

## research highlights

### TOMATO IMPROVEMENT

#### Good old flavour

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As one of the most nutritious and widely cultivated fruit and vegetable crops, tomato is now having problems satisfying consumer need as years of breeding efforts have ignored flavour improvement. To understand what underlies the decline in flavour quality, Sanwen Huang's group, from the Agricultural Genomics Institute at Shenzhen, Chinese Academy of Agricultural Sciences, in collaboration with Harry Klee's group from the University of Florida, conducted chemical and genomic analyses to unravel the molecular basis for the flavour change in commercial tomato fruits, providing a promising chemical genetic roadmap for tomato flavour improvement.

To identify the chemicals associated with consumer preference, the researchers carried out whole-genome sequencing and targeted metabolome profiling of

sugars, acids and volatiles in 398 modern, heirloom and wild accessions. Consumer panel evaluation identified chemicals that are associated with consumer preference and flavour intensity, 13 of which exhibited significant content reduction in commercial lines when compared to heirloom varieties.

A genome-wide association study was performed for the 398 accessions and an F2 segregating population to identify the genes responsible for the flavour chemicals. The loci controlling most flavour chemicals, including sugars, acids and volatiles, were characterized. For example, the extracellular invertase, *Lin5*, was found to control sugar content in tomato fruits; this was supported by both association analysis and transgenic experiments. Genes that affect the flavour-associated volatiles, such as guaiacol, methylsalicylate and carotenoid-derived volatiles, were also identified.

In many of the flavour-associated loci, modern varieties seemed to have randomly



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lost the desirable alleles present in heirloom varieties. Replacing unfavourable alleles with desirable alleles would be a promising approach to enhance consumer liking of the commercial tomato.

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