

# Functional Plant Biology

## Contents

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| <p><i>Review: A review of current knowledge about the formation of native peridermal exocarp in fruit</i><br/> <b>Nikolai C. Macnee, Ria Rebstock, Ian C. Hallett, Robert J. Schaffer and Sean M. Bulley</b></p>                                | <p>1019–1031</p> | <p>The skins of fleshy fruit are important on many levels such as attraction, being a protective barrier, and influencing post-harvest performance. Different types of mature fruit skin exist, ranging from live waxy skins (e.g. apples), live rind types (e.g. citrus), russeted (e.g. certain pears), through to a completely russeted outer periderm covered ‘dead’ skin form (e.g. green kiwifruit). In this review, we focus on the order and processes that take place in the development of dead fruit skin forms, for which current understanding is limited.</p>                |
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| <p>Glutamate and NMDA affect cell excitability and action potential dynamics of single cell of macrophyte <i>Nitellopsis obtusa</i><br/> <b>Indre Lapeikaite, Vilmantas Pupkis, Vladas Neniskis, Osvaldas Rukenas and Vilma Kisnieriene</b></p> | <p>1032–1040</p> | <p>Electrical signals constitute an intricate aspect of plant physiology, transducing information and modulating various physiological functions. This study reveals amino acid glutamate and synthetic compound NMDA as exogenous cues, modulating electrical signals on single cell level in aquatic macro-algae <i>Nitellopsis</i>. The effect of NMDA in plant kingdom has been debatable, and the results of this study elucidate NMDA together with glutamate as active compounds and underline dose-dependent responses reflected in cell electrical signalling properties.</p>     |
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| <p>Micronutrient homeostasis and chloroplast iron protein expression is largely maintained in a chloroplast copper transporter mutant<br/> <b>Gretchen E. Kroh and Marinus Pilon</b></p>  | <p>1041–1052</p> | <p>Plants must alter their photosynthetic ability in response to multiple external factors including light and nutrient availability. We have characterised the acclimation of plants that lack a copper transporter, which is required for efficient photosynthesis, and found that the regulation of expression of the photosynthetic machinery and general metal ion homeostasis is not perturbed in the mutant relative to a wild type. These findings have implications for our capacity to detect nutritional deficiency in plants.</p>  |
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| <p>Effects of growth irradiance on photosynthesis and photorespiration of <i>Phoebe bournei</i> leaves<br/> <b>Xinglin Tang, Guangzheng Liu, Jiang Jiang, Changju Lei, Yunxing Zhang, Liyan Wang and Xinliang Liu</b></p>                       | <p>1053–1061</p> | <p>Light intensity is a major environmental factor affecting the growth and survival of trees in a forest. The effect of light reduction on photosynthesis and photorespiration of <i>Phoebe bournei</i>, an evergreen broad-leaved tree, was examined with different growth irradiance. We found that the increase of photosynthesis in <i>P. bournei</i> leaves grown under shade treatments is associated with enhanced CO<sub>2</sub> diffusion and biochemistry, and we propose that enhancement of the photorespiratory is essential for shade leaves to improve photosynthesis.</p> |
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Cover illustration: Whole fruit from *Actinidia chinensis* with peridermal (dead skin) (see Macnee *et al.* pp. 1019–1031). Corresponding brightfield microscopy images of sectioned fruit skin stained with toluidine blue are displayed in the centre and right. Right image is a magnified portion of the corresponding centre image. Images by Ian Hallett, Paul Sutherland and Briar Shaw.

<p>Altered localisation of ZmPIN1a proteins in plasma membranes responsible for enhanced-polar auxin transport in etiolated maize seedlings under microgravity conditions in space  <b>Mariko Oka, Motoshi Kamada, Riko Inoue, Kensuke Miyamoto, Eiji Uheda, Chiaki Yamazaki, Toru Shimazu, Hiromi Sano, Haruo Kasahara, Tomomi Suzuki, Akira Higashibata and Junichi Ueda</b></p>	1062–1072	<p>In the ‘Auxin Transport’, space experiment, polar auxin transport in shoots of etiolated Golden Cross Bantam maize grown in space was greater than those grown on Earth. Microgravity substantially altered ZmPIN1a localization in plasma membranes of the parenchymatous cells of the coleoptiles, shifting mainly towards the vascular bundle direction. These findings contribute to the field of gravitational physiology in plants, and also to development of plant cultivation system in space for long-term exploration of space by human being in future.</p>
<p>Transcriptome analysis provides insights into the molecular bases in response to different nitrogen forms-induced oxidative stress in tea plant roots (<i>Camellia sinensis</i>)  <b>Ziping Chen, Huiping Li, Tianyuan Yang, Tingting Chen, Chunxia Dong, Quan Gu and Xunmin Cheng</b></p>	1073–1082	<p>Nitrogen availability has a major impact on tea productivity; however, how tea plants respond to different N forms remain unknown. Our findings reveal the molecular mechanisms of redox homeostasis and signalling in alleviating oxidative stress induced by N deficiency or NO<sub>3</sub><sup>-</sup>. This paper provides candidate redox-related genes for researchers investigating abiotic stress in tea plants.</p>
<p>Greenhouse evaluation of branching, leaf yield and biochemical compositions of <i>Stevia rebaudiana</i> Bertoni to decapitation and foliar application of abscisic acid and fluridone  <b>Nasibeh Tavakoli Hasanaklou, Mohammad Sedghi, Foad Moradi, Ali Ebadi Khazineh Ghadim and Sodabeh Jahanbakhsh Ghodehkahriz</b></p>	1083–1097	<p>Stevia is a herbaceous plant containing low-calorie sweeteners that could be regarded as a successor to sugar for diabetics. Leaf growth of this plant is restricted in the greenhouse whereas the increase in leaf (as the main source of sweeteners) and sweeteners are economically beneficial for farmers and stevia extract factory. The results showed that substances used in this research increased the sweeteners and leaves yield, which is a very promising strategy to increase the plant cultivation yield.</p>
<p>Fruit growth and sink strength in olive (<i>Olea europaea</i>) are related to cell number, not to tissue size  <b>Adolfo Rosati, Silvia Caporali, Sofiene B. M. Hammami, Inmaculada Moreno-Alias and Hava Rapoport</b></p>	1098–1104	<p>Whether tissue size or cell numbers determine fruit growth and sink strength is not known, because cell number and tissue size are strongly correlated. Using a diploid cultivar and its tetraploid (with larger ovaries made up of larger cells but in similar number) as a biological model, we separated these effects and found that fruit growth and sink strength correlated with cell number across genotypes but not to tissue size. This is fundamental knowledge for fruit growth modelling and management.</p>
<p>Endogenous accumulation of glycine betaine confers improved low temperature resistance on transplastomic potato plants  <b>Qiping Song, Lili You, Yang Liu, Jiang Zhang and Xinghong Yang</b></p>	1105–1116	<p>Potatoes, which are the staple food in most countries and the fourth largest food crop worldwide, are native to subtropical regions and are particularly sensitive to cold stress. Our results showed that endogenous glycine betaine can protect plant photosynthetic systems, improve the antioxidant capacity and cold resistance of potatoes. This study enriches existing methods to improve potato cold resistance.</p>
<p>Sleep tight and wake-up early: nocturnal transpiration traits to increase wheat drought tolerance in a Mediterranean environment  <b>Rémy Schoppach, Thomas R. Sinclair and Walid Sadok</b></p>	1117–1127	<p>Wheat nocturnal transpiration is thought to lead to ‘wasteful’ water losses, but its pre-dawn increase is hypothesised to be beneficial. We applied simulation modelling to quantify yield gains or penalties arising from these theorised strategies in the Mediterranean environment of Tunisia. Increased yield performance under drought was associated with genotypes reducing overall night-time water loss, but maximising its circadian increase at the end of the night, which enabled enhancing radiation use efficiency on the following day.</p>

Response of photosynthate distribution in potato plants to different LED spectra

***Wei He, Jin Li, Min Pu, Zhi-Gang Xu and Lijun Gan***

1128–1137

Although light is essential to photosynthesis, few studies have examined the effects of different LED spectra on photosynthate distribution in potato plants. Treatments under red light promoted  $^{13}\text{C}$  assimilation and had more large tubers than other treatments, whereas plants under blue light distributed more photosynthates into tubers rather than other organs and showed balanced tuber development. This information could provide a new way to regulate the production of seed potatoes in plant factories.

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*Perspective: What makes a plant science manuscript successful for publication?*

***Timothy L. Setter, Rana Munns, Katia Stefanova and Sergey Shabala***

1138–1146

This paper analyses key features necessary for successfully publishing scientific manuscripts based on a review of characteristics for scientific writing and a survey of 22 international journals in agriculture and plant sciences. Top reasons for manuscript rejection are: (1) lack of novelty, (2) flaws in methodology or data interpretation; (3) inadequate data analyses; and (4) poor critical scientific thinking. Recommendations here will improve the quality of manuscripts submitted for publication to scientific journals and hence improve the rate of publication success.

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