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John Bryant takes a closer look at some of this month's Original Articles

Fruity frescoes

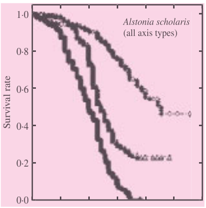
Over the back door of the Cambridge Botany School are some carvings of partly wilted *Ginkgo biloba* shoots. The story goes that 'model' shoots had been brought from the Botanic Gardens but that it was several hours before the stone masons started work. The masons carved what they saw, namely shoots that had been out of water for some time. We might say, copying Oliver Cromwell, that the carvings showed their subject 'warts and all'. The same may be said of the depictions of plants in the wonderful frescoes in the Villa Farnesina at Rome, painted by Giovanni Martini da Udine between 1515 and 1518, as discussed by **Janick and Paris (Purdue University, USA and Newe Ya'ar Research Center, Israel, pp. 165–176)**. The paintings are amazingly accurate representations of crops from the villa's gardens, and if a particular fruit was diseased or blemished, this is clearly illustrated. Janick and Paris have focussed on the fruits of plants in the family Cucurbitaceae, which are so well painted that it is possible to identify the species and to appreciate the genetic variation within them. They show that a number of African and Asian cucurbits, including *Citrullus lanatus* (water melon), three varieties of *Cucumis melo* (melon) and *Cucumis sativus* (cucumber) were grown in Italy in the early 16th century; several of these had been introduced into Europe centuries earlier. There are also clear depictions of some New World species, including the South American *Cucurbita maxima* (pumpkin). The presence of such species is an indication that even so soon after the first voyage of Columbus, European horticulture was already starting to make use of seeds brought back by the explorers. Another interesting specimen is the wild southern-European species *Echballium elaterium* (squirting cucumber). This was grown for its medicinal properties but perhaps the gardeners also appreciated its beautiful seed dispersal mechanism!

Sweet smell of excess

Mutations occurring in vegetative tissues and causing a visible change in the plant are known as sports; depending on the mutation in question and on the cell lineage in which they occur, the changes resulting from sports range from colour variation to alterations in morphology. Moss roses, first described clearly in the early 18th century, are good examples of this type of variation. They derive their name from a moss-like growth on the calyx and pedicel. This mossy growth produces a sticky and odoriferous exudate which, in *Rosa* × *damascena*, the Damask rose, studied by **Caissard *et al.* (Saint-Etienne and Villeurbane, France, pp. 231–238)**, increases the complexity of the fragrance produced by the flowers themselves. Of course, the growth is not a moss at all: the mossy appearance is caused by a hugely excessive growth of trichomes, including trichomes growing from trichomes. The authors were interested to know what contribution is made to the scent of the rose by the petals and by the 'moss' on the calyx and pedicel. They stained the exudate from the trichomes in order to detect lipids and terpenes, and also collected volatile organic compounds (VOCs) from petals and from mossy sepals. The VOCs were analysed by gas chromatography and by gas chromatography/mass spectrometry (GC–MS). The results are very clear: mossy sepals and petals differ markedly in respect of the VOCs that they release. The volatiles from the petals contain large amounts of benzenoids, particularly phenylethanol, together with substantial quantities of monoterpenes, geraniol, nerol and citronellol. In the mossy sepals, the majority of the VOCs are monoterpenes, especially pinene and myrcene, while sesquiterpenes are also well represented. This composition is similar to the composition of exudate from non-mossy (wild-type) sepals but, of course, in the mossy sport these compounds are exuded in much larger amounts and have a major effect on the odour of the rose.

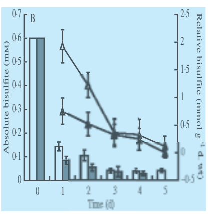
Continued overleaf

Live fast – die young



How long does a leaf last? Well, it all depends . . . but what it all depends on is a matter for discussion. In the words of **Gregoire Vincent (Montpellier, France, pp. 245–255)**, available data pinpoint 'the strong trade-off that exists between leaf photosynthetic capacity and leaf life span'. To test this idea further, the author has carried out experiments on four tropical tree species with differing light requirements: *Lansium domesticum* (fully shade adapted), *Durio zibethinus* (establishes in the shade but grows into the top canopy), *Hevea brasiliensis* (light-demanding but seedlings/saplings are partly shade tolerant) and *Alstonia scholaris* (light-demanding). Seedlings were grown under 12 %, 45 % or 100 % of full sunlight for 18 months; leaf emergence, leaf life span and several physiological parameters were monitored. Some plants died during the experiment: seedlings of *Lansium* and *Durio* were unable to tolerate full sunlight. For the remaining plants, the effects of the light regime on leaf life span were very clear: in all four species, the leaves lived longest in the deepest shade, with *Hevea* showing the least plasticity and *Astonia* the most. The physiological effects of increasing shade included increases in specific leaf area (SLA) and in leaf N per unit mass, and decreases in photosynthetic capacity and in dark respiration. There was a strong correlation between the degree of plasticity in leaf life span and the degree of plasticity in SLA and in photosynthetic capacity. Overall, the data are consistent with the view that increased leaf life span under shaded conditions is a direct or indirect consequence of reduced photosynthetic capacity or rate of photosynthesis. Exactly how a decrease in photosynthesis leads to an increase in leaf longevity is not clear, but these data are certainly in line with observations that moving plants from high light to low light delays leaf senescence.

Moss in detox mystery



Mosses are, in general, very sensitive to sulfur dioxide (SO_2), as discussed by **Bharali and Bates (Jorhat, Assam, India and Imperial College, London, UK, pp. 257–263)**. However, some mosses are able to recover, or partly recover, from the effects of SO_2 even in the continued presence of the pollutant and it is possible that this recovery is at least partly based on detoxification of the SO_2. The authors have investigated this possibility in two species: the calcifuge *Pleurozium schreberi* and the calcicole *Rhytidiadelphus triquetrus*. Both were able to reduce markedly the concentration of dissolved SO_2 (supplied as sodium bisulfite) in medium-term (up to 10 h) and longer-term (up to 5 d) incubations, with *R. triquetrus* being the more effective. In both species, detoxification was much more extensive in the light than in the dark, suggesting the involvement of photosynthesis. This suggestion was supported by the observation that detoxification was inhibited by DCMU, which blocks the chloroplast electron transport chain and the photosynthetic generation of O_2. It is the latter that the authors consider important because the main route for detoxification is likely to be oxidation to sulfate rather than reduction to sulfide. This oxidation, which took place extracellularly, was aided by Fe^{3+} ions taken up into the cell walls in the calcifuge, but not in *R. triquetrus*. However, external detoxification may not be the whole story because in both species there was a clear reduction in detoxification in the presence of diethyldithiocarbamate (DETC), an inhibitor of superoxide dismutase. Nevertheless, the authors consider it unlikely that reactive oxygen species (ROS) are involved in the removal of bisulfite: the irradiance was too low to induce photoinhibition and the generation of ROS, and in any case, the inhibitory effect of DETC occurred both in the dark and the light. As the authors themselves point out, this requires further investigation.

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