concept has been extensively exploited for engineering pathogen resistance in plants, but so far only virus resistance has been achieved. This is the first report on using RNAi technology to control a nematode. Using a novel approach to engineer soybean cyst nematode (SCN) resistance in plants, the authors show that soybean produces siRNAs against a major sperm protein gene needed for SCN to complete its reproductive cycle. The nematodes ingest the siRNA, which then silences the sperm protein in the nematode, preventing egg development.

Excess copper induces structural changes in cultured photosynthetic soybean cells

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Inmaculada Yruela

1001–1012

Soybean cells were cultured in high Cu concentrations for various periods of time, and changes were induced in the sizes and shapes of the chloroplasts and vacuoles. Cu-containing deposits were found on the surfaces of cells after a short-term Cu treatment, but disappeared during a long-term acclimation. This study advances our understanding of Cu tolerance and Cu effects on cell metabolism.

Growth and photosynthetic down-regulation in *Coffea arabica* in response to restricted root volume

Cláudio P. Ronchi, Fábio M. DaMatta,

Karine D. Batista, Gustavo A. B. K. Moraes,

Marcelo E. Loureiro and Carlos Ducatti

1013–1023

The importance of pot size on plant growth is often ignored in scientific literature. These authors assessed the effects of restricting root volume on source–sink relationships in *Coffea arabica*. They showed that down-regulation of photosynthesis and reduced growth is accounted for by decreases in Rubisco rather than by photosynthetic end-product limitations. Photosynthetic acclimation in plants with restricted root volume was a result of an inadequate leaf N status, even though an appropriate N supply was available.

Physiological changes and UV protection in the aquatic liverwort *Jungermannia exsertifolia* subsp. *cordifolia* along an altitudinal gradient of UV-B radiation

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Jochen Scher, Josef Zapp, Rafael Tomás

and Nathalie Beaucourt

1025–1036

Altitudinal changes in photosynthetic pigments, net photosynthesis, chlorophyll fluorescence, protein concentration, sclerophylly, and UV-absorbing compounds (both bulk UV absorbance and the concentrations of five previously identified compounds) were assessed in an aquatic liverwort. The authors' hypothesis was that the liverwort would be adapted to increasing levels of UV-B. Six variables showed linear relationships with altitude, and the authors conclude that UV-B radiation was responsible for these changes.

Stomatal aperture can compensate altered stomatal density in *Arabidopsis thaliana* at growth light conditions

Dirk Büssis, Uritza von Groll, Joachim Fisahn

and Thomas Altmann

1037–1043

To study stomatal control of leaf gas exchange, these authors compared an *Arabidopsis sdd1* mutant (with increased stomatal density) and a transgenic over-expressing the *SDD1* (stomatal density and distribution) gene (with reduced stomatal density). Surprisingly, photosynthesis under normal light conditions was almost identical between the genotypes. Guard cells compensated for the difference in stomatal density by adjusting stomatal aperture, explaining why neither genotype showed a visible phenotype when grown under standard conditions. Only under higher light conditions were differences in photosynthesis observed, with a reduction in the transgenic line caused by CO₂ limitation.

Initial observations of increased requirements for light-energy dissipation in ryegrass (*Lolium perenne*) when source/sink ratios become high at a naturally grazed free air CO₂ enrichment (FACE) site

Jianmin Guo, Craig M. Trotter and

Paul C. D. Newton

1045–1053

The question of whether short-term changes in source–sink ratios can alter photosynthetic acclimation of grazed rye grass (a C₃ pasture species) exposed to long-term CO₂ enrichment is addressed in this paper. Novel data from long-term field experiments show that reduced photochemical electron flow accompanies acclimation to elevated CO₂, and indicates that C₃ plants with large source–sink ratios may be susceptible to photoinhibition after long-term growth at high CO₂.

Iron deficiency induces sulfate uptake and modulates redistribution of reduced sulfur pool in barley plants

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Roberto Pinton

1055–1061

Sulfur-derived compounds play a role in Fe nutrition by Strategy II plants. These authors show that S deficiency affects some processes related to S metabolism and uptake, and that Fe deficiency can affect some S processes. They studied modulation of the S assimilatory pathway in barley by Fe starvation, and showed that Fe deficiency affects shoot–root partitioning of the reduced S pool, and can affect sulfate uptake under limited S supply.

Phloem as a possible major determinant of rapid cavitation reversal in stems of *Laurus nobilis* (laurel)

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Maria A. Lo Gullo

1063–1074

Xylem cavitation and embolism result from environmental stress. These authors investigate the mechanism of embolism reversal under low xylem pressures in *Laurus nobilis*, investigating the role of starch-to-sugar conversion in vessel-associated parenchyma cells. Xylem recovery from embolism was studied in air-injected stems. Starch depolymerisation was a pre-requisite for rapid refilling, but only in the presence of sufficient amounts of phloem and phloem pressure. Phloem is hypothesised to export some signal for starch depolymerisation driving osmotic refilling.