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Functional Plant Biology

Contents

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Genotypic variation in water-soluble carbohydrate accumulation in wheat
Sari A. Ruuska, Greg J. Rebetzke, Anthony F. van Herwaarden, Richard A. Richards, Neil A. Fettell, Linda Tabe and Colin L. D. Jenkins 799–809

Genotypic variation in water-soluble carbohydrate (WSC), principally fructan, accumulation among a diverse set of wheat genotypes produced at six Australian locations is demonstrated. Significant and repeatable differences were found, suggesting that breeding for high WSC may be possible. Wheat stems with higher WSC concentrations also have the highest-DP fructans. There was little biochemical evidence for high or low WSC genotypes utilising different mechanisms of accumulation.

Isolation and characterisation of six putative wheat cell wall-associated kinases
Yong Liu, Dongcheng Liu, Haiying Zhang, Hongbo Gao, Xiaoli Guo, Xiangdong Fu and Aimin Zhang 811–821

Cell wall-associated kinases (WAKs) are an important area in plant molecular breeding, playing an important role for the transfer of signals from cell wall to cytoplasm through protein kinase activity. However, details of plant WAKs are still unknown outside *Arabidopsis*. These authors provided interesting information on wheat WAKs, including a molecular genetic analysis, expression rates in different organs and the changes of expression rate by different growth regulators.

The role of root architectural traits in adaptation of wheat to water-limited environments
Ahmad M. Manschadi, John Christopher, Peter deVoil and Graeme L. Hammer 823–837

These authors aim to elucidate the role of roots in the yield adaptation of cereals to drought. Using large root chambers they find differences in root system architecture between varieties. They use simulation modelling to quantify the effects on yield of the root modifications observed. The simulated consequences across a range of environments reflect the drought adaptation of the varieties studied. They discuss the functional implications of root architecture for water extraction capacity and adaptation of winter cereals to specific production environments.

The antioxidative function of lutein: electron spin resonance studies and chemical detection
Chang-Lian Peng, Zhi-Fang Lin, Yue-Zeng Su, Gui-Zhu Lin, Hong-Yan Dou and Cheng-Xue Zhao 839–846

This paper provides a good case that lutein may be a stronger anti-oxidant that other carotenoids with respect to certain reactive oxygen species. The work compares the *in vitro* radical-scavenging properties of lutein with those of β-carotene, and reports lutein's ability to detoxify the hydroxyl radical and superoxide exceeds that of β-carotene, whereas β-carotene is a more efficient at detoxifying singlet oxygen.

Cover illustration: Flowers of *Dendrobium* 'Pompadour' showing premature senescence of perianth (petals and sepals) after pollination (left), and *Dendrobium* 'Sonia Bom # 28' flowers showing post-pollination development of epinasty and wilting (right). (See Ketsa *et al*. pp. 887–892.)

Novel interaction of selenium-binding protein with glyceraldehyde-3-phosphate dehydrogenase and fructose-bisphosphate aldolase of *Arabidopsis thaliana*
Adamantia Agalou, Herman P. Spaink and Andreas Roussis 847–856

The selenium-binding protein (SBP) plays a role in defence against pathogens and in selenium detoxification in plants. This paper describes two-hybrid studies and biochemical interaction experiments demonstrating the interaction of the SBP with glyceraldehyde-3-phosphate dehydrogenase (GAPDH) and fructose-bisphosphate aldolase (FBA). The results suggest that a protein network consisting of SBP, GAPDH and FBA may be involved in regulating selenium levels in plants.

Steryl glucoside concentration declines with *Cycas micronesica* seed age
Thomas E. Marler, Vivian Lee, J. Chung and Christopher A. Shaw 857–862

Australia claims many cycad species, which have high levels of steryl glucosides. These authors provide evidence that steryl glucosides levels decrease with seed age, and also that steryl glucosides are toxins and responsible for neurodegenerative disease caused by cycad seed consumption. This is a significant piece of work, which helps to clarify a rather confused situation as to the toxicity of seeds from different species of cycad, and the toxicity of seeds compared to other parts of the cycad plant.

Two AP2 domain containing genes isolated from the cold-hardy *Citrus* relative *Poncirus trifoliata* are induced in response to cold
Mehtap Şahin-Çevik and Gloria A. Moore 863–875

This paper deals with the isolation and characterisation of two newly identified putative cold-induced AP2 domain transcription factor genes. The authors report interesting findings regarding the possible involvement of the genes in responses of the cold-hardy *Citrus* relative, *Poncirus trifoliata*, to cold acclimation. This species has been used for improving cold tolerance in cold-sensitive commercial citrus varieties.

VvMADS9, a class B MADS-box gene involved in grapevine flowering, shows different expression patterns in mutants with abnormal petal and stamen structures
Lekha Sreekantan, Laurent Torregrosa, Lucie Fernandez and Mark R. Thomas 877–886

These authors report a MADS-box gene of grapevine, *VvMADS9*, which is a putative orthologue of the *PISTILLATA* gene in *Arabidopsis*. They isolate and characterise the gene by RT-PCR and *in situ* hybridisation studies, and describe its expression in two floral mutants. The work provides interesting and new information about flower formation using grapevine mutants, which are difficult to obtain in woody species.

Auxin is required for pollination-induced ovary growth in *Dendrobium* orchids
Saichol Ketsa, Apinya Wisutiamonkul and Wouter G. van Doorn 887–892

In many orchid species, the ovule matures long after pollination, whilst the ovary starts growing within two days of pollination. The signalling pathway inducing rapid ovary growth remains elusive. These authors address the very important subject of pollen–pistil interaction and long-range hormonal stimuli to ovary and ovule development. Their results suggest that the pollination effect on ovary development requires auxin, ethylene synthesis and ethylene action.