

# Functional Plant Biology

## Contents

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|---|---------|---|
| <p><i>Review:</i> The role of NO in plant response to salt stress: interactions with polyamines<br/><b>Natalia Napieraj, Malgorzata Reda and Malgorzata Janicka</b></p>   | 865–879 | <p>Salinity is an environmental stress factor that limits plant growth, development and survival. Numerous studies have indicated that a signalling molecule, nitric oxide (NO), can mitigate the negative effects of salt stress. NO improves water management, ionic homeostasis, metabolic processes and prevents damages caused by reactive oxygen species (ROS). It is believed that NO may interact with plant growth and development regulators – polyamines – in inducing salt stress tolerance in plants.</p>  |
| <p><i>Review:</i> Mycorrhiza induced resistance (MIR): a defence developed through synergistic engagement of phytohormones, metabolites and rhizosphere<br/><b>Swapnil B. Kadam, Anupama A. Pable and Vitthal T. Barvkar</b></p>  | 880–890 | <p>Arbuscular mycorrhizal fungi forms symbiotic association with more than 80% of terrestrial plants, conferring additional advantage of mycorrhiza induced resistance. The present review summarises underlying molecular mechanisms of mycorrhiza induced resistance at the phytohormone, metabolite and rhizospheric levels. Further scope and controversies in the field of mycorrhiza induced resistance are discussed.</p>  |
| <p>Alteration in plant spacing improves submergence tolerance in Sub1 and non-Sub1 rice (cv. IR64) by better light interception and effective carbohydrate utilisation under stress<br/><b>Debarati Bhaduri, Koushik Chakraborty, A. K. Nayak, Mohammad Shahid, Rahul Tripathi, Rashmita Behera, Sudhanshu Singh and Ashish K. Srivastava</b></p> | 891–903 | <p>Occasional flooding has been a problem for rice growers around the world. The effect of crop spacing for physiological recovery of plants after imposing submergence stress was investigated, where wider spacing revealed better survival owing to carbohydrate reserve especially for submergence intolerant rice cultivar. Closer spaced plants depleted carbohydrate reserve faster, leading to early senescence and damage to leaf tissues, hence had lesser survival. This implies crop management strategy has a prominent role improving the tolerance of rice plants facing submergence stress.</p> |
| <p>Global convergence in the balance between leaf water supply and demand across vascular land plants<br/><b>Yin Wen, Wan-li Zhao and Kun-fang Cao</b></p>  | 904–911 | <p>Modern angiosperms have greater photosynthetic capacity than earlier plant lineages but the adaptations allowing this are under investigation. We found that leaf vein density (water supply) and stomatal density (water demand) are globally coordinated across vascular land plants and that the advantage of modern angiosperms is associated with the emergence of xylem with low intraconduit resistance and leaves with high vein and stomata densities. This probably enhanced their productivity and adaptability to changing climates.</p>   |
| <p>Early effects of salt stress on the physiological and oxidative status of the halophyte <i>Lobularia maritima</i><br/><b>Anis Ben Hsouna, Thaura Ghneim-Herrera, Walid Ben Romdhane, Amira Dabbous, Rania Ben Saad, Faical Brini, Chedly Abdelly and Karim Ben Hamed</b></p>   | 912–924 | <p>Recently, several genes with proven influence on salt tolerance have been isolated from the Mediterranean halophyte <i>Lobularia maritima</i>. We characterise <i>L. maritima</i>'s response to increasing NaCl concentrations (0–400 mM) at the physiological, biochemical and molecular levels. We show that <i>L. maritima</i> is a salt-includer halophyte that can rapidly develop physiological and antioxidant mechanisms to adapt to salt and manage the oxidative stress induced by high salt concentrations.</p>   |

*Cover illustration:* Impact of mycorrhisation on defence hormones and their priming (see Kadam *et al.* pp. 880–890). Image by Swapnil Kadam.

NAC transcription factor involves in regulating bacterial wilt resistance in potato

**Yannan Chang, Ruimin Yu, Jinlin Feng, Huize Chen, Hemu Eri and Gang Gao**

925–936

Overexpression of *StNACb4* gene can enhance the tolerance of tobacco to *R. solanacearum* and can induce cell death and callose deposition in tobacco. The upregulated expression of *StNACb4* can also activate the expression of *StPR10* gene. Our results provide important new insights into the regulatory mechanisms of bacterial wilt resistance in potato.

Proteomic profiling uncovered the cytosolic superoxide dismutase *BsSOD1* associated with plant defence in the herbal orchid *Bletilla striata*

**Bao-Wei Lu, Feng-Xia An, Liang-Jing Cao, Yong-Jian Yang, Peng-Ming Liu, Xuan Wang, Bao-Liang Yang, Yu-Lei Zhang, Yan-Feng Ding and Jun Liu**

937–944

Antioxidation plays an important role in plant defence. We profiled the proteomes of the resistant and susceptible strains of the herbal orchid *Bletilla striata* and identified the superoxide dismutase *BsSOD1* as an antioxidation-related protein localised in the cytoplasm. Our study helps to understand the molecular mechanism of the plant defence system and may lead to development of biological protection strategies for cultivation.

Combined transcriptome sequencing and prokaryotic expression to investigate the key enzyme in the 2-C-methylerythritol-4-phosphate pathway of *Osmanthus fragrans*

**Rui Xiong, Zhu Chen, Weiyu Wang, Li Jiang, Yan Xiang and Jun Fan**

945–958

We combined transcriptome data and a series of experiments to identify genes related to the production of floral aroma in *Osmanthus* without genome sequencing. The transcriptome data revealed the genes related to the 2-C-methylerythritol-4-phosphate pathway (MEP) pathway in *O. fragrans*, a quantitative real-time PCR (qRT-PCR) assay confirmed that terpene synthase (TPS) gene is crucial for the MEP pathway. The *O. fragrans* TPS gene family was screened and two monoterpenoid synthase enzymes were identified based on the expression level, qRT-PCR and a series of experiments.