URBAN FARMING

Edit compactness

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Credit: Image courtesy of Zachary Lippman

The rapid growth of cities, especially in the developing world, poses great demands on urban food supply. As a complementary solution addressing this food security challenge, urban agriculture expands usable lands and is more environmentally friendly than traditional farming. However, its implementation is restricted by the availability of proper crops that need to be both compact and rapid cycling. To develop fruit crops suited to this purpose, Choon-Tak Kwon, from the Cold Spring Harbor Laboratory, and colleagues report a one-step genome-editing strategy to rapidly engineer tomato and groundcherry plants.

The researchers previously found that mutating the flowering repressor *SELF PRUNING* (*SP*) and its paralogue *SP5G* converts tall and continuously growing ‘indeterminate’ tomato plants into compact and early yielding ‘determinate’ varieties.

Now, a third gene, *Solanum lycopersicum* *ERECTA* (*SIER*), is identified to control internode lengths, and its mutagenesis by CRISPR–Cas9 results in short internodes and a more compact architecture. Double and triple combinations of *sp*, *sp5g* and *sier* mutants were generated in the plum tomato variety M82. The triple mutants displayed the most compact architecture while maintaining the same number of flowers and early flowering habits as the *sp sp5g* double mutants, suggesting that targeting the three genes can transform any tomato variety into a compact and rapid cycling form.

Small-fruited varieties are more practical for urban farming because large fruits need large plants for support. The researchers obtained triple determinates for the small-fruited variety, Sweet100, using CRISPR–Cas9 editing. These plants show early flowering and highly compact grape-like fruit clusters, and perform well in a light-emitting diode growth chamber and a hydroponic vertical farm system.

Targeting the *SIER* orthologue in groundcherry generated plants with a strong dwarf and compact phenotype that resembled the tomato triple determinates, but without penalty of fruit number or sugar content compared to wild type. So, the genetic solutions for urban farming could be different, and simpler, for even closely related species.

These CRISPR-edited alleles can be introgressed into more varieties to restructure these crops for urban agriculture.

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