Researcher develop new technique for modifying plant genes

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Researchers at the University of Minnesota and Massachusetts General Hospital have used a genome engineering tool they developed to make a model crop plant herbicide-resistant without significant changes to its DNA.

"It's still a GMO [Genetically Modified Organism] but the modification was subtle," said Daniel Voytas, lead author and director of the U of M Center for Genome Engineering. "We made a slight change in the sequence of the plant's own DNA rather than adding foreign DNA."

The new approach has the potential to help scientists modify plants to produce food, fuel and fiber sustainably while minimizing concerns about genetically modified organisms

For the study, the researchers created a customized enzyme called a zinc finger nuclease (ZFN) to change single genes in tobacco plant cells. The altered cells were then cultured to produce mature plants that survived exposure to herbicides.

The research will be published online by *Nature* on April 29.

"This is the first real advance in technology to genetically modify plants since foreign DNA was introduced into plant chromosomes in the early 1980s," Voytas said. "It could become a revolutionary tool for manipulating plant, animal and human genomes."

Zinc finger nucleases (ZFNs) are engineered enzymes that bind to specific DNA sequences and introduce modifications at or near the binding site. The standard way to genetically modify an organism is to introduce foreign genes into a genome without knowing where they will be incorporated. The random nature of the standard method has given rise to concerns about potential health and environmental hazards of genetically modified organisms.

Voytas is a co-founder of the Zinc Finger Consortium www.zincfingers.org), which developed a do-it-yourself strategy for academic researchers. The consortium is led by co-author J. Keith Joung, a pathologist at Massachusetts General Hospital and an associate professor at Harvard University. The consortium published its method (called Oligomerized Pool Engineering, or OPEN) in the July 2008 issue of Molecular Cell. Nature published a perspective feature on OPEN and a commercial strategy in September 2008.

Voytas' lab used ZFNs created by the OPEN method to modify the tobacco cells to make them herbicide resistant. According to Voytas, OPEN ZFNs can be used to improve the nutrition of crop plants, make plants more amenable to conversion into biofuels, and help plants adapt to climate change.

"The world is going to turn increasingly to plants to solve lots of problems. Now we have a new set of tools to help." Voytas said.

Voytas' next steps will be to apply the technology to Arabidopsis thaliana, a model plant, and rice, the world's most important food crop. He is also adapting algae for biofuel production.

"The technology is ready for prime time," Voytas said. "There is no scientific reason it can't be applied to crop plants now to improve agricultural output and practices."

Source: University of Minnesota (news : web)