

Functional Plant Biology

Contents

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Research Front: Advances in Pathogen Effector Biology

Foreword: Pathogen effectors shed light on plant diseases

Peter S. Solomon and John P. Rathjen iii–iv

Review: Effector proteins of extracellular fungal plant pathogens that trigger host resistance
Ann-Maree Catanzariti and David A. Jones 901–906

Proteins secreted by fungal plant pathogens that infect only the intercellular spaces of host tissue are usually small and cysteine-rich. Many of these proteins (termed effectors) have a virulence function yet also trigger plant defences through their detection by plant resistance proteins. This paper discusses our current understanding of this class of effectors.

Review: Proteinaceous necrotrophic effectors in fungal virulence
Kar-Chun Tan, Richard P. Oliver, Peter S. Solomon and Caroline S. Moffat 907–912

Proteinaceous necrotrophic effectors are a class of virulence factors produced by phytopathogenic fungi. These molecules can cause tissue death in host plants that possess dominant sensitivity genes, leading to subsequent pathogen colonisation. This review provides an updated discussion on some recently discovered effectors and their mode of action.

Review: Effectors of biotrophic fungal plant pathogens
Pamela H. P. Gan, Maryam Rafiqi, Adrienne R. Hardham and Peter N. Dodds 913–918

Effectors are small proteins secreted by pathogens that potentially contribute to disease by manipulating host plants. This review focuses on effectors of biotrophic and hemibiotrophic fungal plant pathogens and summarises advances in understanding the roles of these proteins in disease and the mechanism of their uptake into host cells.

Review: The role of oomycete effectors in plant–pathogen interactions
Adrienne R. Hardham and David M. Cahill 919–925

This article presents a brief overview of effector proteins produced by oomycete plant pathogens. Oomycete effectors are secreted proteins that function in the plant apoplast or symplast. They are important components of infection strategies, promoting successful infection by manipulating plant structure and metabolism including interference in plant defence mechanisms.

Review: Deciphering the mode of action and host recognition of bacterial type III effectors
Selena Gimenez-Ibanez, Dagmar R. Hann and John P. Rathjen 926–932

Adapted bacterial pathogens secrete virulence effector molecules into the plant cell via a specialised secretion apparatus. These contribute collectively to pathogenesis by defeating plant defenses. Despite a huge scientific effort, only a handful of their molecular targets are known and much remains to be learnt about effector strategies for bacterial pathogenicity.

Cover illustration: Death is looming. A mycelial mass of *Stagonospora nodorum* (transformed with a green fluorescent protein reporter) encroaching over healthy wheat tissue (red). The pathogen is one of several known Pleosporales fungi that uses proteinaceous necrotrophic effectors to disable host plants carrying dominant susceptibility genes. The image was taken under a confocal microscope (original photo taken by Kasia Rybak).

<p>Review: Effectors of plant parasitic nematodes that re-program root cell development Samira Hassan, Carolyn A. Behm and Ulrike Mathesius</p>	<p>933–942</p>	<p>Many plant parasitic nematodes re-program root development and cause the formation of galls and cysts. These nematodes inject numerous metabolites into their host's cells, but it is largely unknown how these effectors orchestrate changes in host development. This review highlights recent advances in understanding the function of nematode effectors.</p>
<p>Viewpoint: Excitation pressure as a measure of the sensitivity of photosystem II to photoinactivation Dmytro Korniyev, Barry A. Logan and A. Scott Holaday</p>	<p>943–951</p>	<p>This article describes the role played by electron transport and thermal dissipation in mitigating photoinactivation of photosystem II and demonstrates that chlorophyll fluorescence parameters based on the excitation pressure can predict the extent of PSII photoinactivation better than photon counting.</p>
<p>Comparative and functional morphology of hierarchically structured anti-adhesive surfaces in carnivorous plants and kettle trap flowers Simon Poppinga, Kerstin Koch, Holger Florian Bohn and Wilhelm Barthlott</p>	<p>952–961</p>	<p>Plant surfaces that are slippery for insects have evolved mainly in the groups of carnivorous plants and kettle trap flowers. Scanning electron microscopy of the surfaces of 53 species revealed that they possess highly diverse topographical structures. Here a classification of 12 types of anti-adhesive surfaces, in regards to the assembly and hierarchy of their structural elements is presented.</p>
<p>Reduced expression of a vesicle trafficking-related ATPase <i>SKD1</i> decreases salt tolerance in <i>Arabidopsis</i> Li-Wei Ho, Ting-Ting Yang, Shyan-Shu Shieh, Gerald E. Edwards and Hungchen E. Yen</p>	<p>962–973</p>	<p>This study examines the functions of a vesicle trafficking-related <i>SKD1</i> (suppressor of K⁺ transport growth defect) in mechanism of salt tolerance using transgenic <i>Arabidopsis</i> with reduced <i>SKD1</i> expression. Under salt stress, transgenic <i>Arabidopsis</i> show abnormal root morphology, reduced growth, and imbalanced Na⁺/K⁺ ratio indicating the importance of intracellular vesicular trafficking in development and stress responses.</p>
<p>Effects of root restriction on growth and associated cytokinin levels in cotton (<i>Gossypium hirsutum</i>) Jean W. H. Yong, D. Stuart Letham, S. Chin Wong and Graham D. Farquhar</p>	<p>974–984</p>	<p>During root restriction, less cytokinins entered the leaves while the ABA delivery remained unchanged. These root-restricted plants also had lower photosynthetic rates through lower stomatal conductances. The slow-down in the apparent cytokinin turnover rates during root restriction can be interpreted as a reduction in shoot cytokinin metabolism, thereby affecting development.</p>
<p><i>In situ</i> detection of Esr proteins secretion during maize microspore embryogenesis and their secretion blockage show effects on the culture progression Pilar S. Testillano, María-José Coronado, Anne-Marie Thierry, Elisabeth Matthys-Rochon and María C. Risueño</p>	<p>985–994</p>	<p>Esr (endosperm surrounding region) proteins were localised in the secretory pathway and cell walls of embryo cells in maize microspore cultures, as well as in the liquid medium during early embryogenesis <i>in vitro</i>. Blocking of secretion stopped embryo development and eliminated Esr subcellular localisation, which was recovered when development was restored. Results provided new evidence for an endosperm-like function of microspore-derived embryo structures during early embryogenesis <i>in vitro</i>.</p>