

Functional Plant Biology

Continuing *Australian Journal of Plant Physiology*

Contents

Volume 31 Number 2 2004

Control of gravitropic orientation. I. Non-vertical orientation by primary roots of maize results from decay of competence for orthogravitropic induction

Clifford E. LaMotte and Barbara G. Pickard 93–107

Control of gravitropic orientation. II. Dual receptor model for gravitropism

Clifford E. LaMotte and Barbara G. Pickard 109–120

In the first of these two papers, the authors ask how primary maize roots can orient themselves at non-vertical angles. Are such 'plagiogravitropic' orientations achieved by seeking a non-vertical setpoint or by decay of a step in the environmentally regulated series of events leading to a vertical setpoint? The latter mechanism is experimentally validated. The second paper describes how the data of the first implicate two sequentially acting gravity reception mechanisms and presents a model. Ways in which the model might be generalised to some of the diverse gravitropic behaviours of other organs and other plants are examined.

Early vigorous growth is a major factor influencing nitrogen uptake in wheat

Mingtan Liao, Ian R. P. Fillery and Jairo A. Palta 121–129

This paper tackles an important issue: the characterization of early growth and NO_3^- uptake by different wheat genotypes. Field, lysimeter and nutrient solution experiments revealed genotypic differences for plant and root growth. A significant genotype \times N level interaction was reported for most characters. This paper is a valuable basis for breeding programmes aiming to improve N-use efficiency of wheat.

Partitioning of ^{13}C -labelled photosynthate varies with growth stage and panicle size in high yielding rice

Pravat K. Mohapatra, Yasuyuki Masamoto, Satoshi Morita, Junichi Takanashi, Tsuneo Kato, Tomio Itani, Joseph J. Adu-Gyamfi, Muthiah Shunmugasundaram, Nguyen Tran Nguyen, Hirofumi Saneoka and Kounosuke Fujita 131–139

Mohapatra *et al.* report on experiments designed to elucidate source–sink interactions in rice using partitioning of ^{13}C -labelled photosynthate. They show that in very high-yielding rice cultivar, leaves below the flag leaf feed the developing grains, while in a standard rice cultivar, only the flag leaf contributes substantially to grain fill.

Over-expression of a high-affinity phosphate transporter in transgenic barley plants does not enhance phosphate uptake rates

Anne L. Rae, Janine M. Jarmey, Stephen R. Mudge and Frank W. Smith 141–148

Transgenic barley plants that over-express a phosphate transporter were generated. The phosphate uptake rates and leaf phosphate contents of the transgenic plants were measured and compared to control lines. The results showed that over-expression of the transporter was not effective in improving phosphate uptake under any of the conditions tested.

Identification and characterization of a novel tobacco mosaic virus resistance N gene homologue in *Nicotiana tabacum* plants

Claudia Stange, José Tomás Matus, Alvaro Elorza and Patricio Arce-Johnson 149–158

This paper describes the isolation and characterisation of a resistance N gene homologue named NH, in *Nicotiana tabacum* cv. Xanthi nn plants that are sensitive to tobamoviruses (TMV). The novel gene has 82.6% nucleotide identity with the N gene and also belongs to the TIR/NSB/LRR gene class.

Cover illustration: Maize roots have been tilted obliquely upward to see how they will orient. Downward curving begins early but almost ceases well before the root tips become vertical. Thereafter, root growth roughly maintains the angles achieved. Analysis of how these 'plagiogravitropic' angles are determined (see LaMotte and Pickard, pp. 93–120) has led to a new model for root gravitropism.

Deletions in an endopolygalacturonase gene cluster correlate with non-melting flesh texture in peach
Ann M. Callahan, Ralph Scorza, Carole Bassett, Michael Nickerson and Frederick B. Abeles 159–168

The manuscript explores the relationship of endopolygalacturonase genes and the non-melting phenotype in peach flesh, and concludes that the lack of endopolygalacturonase is responsible for the phenotype. The work extends that idea by presenting evidence that the gene responsible is one in a locus of several endopolygalacturonase genes, and that more than likely the genes that have already been identified are not responsible for the non-melting phenotype.

From controlled environments to field simulations: leaf area dynamics and photosynthesis of kiwifruit vines (*Actinidia deliciosa*)
Dennis H. Greer, Alla N. Seleznyova and Steven R. Green 169–179

Canopy leaf area development and daily rates of carbon acquisition of kiwifruit vines growing in orchard conditions were modelled from mathematically-based physiological descriptions of leaf area expansion and photosynthesis of individual leaves. The authors combine mathematical models of leaf photosynthesis with leaf and shoot growth to predict canopy photosynthesis of whole kiwifruit vines.

Physiological and morphological responses of grassland species to elevated atmospheric CO₂ concentrations in FACE-systems and natural CO₂ springs
Susanna Marchi, Roberto Tognetti, Francesco Primo Vaccari, Mario Lanini, Mitja Kaligarič, Francesco Miglietta and Antonio Raschi 181–194

Atmospheric CO₂ is steadily increasing. Stomata are integrators of all environmental factors affecting plant growth, and stomatal conductance is expected to decline in herbaceous plants with an increase in atmospheric CO₂. This paper compares stomatal responses to elevated CO₂ from around natural CO₂ springs and from manipulative FACE experiments. The results question the reliability of using stomatal indices as proxies for past atmospheric CO₂ concentrations.

Research note: Comparison of solvent regimes for the extraction of photosynthetic pigments from leaves of higher plants
Jodie L. Dunn, Johanna D. Turnbull and Sharon A. Robinson 195–202

This Research Note is an examination of the relative efficiencies of commonly employed extraction procedures for plant photosynthetic pigments. This paper is timely because a number of studies have been published where aqueous methanol was used as a solvent for leaves and other tissues. These results show clearly that aqueous methanol is not as effective a solvent for the less polar chlorophyll and carotenes as the acetone-based regimes.
