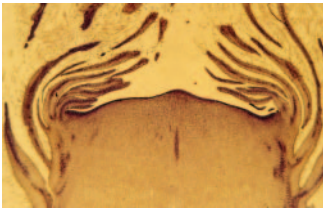




Roots for highly efficient acquisition of phosphorus (Invited Review)

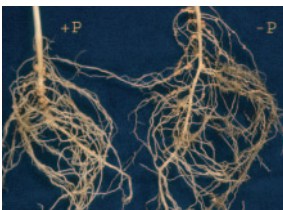
On severely P-impoorished soils, an increasing number of non-mycorrhizal species are being found with highly effective adaptations for P acquisition linked to the possession of cluster roots or functionally analogous structures.

Lambers *et al.* (pp. 693–713) describe the specialized structures and metabolism involved, and emphasize the potential they offer for alleviating crop P-limitations.



stem fasciated, a recessive mutation, alters morphology and auxin levels

The *stem fasciated* (*stf*) mutant of sunflower, described by **Fambrini *et al.* (pp. 715–730)**, is characterized by an enlarged shoot apical meristem (SAM), high levels of auxin, and increased number of leaves and vascular bundles in the stem. The *stf* gene appears to be involved in the initiation of leaf primordia through control of the SAM arrangement and hormonal homeostasis.



Nitrogen fixation adaptation to low phosphorus (P) in white lupin

White lupin (*Lupinus albus*) adapts to low-P soils by forming citric acid-exuding proteoid or cluster roots. In addition, **Schulze *et al.* (pp. 731–740)** show the nitrogen-fixing apparatus adapts by various mechanisms that include altered nodule location, preferential transport of scarce P to nodules and increased malate formation.



Phylogenetic analysis of Centaurea

The genus *Centaurea* is a complicated taxon. **Garcia-Jacas *et al.* (pp. 741–753)** use TS region sequences to resolve three main groups. The first comprises the most widely distributed circum-Mediterranean and Eurosiberian sections; the second encompasses Western Mediterranean sections; the third includes the Eastern Mediterranean and Irano-Turanian sections and where sectional classification needs major revision.



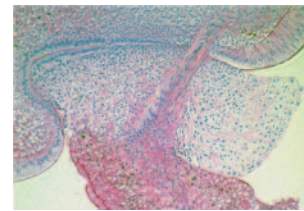
Taxonomy and conservation: a case study from Chamaedorea alternans

Historical taxonomic confusion and debate has left this Mexican palm with an uncertain conservation status. **Bacon and Bailey (pp. 755–763)** report the first molecular analysis of the *C. alternans* complex indicating the species is a distinct threatened endemic located in a declining ecosystem and deserving a high conservation priority status.



Environmental variation, Young's modulus and buckling height

Although elastic similarity models and determinations of critical buckling height often consider density-specific stiffness to be a constant, few studies have tested this assumption. **Watt *et al.* (pp. 765–775)** combine theory with data to develop a model of Young's modulus that tests the assumption for *Pinus radiata* growing across an environmental gradient.



Ontogeny of the aril in Cytisus multiflorus and C. striatus

The origin of the aril seed-appendage is a controversial feature of leguminous seed development. Using two important species of the western Mediterranean flora, **Rodríguez-Riaño *et al.* (pp. 777–791)** demonstrate the funicular origin of the aril and the roles of post-fertilization development and of the endosperm in its development.



Accumulation of anti-depressant in dark glands of St John's-wort

Hypericin and pseudohypericin are pharmaceuticals derived from *Hypericum perforatum* used in the treatment of human depression. The highest concentrations are shown by **Zobayed *et al.* (pp. 793–804)** to be in stamens in

association with high numbers of large dark glands.



Heading-time differentiation in wheat populations

Dynamic crop management aims to maintain genetic variability between populations evolving under natural selection in contrasting environments.

Goldringer et al. (pp. 805–817) report that, after 10 generations, six wheat populations became genetically differentiated according to a north–south latitudinal trend, indicating that local climatic conditions (different vernalization and photoperiodic conditions) can influence the evolution of earliness.



Metabolomics of stress-tolerant transgenic rice

Rice (*Oryza sativa*) over-expressing dihydroflavonol-4-reductase shows enhanced tolerance to biotic and abiotic stresses. Using capillary electrophoresis mass spectrometry, **Takahashi et al. (pp. 819–825)** find that several organic acids and free amino acids are altered in a tissue-specific manner in whole plants and suspension cultures, while in transgenic seeds amounts of carbohydrates and ions remain unchanged.



Field-variable temperature responses by seeds

Thermal-germination models derived from constant-temperature experimentation do not take into account secondary temperature effects on seed dormancy and germination rate. **Hardegee (pp. 827–834)** determines that predicted and actual germination response of four rangeland grass species compare favourably with 7 of 8 models tested under 104 field-temperature simulations.



Preformation and neoformation in tree shoots: analysis by deconvolution

Methodological restrictions have limited our understanding of the relevance of neoformation in trees. Mathematical methods by **Guédon et al. (pp. 835–844)** generate models describing both preformation and neoformation in several tree species. In these species, neoformation is shown to be a major determinant of within-species variation in shoot size.



Distinct distribution patterns of diploid and hexaploid populations

Polyploidy can be an important influence on sympatric speciation. **Mandáková and Münzbergová (pp. 845–856)** find that hexaploid and diploid cytotypes of *Aster amellus* occupy separate areas even though each area is closely similar abiotically. The absence of overlapping territories suggests the possibility of a secondary contact zone.



Large interspecies variation in *Borago* karyotypes

Selvi et al. (pp. 857–868) reveal an unexpectedly large variation between karyotypes of *Borago* species—four base chromosome numbers and three ploidy levels being present. This is interpreted in the light of phylogenetic analyses based on nuclear and plastid DNA sequences showing the monophyly of *Borago* and of the Corso-Sardinian endemic subgenus *Buglossites*.



Light, phytochrome and *Carex* seed germination

Carex is a globally important genus and many species are difficult to restore to degraded ecosystems. **Kettenring et al. (pp. 869–874)** report that white or red light increases germination of eight species from prairie wetlands with the effect being reversible by far-red light in six of these. Implications of the findings for *Carex* seed bank formation and restoration are explored.



Hard-seed dormancy release by wet heat in Australian legume

A wide range of dormancy release mechanisms have been proposed for hard-seeded species. In the Australian tropical shrub *Parkinsonia aculeate*, **van Klinken et al. (pp. 875–883)** find a combination of wet and warm-to-hot

conditions is the principal dormancy releasing factor. This constitutes an effective gap-detection mechanism.



Sex discrimination in tree-rings

Once sexual maturity is achieved, tree-rings of dioecious *Juniperus thurifera* grow proportionally more in males than in females. Furthermore, **Montesinos *et al.* (pp. 885–889)** show that timing of allocation of resources to tree ring-growth differs between the sexes, probably as a response to the more demanding reproductive cycle of female trees.



A reappraisal of ABA–auxin interaction in branching

According to **Cline and Oh (pp. 891–897)**, abscisic acid (ABA) is probably not the second messenger for auxin in regulating shoot apical dominance nor is it the apocarotenoid novel branching inhibitor suggested by recent branching mutant studies. However, there is evidence for a moderate repression of lateral bud outgrowth by acropetally moving ABA in *Ipomoea nil* and *Solanum lycopersicum*.