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Contents

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Rapid communication: Research note: Single-nucleotide polymorphisms in rice starch synthase IIa that alter starch gelatinisation and starch association of the enzyme
Takayuki Umemoto and Noriaki Aoki 763–768

Natural variation in rice starch synthase IIa is currently a hot topic in the starch and rice breeding world, as this is related to critical single nucleotide polymorphism (SNP) for enzyme function and cooking quality of rice. These authors carried out an association study of rice starch synthase IIa haplotype and starch properties, and revealed critical amino acid residues for activity and starch granule association of the enzyme. Their work will contribute to our knowledge of the structure/function relationships of an important class of starch synthase (SSIIa) involved in amylopectin biosynthesis, as well as our understanding of the process of polymer synthesis.

Rapid and efficient production of transgenic bermudagrass and creeping bentgrass bypassing the callus formation phase
Zeng-Yu Wang and Yaxin Ge 769–776

Genetic transformation has always been more problematic in monocots than dicots. One of the inevitable steps in transformation is callus culture, which is time consuming, laborious and requires experience. These authors demonstrate for the first time that transgenic grasses can be obtained without a callus culture phase, with a simple protocol that allows rapid and highly efficient production. They demonstrate the protocol for two widely grown monocot species, bermudagrass and creeping bentgrass. This is a significant step forward for genetic transformation of monocot species.

Temporal and spatial expression of hexose transporters in developing tomato (*Lycopersicon esculentum*) fruit
Stephen J. Dibley, Michael L. Gear, Xiao Yang, Elke G. Rosche, Christina E. Offler, David W. McCurdy and John W. Patrick 777–785

Sugar accumulation, particularly hexose, in tomatoes is a key way to enhance flavour for the fresh food market, and soluble solid levels for processing. In this paper, hexose accumulation was compared with gene expression and protein levels of hexose transporters in developing tomato fruit. The authors demonstrate that transporter protein levels correlate strongly with rates of hexose accumulation. Based on their temporal and spatial expression patterns, two hexose transporters (*LeHT3* and *LeHT1*) are suggested to be responsible for hexose accumulation.

Characteristics of CO₂ exchange between peach stems and the atmosphere
Giorgio A. Alessio, Fabrizio Pietrini, Federico Brilli and Francesco Loreto 787–795

Alessio *et al.* examine a potentially very interesting, yet neglected topic: the effects of changing atmospheric gas composition on aspects of photosynthesis (CO₂ assimilation, electron flow) and respiration of glasshouse-grown peach stems. The main finding is that PSII photochemical efficiency and CO₂ uptake rates change rapidly after transition from a normal atmosphere to one with lower O₂ or higher CO₂. One of the interesting observations that emerged from the analysis was that peach stems appear to have a significant component of photorespiration under normal atmospheric conditions at modest light intensities.

Cover illustration: Green and albino shoots produced from stolon nodes of bermudagrass after *Agrobacterium*-mediated transformation and antibiotic selection. (See Wang and Ge pp. 769–776.)

Stable osmotica in *Eucalyptus spathulata* — responses to salt and water deficit stress

Andrew Merchant and Mark Adams 797–805

Salt and drought tolerance continue to be limiting factors in plant growth and survival, hence are a major focus of breeding programs. These authors studied the changes in ionic, carbohydrate and polyol levels in *Eucalyptus spathulata* in response to water deficit and salinity stress. Their results highlight contrasting responses within this species, particularly regarding the role(s) of quercitol, a carbon-based osmolyte. The results suggest contrasting characteristics of changes in solute concentrations under saline and drought stress conditions, suggesting that these responses involve distinctly different mechanisms.

Effects of long-term ionic and osmotic stress conditions on photosynthesis in the cyanobacterium *Synechocystis* sp. PCC 6803

Saowarath Jantaro, Paula Mulo, Tove Jansén, Aran Incharoensakdi and Pirkko Mäenpää 807–815

Salt stress is one of the most severe environmental stresses restricting plant growth. These authors use *Synechocystis* as a model organism to clarify the effects of long-term ionic and osmotic stress on cell ultrastructure and on photosynthetic parameters. They show that long-term osmotic stress is more detrimental to photosynthesis than the ionic component, and that D1 protein is the main target in stressed cells, appearing to act as a target of the stress treatment.

Variation in growth responses to availability of water in *Cistus albidus* populations from different habitats

Olga M. Grant, Lynton D. Incoll and Tom McNeilly 817–829

Many plant species have evolved ecotypic differentiation in response to a variety of selection pressures. Within a species, different adaptive strategies may be effective among populations from contrasting environments. In this study, plants from *Cistus albidus* populations from habitats differing in rainfall levels were grown from seed under common conditions. Plants from a population originating from a site with intermediate precipitation and temperature showed distinctly different growth and morphology to plants from other populations. Plants were also exposed to two water treatments, and highly significant differences were found, indicating phenotypic plasticity.

Transient increase of *de novo* amino acid synthesis and its physiological significance in water-stressed white clover

Bok-Rye Lee, Woo-Jin Jung, Kil-Yong Kim, Jean-Christophe Avice, Alain Ourry and Tae-Hwan Kim 831–838

Nutrient uptake is inhibited in dry soil through decreased mineralisation of organically bound nutrients, which may diminish nutrient availability at the root surface. This study provides some useful information about changes in N metabolism with the onset of water stress, and reports novel observations of N metabolism during that very delicate period, when the plant first begins to detect and thus signals, the onset of soil drying.

Binding of 3-phosphoglycerate leads to both activation and stabilisation of ADP-glucose pyrophosphorylase from apple leaves

Rui Zhou and Lailiang Cheng 839–848

The reasoning behind this work was to study ADPglucose pyrophosphorylase (AGPase), a key regulatory step in starch synthesis and carbon partitioning, in a commercially important species that synthesises sorbitol as a major end product of photosynthesis. The authors describe the purification and characterisation of AGPase. The effect of metabolites, reductant and heat treatment is investigated at the activity and molecular weight levels.

Primary root growth: a biophysical model of auxin-related control

Andrés Chavarría-Krauser, Willi Jäger and Ulrich Schurr 849–862

Developing models for plant growth requires the formulation of discrete hypotheses about the behavior of plant systems, and leads to a more thorough understanding of the process under study. These authors present a biophysical model describing the effects of auxin and cytokinin on the growth distribution of root tips. They extend an earlier model using deeper equations regarding the basis of the growth process and hormone transport, and test its behavior by comparing with published experimental data.