

Solving the riddle of the sands

Plants able to grow in sand or in very sandy soils may play an important role in stabilizing the sand and even preventing desertification of adjacent vegetation zones. Thus, it is a matter of concern when a sandland species starts to decline. This has already happened with *Ulmus pumila*, a species that grows in the dunes of the Hunshandak Sandland, Inner Mongolia. **Shi et al. (Beijing, China, pp. 553–560)** proposed that an increased frequency of sand storms may be a factor promoting this decline because seedlings are buried more frequently as a consequence. They have tested this idea by burying seedlings

to different depths for up to 6 weeks. In partial burial treatments, the basal 33 % or 67 % of the stems were under sand. In full burial treatments, the sand surface was either level with the shoot apex (100 %) or the apex was under a depth of sand corresponding to 33 % of total stem height (133 %). The overall effects were very clear. Partially buried plants all survived but fully buried plants started to die between 2 and 4 weeks after burial; 6 weeks after burial, 30 % of the '100 %' plants and 80 % of the '133 %' plants had died. Further, while partial burial stimulated growth of stems and shoots and the emergence of leaves and lateral branches, total burial inhibited all these. In physiological tests (carried out after removal of the sand), plants that had been previously partially or 100 % buried (these experiments were not done with the '133 %' plants) showed greater rates of net photosynthesis and transpiration, higher leaf water contents and greater water-use efficiency than control plants. Of course, these enhancements are not relevant when a plant is actually totally buried but they do indicate that *U. pumila* is adapted to survive partial burial and even short periods of total burial. However, longer periods of total burial are fatal.



A new species—it's plain in Spain

Oranges and bergamot oil are both products of plants in the Rutaceae, a large family with over 900 species, many of which are economically important, distributed from warm-temperate to tropical regions, as described by **Navarro et al. (Granada, Spain, pp. 571–582)**. These authors have focused on the genus *Haplophyllum*, many members of which occur in the warmer parts of Europe. Members of this genus are rich in alkaloids and other important secondary metabolites. However, despite the background of centuries of botanical research in Europe and the commercial potential of *Haplophyllum*

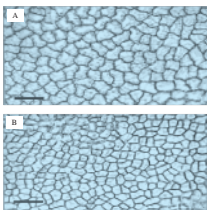
species, we have only a relatively limited knowledge of the ecology and taxonomy of this genus. So much so, that, in the present paper, Navarro and colleagues describe a newly discovered species, *H. bastetanum*. We often hear, in the context of biodiversity, that much of the world's fauna and flora still remains to be described and we presume that such statements relate to less-accessible parts of the world or to regions that have not been the subject of extensive research. But these authors have discovered a previously undescribed species in a major European country. Further, in describing *H. bastetanum* they have enjoyed advantages that previous generations of taxonomists did not have, namely being able to use DNA sequencing and bioinformatics. It is certainly true that *H. bastetanum* is readily distinguishable from its close relatives by virtue of clear differences in morphology, floral characters and chromosome number (which leads us to ask why it had not been discovered earlier) but the DNA sequence comparisons (using part of the major gene encoding ribosomal RNA) confirm very strongly the separate identity of this species and its place in the evolution of the genus. One wonders how many more European plant species await discovery.



Bryophytes see the light

Early in our botanical education we learn the differences between sun and shade plants, but later we come to understand that it is not so straightforward. This is well illustrated in the paper by a joint Hungary–UK team, **Mariann Marschall and Michael Proctor (pp. 593–603)**. They point out that bryophytes, even those that grow in the open, are generally classified as shade plants, based on chlorophyll *a* : *b* ratios and the irradiance levels at which photosynthetic rates plateau. However, they have questioned whether this classification should or indeed can be applied to all bryophytes.

They worked with a large range of bryophytes from a variety of habitats, measuring chlorophyll *a* : *b* ratios, chlorophyll : carotenoid ratios, chlorophyll fluorescence and, for some species, gas exchange. The main feature that stands out from their data is that it is not safe to generalize. Pigment ratios and photosynthetic parameters vary widely between species, although there are strong correlations between chlorophyll *a* : *b* ratios, chlorophyll : carotenoid ratios and photosynthetic photon flux density saturation curves (obtained via chlorophyll fluorescence). Further, some of the values for bryophyte species from open, well-illuminated habitats are at the high end of the range for shade plants. Nevertheless even these cannot be regarded as true sun plants. So, are these bryophytes of open habitats really shade plants that are poorly adapted to their environment? It is not that simple: in most bryophytes with ‘unventilated’ photosynthetic tissue, CO₂ uptake is limited by leaf structure and this is the probable reason for the relatively low photosynthetic saturation values. In support of this, the authors show that the Polytrichaceae, with their ventilated photosynthetic tissue and hence greater surface areas for CO₂ uptake, are the nearest approach to sun plants among the bryophytes. Thus, as the authors state, ‘bryophytes include but are not inherently shade plants’.



Can cassava cells cope when water is withheld?

The effects of water deficit on plant growth are particularly felt in dryland crops where yields are often reduced because of periodic or chronic drought. In defining objectives for plant breeding it is important to have clear information on a plant’s response to drought and on its ability to recover. This has been the subject of research carried out on cassava (*Manihot esculenta*) by **Alfredo Alves from Bahia, Brazil and Tim Setter, Cornell University, USA (pp. 605–613)**. They have focused on leaf development during 8 days of water stress followed by re-watering. Water stress was imposed by

allowing soil to dry to 30 % of field capacity and maintaining the water content at this level. The results show very interesting differences in the effects of water deficit on leaves of different ages, ranging from early leaf meristems to leaves growing just by cell expansion. It was clear that water deficit affected both cell division and cell expansion but that both exhibited some capacity for recovery after re-watering. In leaf meristems, recovery was complete although there was delay in re-watered plants in the attainment of normal size of leaves derived from these meristems. In young leaves, growing by rapid division and some expansion, water deficit inhibited both processes, and on re-watering both recovered partially so that at maturity leaves had fewer and smaller cells than controls. Finally, in leaves growing only by rapid expansion, growth was again brought to a halt by water deficit and, again, recovery was only partial: leaves of re-watered plants had smaller cells than control plants. Loss of leaf area affects the overall photosynthetic capacity of the plant and thus influences yield. It is thus important to continue these studies in order to understand why, except in meristems, recovery from the effects of water deficit is only partial.

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