CRISPR is revolutionizing agriculture but modifying fruit remains challenging. Here's how scientists are working to overcome that barrier

One of the major advantages of CRISPR-CAS-edited crops over the classic genetically modified (GM) crops is that the former does not contain any foreign DNA, making them indistinguishable from those developed by conventional plant breeding.

In annual crops, such as rice and tomato, the CRISPR-CAS gene-editing components (considered foreign DNA) that were introduced into their genome can be quickly removed though genetic segregation in two life cycles, taking only one or two years.

However, this strategy could not be adapted in perennial woody fruit crops, causing a major technical hurdle due to the following two reasons:

The first is their long juvenile phase before flowering. In apple, for example, the juvenile phase usually requires five or more years.

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The second is their highly heterozygous genomes. This makes it impossible to reproduce the mother trees from their own seeds. Similarly, any foreign DNA-free segregants with desired gene edits will be different from their mother trees, inevitably causing uncertainties in their performance.

What looks promising is an approach that uses a DNA base editor (a modified version of CRISPR-CAS) capable of editing single DNA bases, the Agrobacterium-based DNA delivery system, and one or more herbicide-resistance genes in plants.

Agrobacterium is a plant tumor-causing bacterium due to its ability to transfer DNA into plant cells, which has been used widely for developing conventional GM crops.

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