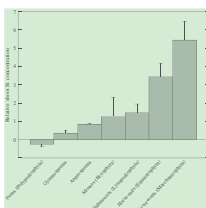


Great walls of fire

For large numbers of wild plant species, dormancy is an essential part of their mode of life. It is usually seen as a mechanism for avoiding germination in situations in which the seedling would be exposed to unfavourable conditions. Further, dormant seeds may remain in the soil forming seed banks whose germination can be delayed for several years. These features are illustrated in the Australian genus *Grevillea* by **Briggs *et al.* (UWS and UNSW, Sydney, Australia, pp. 965–980)**.

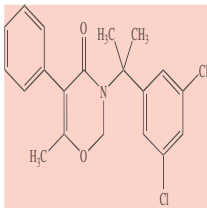
The seeds of certain *Grevillea* species contain, external to the embryo, an oil-filled structure, the elaiosome. This attracts ants that store the seeds in their nests, thus forming seed banks. The seeds are dormant but this may be broken by heat and/or smoke, thus causing the seeds to germinate and the seedlings to colonize the bare ground left by fire. In some species, scarification increases the rate of germination, even sometimes in the absence of fire-related factors, thus suggesting that the seed coat is involved in dormancy. However, it does not impose dormancy by preventing uptake of water. The authors have thus undertaken a detailed and elegant microscopic and histochemical investigation showing clearly that these 'classical' techniques still have much to tell us. Their results are presented in an extensive and beautiful set of micrographs; here we just focus on their conclusions. The seed coat is complex and multi-layered, and together with the hypostase (an incomplete layer of cells derived from the nucellus) acts both as a barrier to diffusion of high-molecular-weight compounds and as a mechanical restraint to the embryo; it is also possible that phenolic compounds in the exotesta hinder gas exchange. These are classic features of coat-imposed dormancy and the challenge now is to discover how these properties are modified by heat and/or smoke.



Data mining reveals silicon extractors

The paper of **Hodson *et al.* (Oxford Brookes, Warwick and Nottingham Universities, UK, pp. 1027–1046)** illustrates clearly that, on occasions, new insights may be gained from comprehensive analysis of previously published data. They point out that silicon is one of the most abundant elements in soil; a small proportion of this Si exists as soluble silicic acid and many plants are able to take up Si from this source. It is already known that there is variation between different plant groups in respect of Si accumulation but the authors have provided a much more detailed picture of that

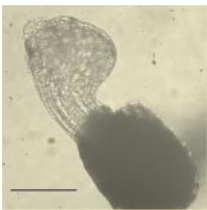
variation. To make comparisons meaningful, strict criteria were applied to the selections from the primary literature: the data came from papers 'that reported Si concentrations . . . in at least two species growing in the same environment and which contained at least one species in common with another study'. The data were subjected to a residual maximum likelihood (REML) analysis to 'adjust for differences in between-study variances and means'. The authors were then able to rank plant groups according to their shoot Si content. Of the groups analysed, ferns have the lowest Si content (a mean of <1 % of dry weight); just above them are the gymnosperms (approx. 1 %) and then the angiosperms (approx. 1.5 %). At the other end of the scale are the horsetails (approx. 3.5 %) and liverworts (approx. 5.5 %). Further analysis of the angiosperm data revealed extensive variation, both within the dicots and the monocots, with the highest values being seen in two commelinoid monocot orders, the Arcales and Poales, the latter point being clearly relevant to agricultural use of cereals and other grasses. Further, the likelihood that, in the near future, a gene encoding an Si transporter will be identified raises the possibility of manipulating plant Si content, an endeavour that will be aided by this analysis.



Hunting for herbicide action: all systems negative

In searching for new herbicides, there are several key factors to consider. These include long-term effects in the environment and the possible susceptibility of non-target organisms. In respect of the latter, an obvious route to follow is to look for compounds that affect plant-specific processes, thus avoiding 'collateral damage'. One aspect of plant biology that provides several such processes is the biochemistry and physiology of the cell wall, especially in light of the knowledge gained over the past 30 years of the structure, synthesis and modification of the wall. Indeed, as stated by **O'Looney**

and Fry (Edinburgh University, UK, pp. 1097–1107), the cell wall is 'a large untapped resource of potential herbicide action'. Further, the taxonomic variation in cell wall biochemistry raises the possibility of selective action. It was therefore of interest that a new herbicide, oxaziclomefone, inhibits cell expansion without affecting cell turgor, strongly suggesting that the mode of action involves an effect on cell wall extensibility. However, extensibility involves several mechanisms. Accordingly, the authors have conducted a systematic evaluation of the effects of oxaziclomefone on each of these in maize (*Zea mays*) cell cultures. Their research 'covered all bases' in studying known processes involved in cell wall synthesis, modification, loosening and tightening. However, the herbicide had no effect at all on any of the processes they studied. It is often disappointing to obtain an array of essentially negative results but there is a positive side to this situation. The clear effect of the herbicide on cell expansion, taken with the lack of any effect on processes known to be involved in cell expansion, indicates that there must be a mechanism or process, essential for cell expansion, that remains to be identified. Thus, a negative set of results will lead to the search for a completely novel aspect of plant growth and development.



Parasite's self-stimulation following host's signal

One of the problems in studying early stages of infection of hosts by parasitic plants is that it is often difficult to separate host and parasite tissues. This, in turn, gives rise to problems in distinguishing between populations of molecules such as mRNA in the two organisms. However, if the parasite can be stimulated to initiate infection in the absence of the host plant, then the processes occurring specifically within the parasite may be studied. This is the approach adopted by **González-Verdejo**

et al. (Córdoba and Madrid, Spain, pp. 1121–1127), in their work on a broomrape, *Orobanch*
ramosa. The first requirement was to develop a method for sterilization of seeds that did not significantly reduce their germinability. The sterilized seeds were then conditioned under moist conditions for 8 days, making them receptive to signals from the host plant. Indeed, in order to germinate, the conditioned seeds actually require a signal from the host that in these experiments was supplied either by a tobacco root exudate or by 'G24', an analogue of strigol (a compound involved in the germination of another parasitic plant, *Striga*). These were equally effective in inducing germination, but because G24 was more easily obtained it was used for most of the experiments. The effect of G24 was very rapid, requiring only a 5-minute immersion of seeds in the inducer. This suggests that once the inducer has been perceived by the plant tissues it sets off a signal transduction pathway that operates independently to induce germination. A few days after germination, attachment organs developed that were indistinguishable from those that develop in the presence of the host. It is not yet clear whether this developmental phase is part of the sequence of events triggered by G24 or whether a separate endogenous signal is involved. Preliminary evidence consistent with the latter was obtained by the authors, providing a clear stimulus for further research.

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