

Functional Plant Biology

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Goldacre Review: Novel chlorophylls and new directions in photosynthesis research

Yaqiong Li and Min Chen

493–501

Chlorophylls *d* and *f* are red-shifted chlorophylls based on their significantly red-shifted absorption bands compared with chlorophyll *a*. Understanding the molecular mechanism of photosynthesis driven by red-shifted chlorophylls is of global importance and will contribute to cutting-edge photosynthetic research. The current research status in related to the red-shifted chlorophylls is reviewed in this review.

Perspective: Towards a conceptual ABA ideotype in plant breeding for water limited environments

Abraham Blum

502–513

ABA is a plant hormone produced in plants under drought stress. On one hand, it causes the plant to conserve its water status; on the other hand, it reduces growth and productivity. This opinion review examines the available data on ABA and attempts to resolve this conundrum by formulating an appropriate crop plant phenotypic ABA ideotype for breeders to pursue within different dryland stress environments.

Effects of different temperature regimes on flower development, microsporogenesis and fertility in bolting garlic (*Allium sativum*)

Einat Shemesh Mayer, Tomer Ben-Michael, Sagie Kimhi, Itzhak Forer, Haim D. Rabinowitch and Rina Kamenetsky

514–526

Infertility prevents genetics research and conventional breeding in garlic. Recent achievement of fertility restoration enables extensive studies of garlic florogenesis and causes for male sterility. We report on temperature effects on flower development and pollen quality in fertile and male-sterile garlic, and on the vulnerable phases of pollen formation. It is concluded that under unstable climatic conditions, agro-management modifications will facilitate breeding and seed production in this important crop.

Comparative proteomic and physiological characterisation of two closely related rice genotypes with contrasting responses to salt stress

Seyed Abdollah Hosseini, Javad Gharechahi, Manzar Heidari, Parisa Koobaz, Shapour Abdollahi, Mehdi Mirzaei, Babak Nakhoda and Ghasem Hosseini Salekdeh

527–542

According to a two-phase growth response concept, genotypes with differing susceptibility to salinity usually develop distinct responses when excess salt accumulates in their tissues. In this study, two rice genotypes (IR29 and FL478) were exposed to salt stress until they showed distinct growth. Their physiology and proteome responses were analysed. The sensitivity of IR29 to salinity may be due to its inability to exclude salt, compartmentalise excess ions or maintain its photosynthetic apparatus in a healthy state under salt stress.

Leaf green-white variegation is advantageous under N deprivation in *Pelargonium × hortorum*
Cyril Abadie, Marlène Lamothe, Caroline Mauve, Françoise Gilard and Guillaume Tcherkez

543–551

Growth and metabolism of green-white variegated and plain morphs of *Pelargonium* have been examined under nitrogen deficiency. Variegated plants performed better than non-variegated plants, owing to the remobilisation of nitrogenous compounds stored in leaf white areas. It is concluded that variegation is disadvantageous under non N-limited conditions due to the lower photosynthetic surface area, but is advantageous under nitrogen deprivation.

Cover illustration: Two different sorghum lines under dryland conditions photographed 1 day after a severe hot windy event (see Blum pp. 502–513). The line on the right is known to be relatively more sensitive in stomatal closure under drought stress than the line on the left (and the other materials in the background) and it therefore shows heat stress damage in the form of partially dead leaves. Photograph by Abraham Blum.

Temperature responses of photosynthesis and respiration in a sub-Antarctic megaherb from Heard Island

Marcus Schortemeyer, John R. Evans, Dan Bruhn, Dana M. Bergstrom and Marilyn C. Ball

552–564

Climate warming may affect carbon gain and loss, with consequences for growth of cold climate species. Responses of photosynthesis and respiration to temperature were studied in *Pringlea antiscorbutica* R. Br. along an altitudinal gradient on sub-Antarctic Heard Island. The results showed greater importance of thermal acclimation of respiration than photosynthesis to maintenance of favourable carbon balances with increasing temperature range.

Impact of elevated atmospheric humidity on anatomical and hydraulic traits of xylem in hybrid aspen

Anna Katarzyna Jasińska, Meeli Alber, Arvo Tullus, Märt Rahi and Arne Sellin

565–578

The Free Air Humidity Manipulation (FAHM) experiment offers unique possibilities to test trees' acclimation capacity to increasing atmospheric humidity – a climate trend predicted for northern Europe. We investigated changes in wood anatomy and hydraulic conductivity in hybrid aspen; results showed moderate modifications in both the structure and functioning of xylem. Our results suggest that hybrid aspen is relatively insensitive to the changes in air humidity.

Whole-plant respiration and its temperature sensitivity during progressive carbon starvation

Martijn Slot and Kaoru Kitajima

579–588

Carbon release from plant respiration increases with temperature. Although it is thought that low sugar concentrations limit the rate of this increase, this has not been tested at the whole-plant level. When we sugar-starved *Ardisia crenata* plants, respiration decreased but, surprisingly, the sensitivity of respiration to warming increased. These results highlight the complexity of the controls over plant respiration, especially at the whole-plant level.

Comparative expression profiling of three early inflorescence stages of oil palm indicates that vegetative to reproductive phase transition of meristem is regulated by sugar balance

Walter Ajambang, Sintho W. Ardie, Hugo Volkaert, Georges F. Ngando-Ebongue and Sudarsono Sudarsono

589–598

In some cases, induction of male flower inflorescences in oil palm is difficult to accomplish. Investigation to explore part of the possible ways to induce male flower inflorescences from *Pisifera* oil palm and understanding the molecular processes associated with it have been investigated and answered. The findings may be important in the management of commercial oil palm production especially under changing climate conditions.