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Contents

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Viewpoint: Carbon isotope effect predictions for enzymes involved in the primary carbon metabolism of plant leaves
Guillaume Tcherkez and Graham D. Farquhar 277–291

Plant physiologists have long wondered whether isotope effects in enzymes of C metabolism of green tissues can be used for a better understanding of the endogenous and exogenous controls on plant metabolism. These authors tackle theoretical predictions of isotope effects of key reactions in the metabolism of plants, either by a quantum chemistry approach or by calculations at equilibrium.

On the isotopic composition of leaf water in the non-steady state
Graham D. Farquhar and Lucas A. Cernusak 293–303

This paper develops theory to predict the isotopic composition of water in leaves under non-steady state conditions. The extension beyond the steady state is important at night, because the time constant for change is proportional to stomatal resistance, which is high at night. The theory compares well with available data.

Molecular analysis of alkaloid metabolism in *AABB* vs *aabb* genotype *Nicotiana tabacum* in response to wounding of aerial tissues and methyl jasmonate-treatment of cultured roots
Karen A. Cane, Melinda Mayer, Angela J. Lidgett, Anthony J. Michael and John D. Hamill 305–320

Alkaloids are an intriguing group of plant secondary metabolites. Leaves of *Nicotiana* species contain relatively high levels of nicotine, a neurotoxic pyridine alkaloid. These authors use near-isogenic lines of tobacco differing at two regulatory loci to compare the effects of wounding and jasmonate treatment on the expression of genes associated with nicotine biosynthesis. Mutations in these loci diminish, but do not ablate, transcriptional up-regulation in roots, but transcript abundance in leaves is independent of the regulatory loci.

Contribution of initial C and N reserves in *Medicago sativa* recovering from defoliation: impact of cutting height and residual leaf area
Fréderic Meuriot, Marie-Laure Decau, Annette Morvan-Bertrand, Marie-Pascal Prud'Homme, François Gastal, Jean-Claude Simon, Jeffrey J. Volenec and Jean-Christophe Avice 321–334

The role of stubble C–N reserves and residual leaf area on the contribution of taproot C–N reserves to shoot regrowth of alfalfa was studied after defoliation. These experiments provide new insight on the importance of stubble C–N reserves during early regrowth, particularly when the taproot has low initial N reserves, and suggest that increasing the cutting height may improve winter survival and persistence, and spring herbage regrowth.

The functional status of paraveinal mesophyll vacuoles changes in response to altered metabolic conditions in soybean leaves
Kimberly A. Murphy, Rachel A. Kuhle, Andreas M. Fischer, Aldwin M. Anterola and Howard D. Grimes 335–344

This work describes the dynamic function of soybean paraveinal mesophyll cell vacuoles as they alternate between lytic and storage functions. This is the first report of a conversion from a storage to a lytic form of vacuole.

Cover illustration: A castor bean plant (*Ricinus communis*) in a gas-exchange cuvette. The equations describe oxygen isotope enrichment at the sites of evaporation in leaves. The font and form of the equations changes along their length to represent the fact that they are non-steady-state equations, and deal with changing conditions around a leaf. (See Farquhar and Cernusak pp. 293–303).

Components of the *Arabidopsis* autonomous floral promotion pathway, *FCA* and *FY*, are conserved in monocots
Somrutai Winichayakul, Nicola L. Beswick, Caroline Dean and Richard C. Macknight 345–355

These authors have isolated and characterised two key flowering genes from rice and ryegrass, that encode proteins that interact together. They show that both the rice and ryegrass *FCA* mRNAs are prematurely polyadenylated within intron 3, suggesting that monocot *FCA* genes are regulated by a similar negative feedback mechanism to *Arabidopsis*.

In vitro sugar uptake by grapefruit (*Citrus paradisi*) juice-sac cells
Moshe Huberman, Uri Zehavi, Wilfred D. Stein, Ed Etxeberria and Raphael Goren 357–366

In order to better understand the mechanisms of sugar uptake and accumulation, the kinetics of glucose, fructose and sucrose uptake and utilisation in grapefruit juice cells were studied in the absence and presence of sodium azide (NaN_3) and carbonylcyclamide m-chlorophenylhydrazone (CCCP). The data show a preferential utilisation for glucose over fructose and sucrose, and an effect of two metabolic inhibitors on the decarboxylation of sugars.

Short communication: The anatomy of the pathway of sucrose unloading within the sugarcane stalk
Kerry B. Walsh, Russell C. Sky and Sharon M. Brown 367–374

There is long-standing debate about the mechanisms and pathways involved in the movement of sucrose from the phloem into the storage parenchyma tissue in sugarcane. This study presents anatomical measures coupled with movement of dye studies to demonstrate that the vascular bundle fibre sheath represents an apoplastic barrier, but that the plasmodesmatal system through this layer can allow symplastic unloading and transport sufficient to correspond to observed rates of sucrose accumulation in the stalk.
