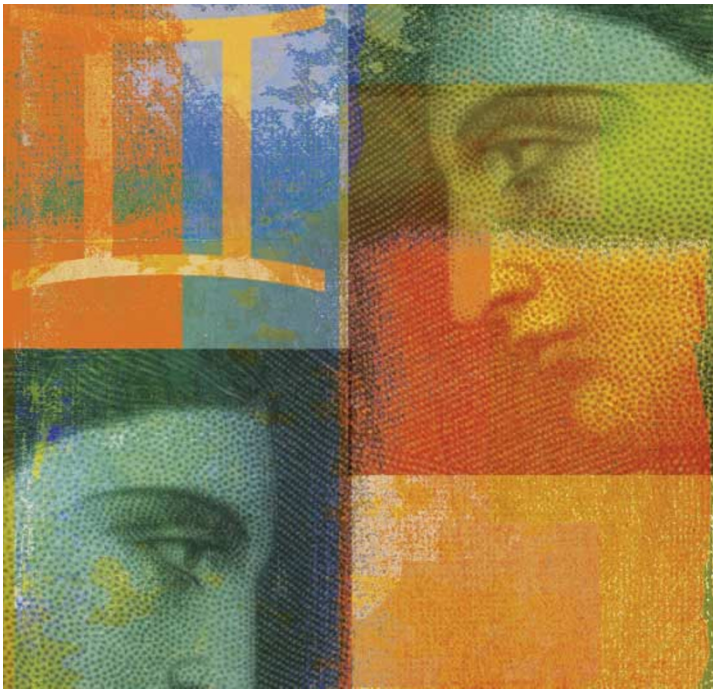
PLANT VIROLOGY

Tête à tête for geminiviruses



A recent paper in the *Journal of Virology* reveals that the frequency of infection of single nuclei of tomato plants by two distinct geminiviruses is greater than might previously have been believed.

Geminiviruses are so named because they are found as twinned (or geminate) virus particles. The geminivirus *tomato yellow leaf curl virus* (TYLCV) is an economically important pathogen of tomato plants. Although tolerant tomato cultivars have been developed, TYLCV remains a major threat to tomato crops owing to the increased range of its vector, the whitefly, and the potential emergence of new species as a result of recombination between existing species.

In this work, Gabriel Morilla *et al.* investigated whether it was possible for two distinct geminivirus species — TYLCV and *tomato yellow leaf curl Sardinia virus* (TYLCSV) — to infect a single nucleus. Initially, tomato plants and the tobacco-related test plant *Nicotiana benthamiana* were singly infected with TYLCV or TYLCSV, or doubly infected with both viruses, using an 'agroinoculation' technique that exploits the Gram-positive bacterium *Agrobacterium tumefaciens* to transfer the viral DNA into plant cells. TYLCV and TYLCSV infection caused similar symptoms in *N. benthamiana* and tomato. More severe symptoms were observed in both *Nicotiana* and tomato plants infected with both viruses, suggesting that the two viruses have a synergistic effect.

Examination of the tissue tropism of these viruses using *in situ* hybridization confirmed that both viruses localized to the phloem, as has previously been observed for TYLCV. Fluorescence microscopy of DAPI (4′,6-diamidino-2-phenylindole)-stained cells revealed that both viruses were mainly present in the nuclei of phloem parenchymal cells and companion cells, although there was some evidence that both viruses were also present in the phloem sieve tubes. The authors suggest that the detection of viral DNA in the sieve tubes could reflect viral transport through these elements.

Further *in situ* hybridization using a dual-colour assay demonstrated that the two viruses could infect the same nucleus. Using purified nuclei from infected plants, it was shown that the amount of nuclei containing viral DNA from a mixed infection was equal to that of single infection with either virus, and it was estimated that about 20% of infected nuclei were infected with both TYLCV and TYLCSV.

The fact that two different TYLCV species can infect the same nucleus at a high frequency indicates that recombination between different species or strains could be a more frequent event for this plant virus than it is for others, and could help to explain the success of this viral pathogen.

Sheilagh Clarkson

References and links

ORIGINAL RESEARCH PAPER Morilla, G. *et al.* Tête à tête of tomato yellow leaf curl virus and tomato yellow leaf curl Sardinia virus in single nuclei. *J. Virol.* **78**, 10715–10723 (2004)