A Startup Is ‘Editing’ Fruit and Veggies to Make Them Taste Better

Scientists are using gene editing to make healthy food more appealing

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You probably know that kale is packed with antioxidants and other nutrients and that you should be eating more of it. But it’s also bitter and fibrous, which might make you reach for less healthy greens at the grocery store instead.

A food tech startup called Pairwise Plants wants to change that. The company, based in Durham, North Carolina, and backed by a $125 million investment from agricultural giant Monsanto (now part of Bayer), is using the gene-editing tool CRISPR in an attempt to make nutritious but less popular fruits and vegetables like kale more appealing to the average shopper. Pairwise is also working on improving a number of large-scale staple crops like corn, soybeans, wheat, canola, and cotton.

CRISPR has been imagined as a way to end world hunger by producing better harvests and fortifying crops against disease and climate change. That vision hasn’t yet materialized, but in the shorter term, we could see new CRISPR-edited produce varieties at the grocery store.

As part of this effort, Pairwise has started editing mustard greens, a peppery relative of kale and cabbage in the *Brassica* family high in many essential vitamins and minerals. Mustard greens are often used in Chinese, Japanese, and Indian dishes. Along with collard greens, they’re also cooked in the American South with ham or bacon fat, onion, and other seasonings. When cooked in these dishes, they taste a lot like spinach, but they’re not a first choice for salad greens because of their strong horseradish taste when eaten raw.

Ryan Rapp, head of genome editing technologies at Pairwise, tells *OneZero* that the company has successfully used CRISPR to take some of the pungency and heat out of mustard greens to make their raw form more pleasant. “They’re pretty tasty,” says Rapp. “They’re not bland like iceberg lettuce or romaine. They’ve got a little bit of a complex flavor.”

Pairwise, founded by leading CRISPR researchers David Liu and Feng Zhang in 2018, is using gene editing to experiment with different flavors and wants to get consumers to taste-test the greens in the near future. “We’re not quite sure what the final flavor profile will wind up tasting like,” Rapp says.

Likened to “molecular scissors,” CRISPR can be programmed to cut out and replace DNA in organisms, and it’s cheaper and faster to use than traditional genetic engineering techniques. To start, scientists at the company first compared the genes of the mustard plant to those of other plants in the *Brassica* family. They identified several genes associated with the pungent taste of mustard greens, and in the plant breeding process, programmed CRISPR to find and delete those genes. The resulting greens were less pungent and peppery than the naturally occurring variety.

Pairwise is looking to commercialize the new greens, hoping to make them available in stores and restaurants by 2021 or 2022. But it's unclear how gene-edited greens will compare to their non-edited counterparts in terms of price and availability.

The company also wants to use gene editing to make tastier and longer-lasting berries that are available year-round. In April it partnered with California-based Plant Sciences, a berry breeder and agricultural research company, and turned its attention toward blackberries.

Blackberries are packed with vitamins and nutrients, but strawberries, raspberries, and blueberries tend to be more popular. Rapp says one reason is that blackberry seeds tend to get stuck in your teeth. Pairwise wants to use gene editing to take out those seeds to make blackberries a more attractive fruit. Whether that edit will actually have an effect on people's inclination to buy blackberries, though, is debatable. People might just prefer the taste of other berries to blackberries.

Meanwhile, scientists are using CRISPR to improve numerous other crops, like making higher-yielding corn or disease-resistant cacao trees, which are being threatened by climate change. Other projects have aimed to prolong the shelf life of certain foods, like a non-browning mushroom engineered by plant biologist Yinong Yang at Penn State University. In April 2016, the U.S. Department of Agriculture's Animal and Plant Health Inspection Service, which oversees genetically modified crops, said Yang's anti-brown mushroom wouldn't be subject to the agency's approval since it doesn't contain foreign DNA from other organisms — the common definition of a GMO.

Traditional genetic engineering typically involves taking chunks of DNA from one plant species and putting it into another plant. For instance, golden rice, a type of genetically modified rice that was developed 20 years ago but has struggled to gain regulatory approval in many countries, was made by adding genes from the daffodil plant and a type of bacteria found in soil to make it more nutritious. But scientists using gene editing are tweaking a plant's own DNA.

One gene-edited food is already on the market, a type of healthier canola oil, but it's made with an older gene-editing technology known as TALENs.

"We're making small and very precise and discreet changes to genes that already exist in the plant," says Aaron Hummel, head of genome editing technologies at Pairwise. He sees CRISPR as a way to speed up plant breeding for certain desirable traits.

Hummel and other scientists working on CRISPR crops hope this distinction will win over the public's perception of gene-edited foods.

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