

Functional Plant Biology

Contents

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Viewpoint: The perils of pot experiments

John B. Passioura

1075–1079

This *Viewpoint* article offers a commentary of three critical problems in pot experiments that can have a large impact in interpreting results. These problems, often unrecognised, include aberrant water relations, hypoxia, and large variations in the temperatures of both the pots and their water supply.

Alternation of wet and dry sides during partial rootzone drying irrigation alters root-to-shoot signalling of abscisic acid

Ian C. Dodd, Julian C. Theobald, Mark A. Bacon and William J. Davies

1081–1089

This timely study shows how we can exploit ABA-based root-to-shoot signalling to save irrigation water. Partial rootzone drying (PRD) was imposed on split-root tomato plants to achieve heterogeneity of soil moisture. When all plants received the same amount of water, alternation of wet and dry pots increased xylem ABA concentration and further decreased stomatal conductance, when compared to plants in which the same wet and dry pots were maintained. These results have implications for irrigation scheduling of PRD plants in the field. Where previous PRD studies were often based on a rather too literal interpretation of the work of Dry *et al.* with regard to the setting of switch intervals, this analysis is timely in that it applies some real science to the PRD concept.

Root distributions of Australian herbaceous perennial legumes in response to phosphorus placement

Matthew D. Denton, Camille Sasse, Mark Tibbett and Megan H. Ryan

1091–1102

Denton *et al.* highlight the responses of different legumes that allow them to grow in conditions where soil P is enhanced in the surface layers, typical in agricultural fields. The authors studied how root distribution differs according to P placement in surface soils, and found that root distributions of native legumes (*Kennedia prorepens* and *Lotus australis*) differed substantially from those of the introduced forage legume *Medicago sativa*. These interesting findings are contrary to the hypothesis that proliferation of surface roots would result in a reduction of deep roots for the native legumes.

Hydraulically based stomatal oscillations and stomatal patchiness in *Gossypium hirsutum*

Ricardo A. Marenco, Katharina Siebke,

Graham D. Farquhar and Marilyn C. Ball 1103–1113

It is believed that stomata are assisted in adjusting their conductance by two major feedback loops, involving the control of stomatal conductance by intercellular CO₂ concentrations and leaf water status. This interesting paper contains important new data relating to the interface between stomatal control and hydraulic supply. It is another powerful confirmation of the theory of stomatal oscillations, and fits nicely into the concepts that try to causally explain stomatal patchiness and the repair of xylem embolism.

Cover illustration: The growth medium at the bottom of a freshly watered and drained pot is unavoidably saturated with water, even if the pot is not sitting in a saucer. If the growth medium is soil, or the fine mix used for growing *Arabidopsis*, the bottom 50 mm of the pot will be close to saturation and probably hypoxic. The proportion of pores that are filled with air (rather than water) increases with height in the pot, and the medium is only likely to provide adequate aeration above a height of about 100 mm (See Passioura pp. 1075–1079.)

Measurement of (carbon) kinetic isotope effect by Rayleigh fractionation using membrane inlet mass spectrometry for CO₂-consuming reactions
Dennis B. McNevin, Murray R. Badger, Heather J. Kane and Graham D. Farquhar 1115–1128

McNevin *et al.* describe a new method for determining stable C isotope discrimination by CO₂-fixing plant enzymes, which enables them to determine kinetic isotope effects for CO₂-consuming reactions by following the change in ¹²CO₂ and ¹³CO₂ concentrations directly. As previous methods relied on measuring isotope ratios of CO₂, this considerably simplified and faster method represents a profound boon to the field, and will be a very valuable tool for understanding fractionation associated with CO₂-fixing enzymes under various conditions.

VvFT and *VvMADS8*, the grapevine homologues of the floral integrators *FT* and *SOC1*, have unique expression patterns in grapevine and hasten flowering in *Arabidopsis*
Lekha Sreekantan and Mark R. Thomas 1129–1140

Understanding the controlling mechanisms for grapevine flowering is of central importance to viticulturalists, due to the direct link between seasonality of flowering, vine fruitfulness and berry quantity and quality at harvest. This paper deals with the isolation and characterisation of two genes involved in floral induction. The genes have been isolated previously, but the significance of this work is that it is in a commercial perennial, grapevine.

Altering expression of the flavonoid 3'-hydroxylase gene modified flavonol ratios and pollen germination in transgenic Mitchell petunia plants
David Lewis, Marie Bradley, Stephen Bloor, Ewald Swinny, Simon Deroles, Chris Winefield and Kevin Davies 1141–1152

Lewis *et al.* examine modification of a specific step in the flavonoid biosynthetic pathway and the subsequent effects in petunia. Using an antisense construct, endogenous F3'H expression was suppressed and three transgenic lines, showing differing levels of transcript loss, were monitored for F3'H enzyme activity, flavonol content (in leaves, petal limb tissue and anthers), pollen viability and germination and seed set.