

# Functional Plant Biology

## Contents

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RNAi mediated silencing of dehydrin gene *WZY2* confers osmotic stress intolerance in transgenic wheat

**Zhengyang Yu, Xin Wang, Xiaoqian Mu and Linsheng Zhang**

877–884

Drought stress negatively influences plant growth, survival and productivity. Here, we found that RNAi silencing of the *WZY2* gene could decrease the drought tolerance of transgenic wheat while overexpression of *WZY2* in transgenic *Arabidopsis* significantly increased its tolerance to drought stress. Our work suggests that *WZY2* may act on the stress-resistance of a plant through influencing synergistic/antagonistic cross-talk among various stress signalling pathways.

Overexpression of *Triticum durum* *TdAnn12* gene confers stress tolerance through scavenging reactive oxygen species in transgenic tobacco

**Rania Ben Saad, Marwa Harbaoui, Walid Ben Romdhane, Nabil Zouari, Khong N. Giang, Anis Ben Hsouna and Faical Brini**

885–895

Abiotic stresses negatively affect the growth and productivity of crop plants around the world. We report here the functional characterisation of *TdAnn12* in transgenic tobacco and its involvement in salt and drought stress tolerance through the removal of reactive oxygen species. These results show that *TdAnn12* could be a useful candidate gene for engineering abiotic stress tolerance in cultivated plants.

Lower levels of UV-B light trigger the adaptive responses by inducing plant antioxidant metabolism and flavonoid biosynthesis in *Medicago sativa* seedlings

**Limei Gao, Ying Liu, Xiaofei Wang, Yongfeng Li and Rong Han**

896–906

In this work we investigated the responses of *Medicago sativa* seedlings to different levels of UV-B light. Seedlings grew better under lower levels of UV-B light (UV-B irradiation dosage  $<17.35 \mu\text{W cm}^{-2} \text{ day}^{-1}$ ) and have higher UV-resistance. However, higher levels of UV-B light (UV-B irradiation dosage  $>17.35 \mu\text{W cm}^{-2} \text{ day}^{-1}$ ) caused severe stress injuries to seedlings, and seriously inhibited growth and development. Further tests have suggested that the significant induction of plant antioxidant capacity and flavonoid excessive accumulation play a central role in alfalfa UV-B tolerance to the lower levels of UV-B irradiation.

The contrasting leaf functional traits between a karst forest and a nearby non-karst forest in south-west China

**Pei-Li Fu, Shi-Dan Zhu, Jiao-Lin Zhang, Patrick M. Finnegan, Yan-Juan Jiang, Hua Lin, Ze-Xin Fan and Kun-Fang Cao**

907–915

Karst habitats cover extensive areas of south-west China; however, we know little about the adaptive mechanisms of plants there. We compared leaf functional traits between a karst forest and a nearby non-karst forest and found that karst trees had more conservative water use and higher leaf P concentrations. Our results show that trees in the karst forest are structurally and physiologically acclimated to the dry, nutrient-rich soil.

Light regulates hydrogen sulfide signalling during skoto- and photo-morphogenesis in foxtail millet

**Zhiqiang Liu, Chunyu Cao, Yawen Li, Guangdong Yang and Yanxi Pei**

916–924

After more than a decade, the role of  $\text{H}_2\text{S}$  has changed from a hazardous substance into a beneficial gasotransmitter. In the present study we show that light, an indispensable factor for plant growth, provokes  $\text{H}_2\text{S}$  generation by regulating  $\text{H}_2\text{S}$ -producing enzyme coding genes and enzymatic activity. This research provides meaningful connection for environmental signal light and endogenous signal  $\text{H}_2\text{S}$ , both of which are important in regulating various plant physiology processes.

Cover illustration: *Medicago sativa* phenotype under different levels of UV-B light. Image by Limei Gao.

<p>Induction of the heat shock response in <i>Arabidopsis</i> by heat shock protein 70 inhibitor VER-155008  <b>Erina Matsuoka, Naoki Kato and Masakazu Hara</b></p>	925–932	<p>It has not yet been determined how plants sense extremely high temperature in the growth environment. Here we propose that a common chaperone HSP70 can be a heat sensor of plants. The inhibition of HSP70 by a specific inhibitor VER-155008 efficiently induced the heat shock response and enhanced the heat tolerance of <i>Arabidopsis</i>.</p>
<p>Physiological response of <i>Posidonia oceanica</i> to heavy metal pollution along the Tyrrhenian coast  <b>Laura Bertini, Francesca Focaracci, Silvia Proietti, Patrizia Papetti and Carla Caruso</b></p>	933–941	<p>Bioindicators of marine pollution enable fast and reliable monitoring of environmental conditions over time. In this work, we analysed timely warning symptoms of pollution in the marine phanerogam <i>Posidonia oceanica</i>, correlating the physiological response of plants from different meadows to the content of leaf heavy metals. Our results suggest that prolonged exposures to high heavy metal concentrations may interfere with the plants' defence mechanisms.</p>
<p>The effect of vanadium(IV) complexes on development of <i>Arabidopsis thaliana</i> subjected to H<sub>2</sub>O<sub>2</sub>-induced stress  <b>Joanna Rojek, Małgorzata Kozieradzka-Kiszkurno, Małgorzata Kapusta, Anna Aksmann, Dagmara Jacewicz, Joanna Drzeżdżon, Aleksandra Tesmar, Krzysztof Żamojć, Dariusz Wyrzykowski and Lech Chmurzyński</b></p>	942–961	<p>This report demonstrates the influence of oxidovanadium(IV) complexes on <i>Arabidopsis thaliana</i>. In the presence of vanadium(IV) complexes, plants proceeded through their entire life cycle, with proper morphological and cytological organisation of leaf and root tissues. H<sub>2</sub>O<sub>2</sub> treatment caused damage and death to plants. Plants pretreated with 10<sup>-6</sup> M vanadium(IV) complexes survived longer in the presence of H<sub>2</sub>O<sub>2</sub>, suggesting some role of conjugated vanadium(IV) in response to stress factors.</p>
<p><i>Obituary:</i> Emeritus Professor Reinhard Ferdinand Mathias Van Steveninck (1928–2017) and Dr Margaret Elva Van Steveninck (1931–2017) – plant physiologists and electron microscope X-ray microprobe specialists  <b>Terence V. Price</b></p>	962–965	<p>This obituary is a tribute to the late Emeritus Professor Reinhard Van Steveninck (RFM) (1928–2017) and Dr Margaret Van Steveninck (1931–2017) (Fig. 1). Their careers and distinguished contributions as teachers and researchers in plant physiology are highlighted. They were renowned for major contributions of salt and ion transport within plant cells using ultrastructural X-ray techniques.</p>