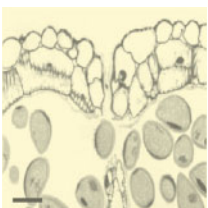


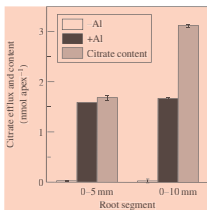
## Early wake-up call elicits no response

Yam (*Dioscorea rotundata*) tubers are an important crop in several parts of the tropics and are grown in areas where the climate may permit more than one planting per year. However, the growth cycle of the tuber itself prevents this, as described by **Ile *et al.*, Reading, UK and Ibadan, Nigeria (pp. 497–504)**. Depending on where the crop is grown, tubers are harvested either 180 days after planting (DAP) or 180–270 DAP (when the shoot becomes senescent). The authors point out that, in contrast to potato, harvested tubers do not possess any surface buds, nor indeed do they have any internal buds. They are therefore incapable of sprouting. However, there is a layer of meristematic cells under the surface of the tuber and it is in this layer that a ‘tuber germinating meristem’ differentiates, giving rise to the new shoot. The specific question addressed by the authors was whether it is possible to induce earlier formation of buds in the meristematic layer? The head region of each sampled tuber was cut longitudinally into portions and the portions were assigned to different treatments with plant growth regulators (PGRs): GA (two concentrations), 2-chloroethanol (two concentrations), thiourea and control. Typically, the tuber germinating meristem appeared approx. 290 DAP and the treatments with PGRs did not bring this forward. Indeed, with GA there was evidence for inhibition of development. This long first phase of dormancy is thus likely to be controlled by as yet unknown endogenous factors. However, once the tuber germinating meristem had appeared, PGRs did have an effect on the timing of the initiation of foliar primordia and the subsequent development of the shoot, with 2-chloroethanol being especially effective in acceleration of these later stages. The role of GA, however, remains unclear because of evidence that it may delay, by re-imposition of dormancy, the outgrowth of the shoot.



## Pollen outing takes a rain check

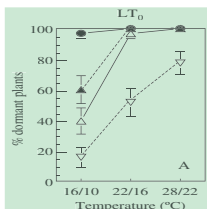
The release of pollen from the anther is generally regarded as consisting of two main phases. The first is the opening of the stomium, the aperture through which the pollen escapes. The second is the bending back of the anther wall, thus exposing the aperture to the outside world. This is a process that in many species involves desiccation of the tissue and may be subject to external environmental influences. It is this subject that has been investigated by **Carrizo García *et al.*, Córdoba, Argentina and Siena, Italy (pp. 521–527)**, working with *Allium triquetrum*. Morphological examination of anthers at different stages showed that anthers in the inner whorl opened first, in the morning, and the outer whorl followed in the afternoon of the same day. In their baseline studies at 40–45 % relative humidity (RH), the authors observed that complete bending back of anther walls took between 0.5 and 1.5 h. However, the effects of changing humidity were complex. Reducing the RH to 20 %, a desiccating environment, did bring about some acceleration of opening in the inner whorl but, somewhat unexpectedly, actually delayed opening in the outer whorl. Indeed, most outer whorl anthers did not open until the next day, while some did not open at all. Increasing the RH above that of the controls (expected to inhibit desiccation) also delayed significantly the opening of outer whorl anthers. At 55 % RH, the pattern for outer whorl anthers was similar to that at 20 %, while at 98 % RH over 45 % of outer anthers did not open at all. Inner anthers were more tolerant of increasing humidity: even at 98 % RH, only approx. 20 % showed a 24 h delay in opening and only 15 % failed to open. The authors conclude that phase two of anther opening is subject both to environmental and specific developmental controls, the relative importance of which varies between the whorls.



### The acid test for Al tolerance

Aluminium toxicity is a particular hazard for organisms in more acid environments and, as discussed by Yang *et al.*, Hangzhou, China (pp. 579–584), can lead to significant yield losses in crops growing in acid soils. However, tolerance to Al has been observed in several species, including a number of crop plants. Such a trait is clearly useful to plant breeders and it is thus important to understand the mechanisms underlying the tolerance. One mechanism observed in several species is the efflux of organic acids that presumably chelate the Al, reducing its capacity to enter the plant. It is

this type of mechanism that is shown by *Vigna umbellata* (rice bean), studied by these authors. Exposure of plants to 50  $\mu\text{M}$  Al led to efflux of citrate from the apical 5 mm of the roots, but this only occurred after a 3 h lag. Al also induced the accumulation of citrate in the root. This in fact preceded the efflux but was not confined to the apical 5  $\mu\text{m}$ . The 3 h lag led the authors to suggest that protein synthesis may be necessary for citrate efflux, a postulate that was at least partly supported by the finding that cycloheximide, a protein synthesis inhibitor, reduced significantly the development of citrate efflux capability. The question then is which proteins? A partial answer is provided by the authors' finding that inhibitors of anion channels and of citrate carriers both inhibited citrate efflux, with the effects of the two types of inhibitor being additive. This clearly points to a role for induction of both types of carrier molecule in the response to Al. Of course, it is possible that induction or up-regulation of citrate accumulation enzymes is also a key event, although the authors argue against this, based on evidence that the accumulation of citrate is separately controlled from the efflux of citrate.



### Lazy days of summer

The overall response of a plant to its environment is an integration of the different effects of different factors on different plant processes. This is very nicely illustrated by *Poa bulbosa*, the subject of the research of Ofir and Kigel, Rehovot, Israel (pp. 659–666). This grass, an inhabitant of the Mediterranean region, is summer dormant and exists as ecotypes with different drought tolerances. The plants exist in the dormant phase as bulbs formed at the base of tillers and new growth arises from these bulbs in autumn. The authors gathered plants from several sites along a rainfall gradient and

grew them outdoors in a 'net-house'. From this range four ecotypes were selected: a flowering ecotype from an arid site, a flowering and a non-flowering ecotype from a semi-arid site (non-flowering populations reproduce only via bulbs) and a non-flowering ecotype from a mesic site. In the net-house, the ecotypes maintained their normal flowering and dormancy behaviour (the more arid the site, the earlier was the entry into dormancy; non-flowering ecotypes entered dormancy later than flowering ecotypes). The plants were then grown under three different temperature regimes (16°/10°, 22°/16°, 28°/22° C), under long or short days, with or without pre-chilling. Here we concentrate on the effects of daylength and temperature. Short-day treatments promoted flowering and inhibited dormancy. Indeed, under short days, even non-flowering ecotypes were induced to flower, especially in the lowest temperature regime. In the flowering ecotypes, higher temperatures induced earlier flowering, but in all ecotypes fewer panicles were produced at higher temperatures such that even the flowering ecotypes produced very few flowers at 28°/22° C. Under long days, very few plants flowered and then only at the lower temperatures. By contrast, long-day treatments accelerated the onset of dormancy, which was further accelerated by higher temperatures with the actual timing of dormancy again varying with ecotype (as already seen in net-house-grown plants).

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