

Functional Plant Biology

Contents

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Review: The effects of total glucosides of paeony (TGP) and paeoniflorin (Pae) on inflammatory-immune responses in rheumatoid arthritis (RA)

Lei Zhang, Jun Yu, Chun Wang and Wei Wei 107–117

This review provides novel insights into the treatment of rheumatoid arthritis. Total glucosides of paeony (TGP) and paeoniflorin (Pae) inhibit lymphocyte proliferation; repress the activation of macrophages, monocytes and fibroblast-like synoviocytes (FLSs); decrease prostaglandin E₂; upregulate E-prostanoid-G-protein-cyclic adenosine monophosphate and blockade the mitogen-associated-protein kinases pathway in FLSs. These results provide the basic and clinical application of TGP and Pae.

Review: Two molecular species of phytochrome A with distinct modes of action

V. Sineshchekov 118–135

Phytochrome A – the key photoreceptor in the higher plants – mediates three fundamental types of their photoregulation reactions. It is widely accepted that it is represented in plants as a single molecular species. This review presents an alternative point of view: the existence of two phytochrome A types differing by the molecular structure and mode of action.

Hydrogen sulfide may function downstream of hydrogen peroxide in salt stress-induced stomatal closure in *Vicia faba*

Yinli Ma, Wei Zhang, Jiao Niu, Yu Ren and Fan Zhang 136–145

The roles of hydrogen sulfide (H₂S) and hydrogen peroxide (H₂O₂) during salt stress-induced stomatal closure were examined in *Vicia faba* L. Our data showed that H₂S and H₂O₂ are involved in salt stress-induced stomatal closure, and H₂S may function downstream of H₂O₂ in the process. We have provided direct evidence for further studies on stomatal movement signalling networks under salt stress.

Blue and red light effects on stomatal oscillations

Trevor Ballard, David Peak and Keith Mott 146–151

Plants absorb CO₂ through pores in their leaves called stomata, which are known to open and close in response to myriad environmental and physiological triggers. We demonstrate here that blue light inhibits stomatal aperture oscillations in both the guard cells and surrounding tissue layers, whereas these oscillations continue under the influence of red light. This observation of blue light behaviour agrees with recent research and suggests another physiological pathway for oscillations.

DNA synthesis pattern, proteome, and ABA and GA signalling in developing seeds of Norway maple (*Acer platanoides*)

Aleksandra M. Staszak, Monika Rewers, Elwira Sliwinska, Ewelina A. Klupczyńska and Tomasz A. Pawłowski 152–164

Norway maple embryo (axis and cotyledons) development was studied, including DNA synthesis, proteins, and plant hormone signalling. Results revealed that cell cycle/endoreduplication activity is a good indicator of developmental stages, distinguishing maturation phases, including deposition of storage reserves, desiccation and dormancy acquisition. Our results provide novel insights into the mechanisms underlying the development of temperate tree seeds.

Cover illustration: Reactive oxygen species (ROS) accumulation in the primary root of the *rbohC* mutant and *perk4-1/rbohC* double mutant in response to exogenous ABA (see Ma *et al.* pp. 165–174). Five-day-old seedlings were cultured on MS medium without or with 50 μM ABA for 5 h, then stained with 50 μM H₂DCF-DA. Scale bars = 100 μm. Image by Xiaonan Ma.

Hydrogen peroxide plays an important role in PERK4-mediated abscisic acid-regulated root growth in *Arabidopsis*

Xiaonan Ma, Xiaoran Zhang, Ling Yang, Mengmeng Tang, Kai Wang, Li Wang, Ling Bai and Chunpeng Song

165–174

Reactive oxygen species (ROS) are important regulators of ABA signalling in root growth. This work aimed to explore the mechanisms of PERK4-associated ABA inhibition of root growth. Our results provided new perspectives that enhance our understanding of the process, and provided a foundation for elucidation of the molecular mechanisms of PERK4-mediated ABA-regulated primary root growth.

Costs and benefits of photosynthetic stems in desert species from southern California

Eleinis Ávila-Lovera, Roxana Haro, Exequiel Ezcurra and Louis S. Santiago

175–186

Woody plants with green stems are common in the drylands of the world; however, the advantages of having such stems (e.g. extra carbon gain) may be offset by water costs. We found that green stems can gain as much carbon as leaves do but are subjected to greater water losses through their cuticle. This trade-off between carbon gain and water loss has important implications for plant responses to future droughts.

MdMYBL2 helps regulate cytokinin-induced anthocyanin biosynthesis in red-fleshed apple (*Malus sieversii* f. *niedzwetzkyana*) callus

Yicheng Wang, Jingjing Sun, Nan Wang, Haifeng Xu, Changzhi Qu, Shenghui Jiang, Hongcheng Fang, Mengyu Su, Zongying Zhang and Xuesen Chen

187–196

During the cultivation of fruit trees, the rational application of hormones based on different environmental conditions can improve the appearance and nutritional value of fruit crops. Herein, we discussed the involvement of cytokinin in the anthocyanin biosynthesis pathway, which may have implications for the development of new cultivation techniques aimed at improving fruit coloration under diverse environmental conditions.