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Functional Plant Biology

Contents

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Review: Plant extracellular matrix metalloproteinases
Barry S. Flinn 1183–1193

Extracellular matrix (ECM) modifications occur during plant growth, development, and in response to environmental stimuli. Key modulators of ECM modification in vertebrates, the extracellular matrix metalloproteinases (MMPs), have also been described in a few plants. However, the roles of MMPs in higher plants remain unclear. This review examines the current status of plant MMP knowledge, and discusses the variety of genomic and proteomic methodologies available to characterise plant MMP activity, function and potential substrates.

Characterisation of *BcMF10*, a novel gene involved in the pollen wall development of *Brassica rapa* ssp. *chinensis*
Li Huang, Jiashu Cao, Ai-Hong Zhang, Yu-Chao Zhang and Yi-Qun Ye 1194–1204

A novel gene *BcMF10*, which was expressed specifically in microspore and tapetal cells in the male fertile maintainer line in Chinese cabbage pak-choi, was isolated. Functional analysis by RNA interference technology indicated that *BcMF10* may encode a protein which plays a role in intine wall formation.

The transcript abundance of an expansin gene in ripe sapodilla (*Manilkara zapota*) fruit is negatively regulated by ethylene
Sutin Kunyamee, Saichol Ketsa, Wachiraya Imsabai and Wouter G. van Doorn 1205–1211

Fruit softening is associated with an increase in the expression of genes involved in cell wall loosening. An expansin gene was expressed directly after harvest, concomitant with softening in sapodilla (*Manilkara zapota*) fruit. Ethylene promoted softening, but prevented the expression of the expansin gene, whereas 1-MCP had the opposite effects. Fruit softening, therefore, cannot be due to the expansin gene.

The harvest-responsive region of the *Asparagus officinalis* asparagine synthetase promoter reveals complexity in the regulation of the harvest response
Donald A. Hunter and Lyn M. Watson 1212–1223

The expression of an asparagine synthetase harvest-responsive promoter was studied in detached *Arabidopsis* leaves by examining the sequence constraints and signals governing its activity. Harvest induction remained even when large changes were made to the promoter, and linking four copies of a short harvest-responsive region onto a minimal promoter made its activity

The promoter from *SlREO*, a highly-expressed, root-specific *Solanum lycopersicum* gene, directs expression to cortex of mature roots
Matthew O. Jones, Kenneth Manning, John Andrews, Carole Wright, Ian B. Taylor and Andrew J. Thompson 1224–1233

Genetic modification of root functions requires highly active, root-specific gene promoters. Here, the promoter of the *SlREO* gene, encoding a dioxygenase, directs strong expression to the cortex of mature tomato roots growing in soil. The promoter will be useful to engineer metabolic changes in the bulk of root tissue.

Cover illustration: 3D predictive protein modelling of the RADiation sensitive 51 (RAD51) recombinase from *Arabidopsis* (blue) superimposed onto wheat RAD51 (green) illustrating that these two proteins share very similar secondary and tertiary structures. Pink spheres highlight the conserved glycine residue. The image on the left shows a front view of the protein structures while the image on the right has been rotated 90° (see Khoo *et al*. pp. 1267–1277).

Rooting depth and leaf hydraulic conductance in the xeric tree *Haloxyolon ammodendron* growing at sites of contrasting soil texture
G.-Q. Xu and Y. Li 1234–1242

An experiment on *Haloxylon ammodendron* revealed that plants growing in sandy soil experienced better water status than in heavy textured soil. In sandy soil, plants developed much deeper root systems, larger root surface and higher root : leaf ratio than in heavy textured soil, which facilitated water acquisition of the plants during prolonged drought period.

Response of bahiagrass carbon assimilation and photosystem activity to below-optimum temperatures
V. G. Kakani, K. J. Boote, K. R. Reddy and D. J. Lang 1243–1254

Sensitivity to below-optimum temperature reduces the yield potential of warm season bahiagrass during the winter months. Study of bahiagrass response to growth temperature showed that CO_2 assimilation and photosystem activity are reduced at cooler temperatures, and that CO_2 assimilation is more sensitive than electron transport at below optimum temperatures

Identification of grapevine *MLO* gene candidates involved in susceptibility to powdery mildew
Angela Feechan, Angelica M. Jermakow, Laurent Torregrosa, Ralph Panstruga and Ian B. Dry 1255–1266

MLO proteins mediate powdery mildew susceptibility in different plant species. A 17 member *VvMLO* gene family was identified from the *Vitis vinifera* genome. Four *VvMLO* genes are up-regulated in response to grapevine powdery mildew infection and are orthologous to the *Arabidopsis* and tomato genes required for powdery mildew susceptibility.

The *RAD51* gene family in bread wheat is highly conserved across eukaryotes, with *RAD51A* upregulated during early meiosis
Kelvin H. P. Khoo, Hayley R. Jolly and Jason A. Able 1267–1277

The authors describe the isolation of four bread wheat *RAD51* recombinases. Comparative amino acid and 3D molecular modelling suggests that at least one of these proteins, RAD51A, is conserved across eukaryotes. A DNA binding assay and Q-PCR further suggest that this recombinase is important during early meiosis in bread wheat.