

Gene-editing technology to create virus-resistant cassava plant has opposite effect, researchers find

April 26 2019, by Katie Willis



Diseased (left) and healthy (right) cassava plants. Researchers are urging caution with using CRISPR gene-editing technology on the plant after their attempt to produce a virus-resistant variant resulted in mutated viruses that are resistant to gene editing. Credit: Hervé Vanderschuren

Using gene-editing technology to create virus-resistant cassava plants could have serious negative ramifications, according to new research by plant biologists at the University of Alberta, the University of Liège in

Belgium and the Swiss Federal Institute of Technology.

Their research shows that attempts to genetically engineer the [plants](#) to fight off viruses resulted in the propagation of mutated viruses in controlled laboratory conditions.

"Because this technology creates a selection pressure on the viruses to evolve more quickly, and also provides the viruses a means to evolve, it resulted in a virus mutant that is resistant to our interventions," explained U of A post-doctoral fellow Devang Mehta.

The researchers used a new gene-editing technology called CRISPR-Cas9 in an attempt to design [cassava](#) plants that could cut the DNA of the mosaic virus and make the plants resistant to its damaging effects. They weren't successful and decided to sequence hundreds of viral genomes found in each plant to understand exactly what happened.

"We discovered that the pressure that CRISPR-Cas9 applied to the virus probably encouraged it to evolve in a way that increased resistance to intervention," said Mehta, who noted CRISPR-Cas9 has many other applications in food and agriculture that do not pose the same risks.

CRISPR-Cas9 is found in nature, where bacteria use it to defend against viruses. However, the researchers found the technology results in different outcomes in plants—and researchers are stressing the importance of screening against these sorts of unintended results in the future.

The cassava plant is a starchy root vegetable that is consumed for food throughout the tropics. Cassava is a primary staple crop grown in South America, Africa and Asia, from which a billion people get most of their calories each day. Each year, cassava crops are plagued by cassava mosaic disease, which causes 20 per cent crop loss. It is the mosaic

disease that Mehta and his colleagues endeavoured to engineer against.

The research team is encouraging other scientists who are using CRISPR-Cas9 technology to engineer [virus](#)-resistant plants, to test their plants to detect similar viral mutations.

"We need to do more research on these types of applications of CRISPR-Cas9 [technology](#) before we proceed with [field testing](#)," said Mehta.

The study, "Linking CRISPR-Cas9 Interference in Cassava to the Evolution of Editing-Resistant Geminiviruses," was published in *Genome Biology*.

More information: Devang Mehta et al. Linking CRISPR-Cas9 interference in cassava to the evolution of editing-resistant geminiviruses, *Genome Biology* (2019). [DOI: 10.1186/s13059-019-1678-3](#)

Provided by University of Alberta

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