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Editorial

Photoperiod during stem elongation in wheat: is its impact on fertile floret and grain number determination similar to that of radiation?

Fernanda G. González, Gustavo A. Slafer and Daniel J. Miralles 181–188

Floret development and survival in wheat plants exposed to contrasting photoperiod and radiation environments during stem elongation

Fernanda G. González, Gustavo A. Slafer and Daniel J. Miralles 189–197

This pair of papers examines the relationships between photoperiod, stem elongation and fertility in wheat. The aim of the first paper is to determine whether photoperiod effects on the number of fertile florets and grains are mediated by assimilate supply, by comparing photoperiod effects with those of canopy shading. Most photoperiod effects on the number of fertile florets were mediated by assimilate supply to the growing spike. The second paper reports floret primordia survival in different positions along the spike in relation to the dynamics of spike growth. Dry matter partitioning to the spike was manipulated by photoperiod and shading treatments during stem elongation. The fate of the floret primordia and its final stage at anthesis were associated with the duration of floret development within the stem elongation phase.

Effect of aluminium on membrane potential and ion fluxes at the apices of wheat roots

Tim Wherrett, Peter R. Ryan, Emmanuel Delhaize and Sergey Shabala 199–208

Aluminium tolerance in wheat is associated with efflux of malate and K^+ from the root apices. These authors used near-iso-genic wheat lines differing in sensitivity to Al to measure Al-activated ion fluxes and changes in membrane potential (V_m). Al stimulated increases in K^+ efflux and H^+ influx in the root elongation zone of the Al-tolerant genotype, but not in the sensitive genotype. Differences in Cl^- influx in response to Al were also observed, and provide new temporal and spatial information on Al-activated ion fluxes and associated V_m changes from intact wheat plants.

Nitrate reductase in durum wheat seedlings as affected by nitrate nutrition and salinity

Petronia Carillo, Gabriella Mastrodonato, Francesco Nacca and Amodio Fuggi 209–219

This paper describes the combined effects of nitrate and salt supply on durum wheat seedlings by analysis of nitrate reductase (NR). Although the influence of nitrate on NR activity and regulation are well known, the current work shows that chloride can mimic nitrate as a signal to induce NR-mRNA transcription in roots and leaves. Results also indicate that salt could affect NR-mRNA translation or protein degradation. These are important issues for evaluating the effects of environmental changes on crops.

*Cover illustration: In situ immunolocalisation of WM5 showing location of the protein in the nucleus of pollen mother cells during early meiotic prophase. The section was immuno-stained with WM5 antibody (labelled as green) and counterstained with propidium iodide (red). (See Dong *et al.* pp. 249–258).*

Elevated CO₂ protects poplar (*Populus trichocarpa* × *P. deltoides*) from damage induced by O₃:
identification of mechanisms
**Simon D. L. Gardner, Peter H. Freer-Smith,
J. Tucker and Gail Taylor** 221–235

This paper presents new data that identifies that, for poplar grown in short rotation, elevated CO₂ levels can act to offset the adverse impacts of O₃. Detailed measurement of leaf emergence, expansion and abscission, and of photosynthesis, solute potential and turgor show how differing effects determine the magnitude of O₃ impacts on shoot growth, and how elevated CO₂ can modify the adverse effects of O₃. The authors propose a new mechanism, by which O₃ may stimulate leaf growth through non-enzymatic scission of cell walls.

The role and the interrelationship of hydrogen peroxide and nitric oxide in the UV-B-induced stomatal closure in broad bean
**Jun-Min He, Hua Xu, Xiao-Ping She, Xi-Gui Song
and Wen-Ming Zhao** 237–247

Depletion of ozone from the stratosphere has increased UV-B irradiation of the earth's surface, with inevitable consequences for plants. Stomata exhibit complex responses to this increased exposure, and this study aims to elucidate the roles of H₂O₂ and NO in stomatal response to UV-B. NO and H₂O₂ production in broad bean guard cells preceded UV-B-induced stomatal closure, suggesting that UV-B radiation induces stomatal movement by promoting NO and H₂O production.

WM5: Isolation and characterisation of a gene expressed during early meiosis and shoot meristem development in wheat
**Chongmei Dong, Stephen Thomas, Dirk Becker,
Horst Lörz, Ryan Whitford, Tim Sutton, Jason A. Able
and Peter Langridge** 249–258

The isolation and characterisation of a gene that is predominantly expressed during early meiosis and is involved in shoot meristem development are described. The gene, *WM5*, encodes a novel protein that is rich in glycine, proline and serine. It shares a degree of similarity to PDF1 (protodermal factor 1, from *Arabidopsis*) at the carboxy terminus.

Identification of a SAR8.2 gene in the susceptible host response of *Nicotiana benthamiana* to *Colletotrichum orbiculare*
Xue Chan Shan and Paul H. Goodwin 259–266

The plant gene SAR8.2 is involved in an infection by a pathogenic fungus, *Colletotrichum*, which often develops hemi-biotrophically in its host. These genes are upregulated in plants undergoing systemic acquired resistance and responding to environmental stresses and pathogens. A novel gene, *NbSAR8.2m*, was obtained from a cDNA subtraction library constructed from mRNA of *Nicotiana benthamiana* infected with *C. orbiculare*. *NbSAR8.2m* expression was induced by *C. orbiculare* infection and silencing the gene prolonged the biotrophic phase of the infection.

Resistance to downy mildew in pearl millet is associated with increased phenylalanine ammonia lyase activity
**N. P. Geetha, K. N. Amruthesh, R. G. Sharathchandra,
and H. S. Shetty** 266–275

Regulation and tissue specificity of phenylalanine ammonia lyase (PAL) activity, and the effect of inhibitors, are reported for seedlings and suspension cells of pearl millet infected with downy mildew. Temporal changes in wall-bound phenolics and lignin were also studied, and the authors discuss the importance of host phenolic compounds and lignin metabolism in relation to PAL activation as a response to pathogen infection.