



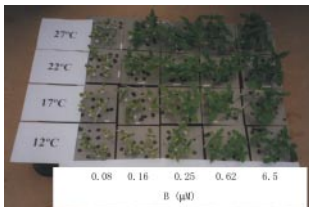
Multiple gravity signal transduction pathways in roots (Botanical Briefing)

Gravitropism directs downward growth of roots, allowing them to anchor the plant in soil and take up water and mineral ions. **Perrin *et al.* (pp. 737–743)** review recent insights into early phases of root gravitropism, and suggest the existence of multiple gravity signal transduction pathways leading to auxin redistribution and curvature response.



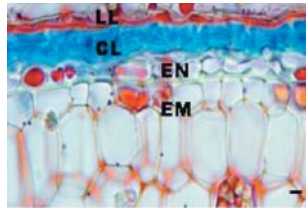
Role of molybdenum in plant development and growth (Invited Review)

Molybdenum is a trace element required for plant growth and is primarily involved in nitrogen metabolism and hormone synthesis. **Kaiser *et al.* (pp. 745–754)** discuss its role in plant growth and explore lesser known aspects of its transport and potential use in enhancing agricultural crop production.



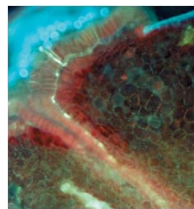
Boron nutrition and chilling stress in plants (Invited Review)

Huang *et al.* (pp. 755–767) review how boron modulates plant responses to chilling temperatures in roots and shoots. Conceptual hypotheses explore the role of boron in water channel activity, boron uptake functions in the root and boron-modulated anti-oxidative systems in the leaf cells.



Characteristics of the perisperm–endosperm envelope of cucumber seeds

Ramakrishna and Amritphale (pp. 769–778) show that the lipid- and callose-rich layers of the perisperm–endosperm envelope in *Cucumis* have different origins and that the lipid layer of the envelope contributes to its semipermeability. Evidence is provided for proton diffusion and endo- β -mannanase activity in the caps of the envelope, and β -glucanase activity in embryonic tissue prior to radicle emergence.



New views on pollen germination and pollen tube extension

The archetype pathway of pollen tube growth in angiosperms involves germination on the surface of a wet stigma and the contiguous epidermis at the site of angiospermy. Using Chloranthaceae, a taxon much used to study origins and early evolution of flowering plant reproduction, **Hristova *et al.* (pp. 779–791)** challenge this view by demonstrating pollen germination on a dry stigma and intercellular pollen tube growth orientated towards the ovary locule.



Nitrogen supply and nicotine concentration

By using different amounts of [^{15}N]nitrogen, **Xi *et al.* (pp. 793–797)**

show that enhanced N supply in the later growth stages (after removing the shoot apex) increases N content and nicotine concentration in tobacco plants. Nicotine is synthesized *de novo* at this time.



Competition for N between C₃ and C₄ grasses

Nassella trichotoma is a troublesome C₄ grass weed of south-eastern Australia. **Badgery *et al.* (pp. 799–809)** show that it competes strongly for N when in ample supply but only overwhelms native species when the latter are at low densities. The success of *N. trichotoma* seems to depend on its fast rate of biomass accumulation.



Ontogenic plasticity in tropical Eucalyptus species

Few studies have addressed the genetic basis of ontogenic plasticity in forest trees. **Bouvet *et al.* (pp. 811–821)** examine the impact of density of planting on growth traits and form of tropical *Eucalyptus* species. They show that plasticity is under genetic control and that competition changes the genetic co-variation between height and circumference through ontogeny.

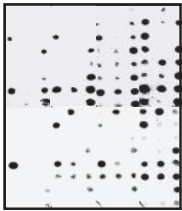


Clonal growth in populations of *Olea europaea* subsp. *laperrinei*

Laperrine's olive is an endangered tree from the Saharan mountains.

Baali-Cherif and Besnard

(pp. 823–830) assess its genetic diversity using nuclear and chloroplast DNA markers. The tree is found to reproduce vegetatively and is assumed to have existed without sexual reproduction for a very long time. This process is shown to have preserved a high genetic diversity within small relict populations.



Macroarray-based screening for anoxia-induced genes in FR13A rice

Flooding imposes anoxic stress in crops. Agarwal and Grover (pp. 831–844) investigate the genes associated with anoxia in flood-tolerant FR13A rice. Two different subtraction libraries are screened using a macroarray-based assay to identify genes induced specifically in the tolerant rice variety. Selected clones are also examined for stress-induced transcripts.



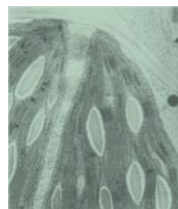
Pollinator visitation in a hellebore

Biotic and abiotic factors influencing pollinator visitation in winter-flowering *Helleborus foetifus* are investigated by Sánchez-Lafuente *et al.* (pp. 845–852) over a wide regional scale in Spain. Despite highly variable weather conditions, only temporal variation in floral display seems to be consistently responsible for variation in visitation rates.



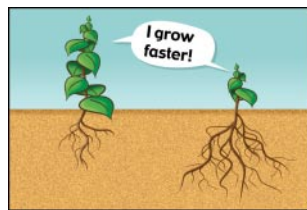
Cork oak, a far-western Mediterranean species, has an eastern origin

By analysing variation in chloroplast DNA, Lumaret *et al.* (pp. 853–861) provide evidence of either a Middle Eastern or of a central Mediterranean origin for cork oak with subsequent westward colonization during the Tertiary Period. Three potential glacial refuges, in Italy, North Africa and Iberia, are also identified.



Photorespiratory enzyme activities in C₄ grasses

Ueno *et al.* (pp. 863–869) investigate granal development in bundle sheath chloroplasts and activities of peroxisomal enzymes of photorespiration in leaves of 28 C₄ grasses. Interspecies variation in glycolate oxidase activity is shown to be associated with the granal development, suggesting different potential photorespiration capacities among C₄ grasses.



A simple model for nitrogen-limited plant growth and nitrogen allocation

Verkroost and Wassen (pp. 871–876) construct a plant growth model that assumes formation of photosynthetic N-compounds is proportional to nitrogen uptake. It predicts that the ratio of leaf nitrogen and plant nitrogen declines

linearly with the inverse of plant nitrogen concentration and that nitrogen productivity is proportional to this ratio. Allocation predictions agree well with data from previous studies.



Evidence for hybridization between purple and winged loosestrife

Houghton-Thompson *et al.* (pp. 877–885) test the hypothesis that hybridization with winged loosestrife may have played a role in the success of purple loosestrife in North America. While evidence using morphological and molecular markers indicates that purple loosestrife carries a few genes from winged loosestrife, there is little to suggest large-scale genomic reorganization.



Taxonomic clarification in the Petunia integrifolia complex

Petunia inflata is variously considered as an independent species or as a subspecies of *P. integrifolia*. Ando *et al.* (pp. 887–900) describe field observations of 21 morphological characteristics and the cluster analysis they used to determine more certainly that *P. inflata* and *P. integrifolia* are distinct allopatric species.



Genetic variation of Atriplex tatarica

Mandák *et al.* (pp. 901–912) examine the relationship between marginality and

low within-population genetic diversity in *Atriplex tatarica*. They concluded that, with the exception of allelic richness, genetic diversity is not significantly lower at the margins of the species range. This provides only weak support for the predictions of the Central-Marginal Model.



Mechanical impedance and hypoxia in roots

Root axes swell in response to mechanical resistance, predisposing cells deep within the root to a restricted oxygen supply from surrounding soil. Furthermore, soil compaction can exacerbate poor internal aeration. The fine dynamics of growth and oxygen consumption by apices of lupin roots are used by **Hanbury and Atwell (pp. 913–924)** to demonstrate that roots growing through an artificially compacted matrix suffer oxygen shortage.



Nitrogen deficiency effects on photosynthetic traits of maize

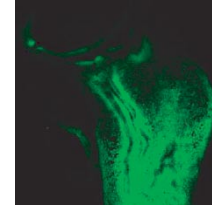
Grain yield under nitrogen deficiency of some newer maize hybrids is discussed by **Ding et al. (pp. 925–930)**. They find that newer hybrids maintain greater photosynthetic capacity than older ones during post-anthesis. This is associated with differences in non-stomatal limitations such as the PEPCase activity, chlorophyll content and soluble protein concentration.



Impact of polyploidy in cell expansion rate in *Lolium* spp.

Sugiyama (pp. 931–938) examines the role of cell division and expansion in the

increased leaf size of polyploid *Lolium perenne* and *L. multiflorum*. Polyploidy is shown to enhance leaf size and final cell size mainly by promoting the rate of cell elongation while having little effect on the duration of elongation, cell cycle times or on cell production rate.



Unloading carbohydrates in maize ovaries

Mäkelä et al. (pp. 939–949) study the delivery of stem-fed carboxyfluorescein to the pedicel of maize ovaries in normal conditions or in water deficit sufficient to inhibit photosynthesis. They find a correlation between this delivery and carbohydrate unloading to the ovary that is imaged for glucose, starch and invertase activity.