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Functional Plant Biology

Contents

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Cover illustration: Plants have a large number of aquaporin isoforms. They are divided into four groups; PIP, TIP, NIP, and SIP. Top, intracellular localisation of plant aquaporins. Bottom, a schematic model of aquaporin (see Katsuhara *et al.* pp. 1–14).

Short-term ^{15}N uptake kinetics and nitrogen nutrition of bryophytes in a lowland rainforest, Costa Rica
Wolfgang Wanek and Katja Pörtl 51–62

The paper presents the first detailed study of uptake kinetics of nitrate, ammonium and amino acids in several Costa Rican bryophytes using N-15 tracer and Michaelis-Menten analysis of uptake data. The authors discuss the implications for N nutrition *in situ* under natural N availabilities in a tropical lowland rainforest.

Annual variation of the steady-state chlorophyll fluorescence emission of evergreen plants in temperate zone
Julie Soukupová, Ladislav Cséfalvay, Otmar Urban, Martina Košvancová, Michal Marek, Uwe Rascher and Ladislav Nedbal 63–76

The manuscript describes a long-term study on the seasonal changes in chlorophyll fluorescence for three evergreen species. The authors assess the information potential of steady-state chlorophyll fluorescence yield (Chl-F_S) as one of the factors determining the passively-sensed chlorophyll fluorescence emisson by remote sensing techniques. They show that Chl-F_S yield paralleled the CO_2 assimilation rate during the year, with a steep increase in the spring and rapid decrease in the autumn combined with an elevated Chl-F_S signal variability. They propose that the elevated variability of the Chl-F_S indicates seasonal onset and offset periods of photosynthetic activity in evergreen plant species.

Optically-assessed preformed flavonoids and susceptibility of grapevine to *Plasmopara viticola* under different light regimes
Giovanni Agati, Zoran G. Cerovic, Anna Dalla Marta, Valentina Di Stefano, Patrizia Pinelli, Maria Laura Traversi and Simone Orlandini 77–84

A non-destructive tool for rapidly predicting grapevine susceptibility to *Plasmopara viticola*, the pathogen responsible for downy mildew, is urgently required. These authors use a new spectroscopic tool, the chlorophyll fluorescence-based portable leaf-clip Dualex, for the non-invasive determination of flavonoids in grapevine leaves under two different light regimes, and the evaluation of the relationship between the constitutive flavonoids and the resistance of grapevine to the infection by downy mildew. The results indicate an inverse relationship between preformed flavonoids and the susceptibility of grapevines to infection.

Dehydrins in *Lupinus albus*: pattern of protein accumulation in response to drought
Carla Pinheiro, Maria H. Cruz de Carvalho, Dorothea Bartels, Cândido Pinto Ricardo and M. Manuela Chaves 85–91

This work characterises the expression of dehydrins in different tissues of lupin in response to drought. The analysis reveals the presence of a 29-kDa polypeptide, the SK3 dehydrin LaDhn1, in roots, regardless of the water state, whereas in stem it depended on the water state. The authors suggest that this protein might be phosphorylated and present ideas on why dehydrins are always present in some tissues and inducible by stress in others.

A mutant ankyrin protein kinase from *Medicago sativa* affects *Arabidopsis* adventitious roots
Delphine Chinchilla, Florian Frugier, Marcela Raices, Francisco Merchan, Veronica Giammaria, Pablo Gargantini, Silvina Gonzalez-Rizzo, Martin Crespi and Rita Ulloa 92–101

Previous data suggest the involvement of the microtubule cytoskeleton in adventitious root organogenesis. These authors have functionally characterised the *Medicago sativa MsAPK1* gene (*Ankyrin Protein Kinase 1*) that is structurally related to the Integrin-Linked Kinases (ILKs) from animals. MsAPK1 is able to phosphorylate tubulin. *Arabidopsis* plants expressing a mutant MsAPK1 protein (DN-lines) showed increased capacity to develop adventitious roots. The *A. thaliana AtAPK2* gene is expressed in roots apexes and hypocotyls. These results suggest that APKs may control the formation of adventitious roots.
