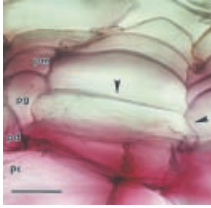


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John Bryant takes a closer look at some of this month's Original Articles



Potato peelings

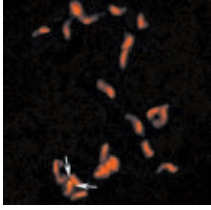
The potato has come a long way since Raleigh brought some back to England from the 'New World' to impress the queen. It is still a significant source of carbohydrate in many meals but it also finds extensive use in a variety of snacks. Diseased potatoes are less desirable than healthy ones both for direct consumption and for manufacture of snack foods and there is also an increasing demand, especially from supermarkets, for high 'visual quality' with no obvious damage. A very common form of damage is abrasion of the immature periderm, the skin of the tuber, leading to local dehydration and providing a possible entry route for disease. As described by **Sabba and Lulai of the USDA lab at Fargo (pp. 1–10)**, the periderm consists of a secondary meristem, the phellogen, that generates an outer layer of phellem and an inner layer of phelloderm. During maturation, the meristematic activity of the phellogen declines, the phellem suberizes and then dies, leading to the formation of a protective layer. Thus only the immature periderm is especially susceptible to abrasion. The cytological basis for this is the fracture of the radial walls of the immature phellogen. In unwounded periderm, there is a decrease in the proportion of esterified pectin during maturation which, the authors suggest, allows for calcium pectate formation and wall strengthening. When immature periderm is abraded, the wound is sealed by suberin and a new phellogen is formed. This wound phellogen has less pectin than native phellogen and there is no decrease in the proportion of esterified pectin as the wound periderm matures; there is also less cell wall peroxidase in wound periderm. However, despite the care and detail of the authors' analysis of periderm cell wall biochemistry, we are no nearer to preventing abrasion damage of the potato. Anyone for chips?



Coffee machine

For growers who wish to propagate an elite strain in large numbers, somatic embryogenesis is a possible route. In this technique, callus cultures are established and the formation of non-sexual embryos is induced. However, many such embryos fail at the 'germination' stage or during early 'seedling' growth. The plantlets are often susceptible to water loss and many fail to make the transition from heterotrophic nutrition to an autotrophic existence based on photosynthesis. **Afreen and co-workers at Chiba University (pp. 11–19 and 21–29)** have extensive experience of working with somatic embryos of coffee (*Coffea arabusta*). In their two papers they describe the production of plantlets from somatic embryos on a commercial scale. It was first necessary to obtain somatic embryos in which the cotyledons develop functional chloroplasts and start to photosynthesize. The next step was to induce these photoautotrophic embryos to 'germinate' to form plantlets, and finally it was necessary to harden these plantlets to more normal regimes than those of a growth chamber. The authors thus developed a 'bioreactor' in which circulation of CO₂-enriched air was provided by forced ventilation. Nutrient solution was provided by partially immersing the root zone of the growth plugs for 15 min every 6 h. This was done mechanically, using an air pump on a time-switch. The plantlets were maintained in the bioreactor for 45 d and then transplanted into a glasshouse; survival was monitored 15 d later. The results were remarkable: 90 % of the embryos developed a root system and 84 % survived the transfer to glasshouse conditions (the authors called this 'plantlet conversion rate'). This rate was approx. 1.6 times better than the next best system and, furthermore, plantlets established by this method also grew faster than those established by other techniques. However, we still wait to find out how the coffee tastes!

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Crying to fit in

It is very frustrating: despite nearly 20 years of use, we still do not know how T-DNA integrates into plant genomes, or what, if anything, controls the sites of integration. This ignorance is all the more significant because both position effects and the number of integration sites affect the level of expression of the foreign gene. **Jin and colleagues (pp. 31–36)** have investigated the distribution of integrated genes in the rice genome using FISH (fluorescence *in situ* hybridization). The foreign gene construct was chimaeric but I focus on just one component, the gene encoding the *Bacillus thuringiensis* toxin [the *CryIA(b)* gene]. Nine transgenic lines were grown to the T₃ generation and were assessed for expression of *CryIA(b)*. The lines were extremely variable in this respect, the highest level of expression being about 25 times the lowest, while two lines showed no detectable expression. The detection by FISH of the genes themselves showed first that no integration occurred closer to the centromere than approx. 26 % of the total distance between centromere and the end of the chromosome arm (i.e. at FL values of less than 26); secondly, that the majority of integrations were at sites with FL values over 75; and thirdly, that in some lines there was more than one integration site. In terms of ‘cold’ and ‘hot’ spots for integration, the region proximal to the centromere is clearly cold, whereas the region distal to the centromere is ‘hot’. However, the specific position of integration did not define the level of expression. Thus, one line in which the integration was a long way from the centromere showed no detectable expression. Clearly we need more information on the specific molecular characteristics of the integration sites, but this may need to await our elucidation of the actual integration mechanism.



Females show their masculine side

There is a widespread assumption that any feature exhibited by an organism must confer some selective advantage to that organism. However, this view has its critics and there are certainly some situations in which it is difficult to see what the advantage might be. Such a situation is described by **Sandra Davis, University of Louisiana (pp. 119–126)**. She is working with *Thalictrum pubescens*, a member of the Ranunculaceae. This species is dioecious, i.e. the sexes are separate. Dioecy is seen as adaptive in that it restricts, in any one plant, the allocation of resources to the floral organs of only one sex. Furthermore, outbreeding is assured without the need for mechanisms to prevent selfing. However, in *T. pubescens*, the situation is rather more complex. While males show no vestiges of femaleness, females not only produce stamens and anthers, but also the anthers produce pollen, albeit sterile. This cryptic dioecy is regarded as a relic of the plant’s hermaphrodite evolutionary origin. However, it is clear from this paper that cryptic dioecy is costly to female plants. Female plants produce only about 20 % of the number of stamens produced by male plants but those stamens contain more N and P per stamen than those in male plants and, even more surprisingly, each anther contains about 25 % more pollen than anthers on male plants. Overall, female plants allocate about 27 % of their floral dry matter to the production of sterile pollen. The author also obtained preliminary evidence that when plants are exposed to environmental stress during floral development, the number of sex organs is reduced and, very surprisingly, female plants produce a **higher** ratio of male to female organs, thereby ensuring less allocation to seeds. While this particular feature may be adaptive in times of stress, the overall picture is confusing in terms of selective advantage.

Professor J.A. Bryant
University of Exeter, UK
E-mail j.a.bryant@exeter.ac.uk