PENNSTATE

Technology Available for Licensing

Office of Technology Management
The Pennsylvania State University
113 Technology Center, University Park, PA 16802
814.865.6277 phone; 814.865.3591 fax

Non-Confidential Description - PSU No. 4082
"Molecular Method to Precisely Edit Plant Genome for Non-Transgenic Genetic Engineering"

Keywords/Field of Invention:

Gene Targeting, Genome Editing, Agronomic Traits, Plants, Cereal Crops, Rice

Inventor

Yinong Yang, Kabin Xie

Background

In contrast to the microbial system, it is very difficult and inefficient to achieve successful gene targeting in plants. This is largely due to the low frequency of homologous recombination. Although zinc finger nuclease (ZFN) and transcription activator-like effector nuclease (TALEN) have been developed to increase the efficiency of gene targeting or genome editing in plant and animal systems, more straightforward and precise methods to edit the plant genome are much needed for functional genomics and crop improvement.

Invention Description

The Penn State inventors have successfully demonstrated the genetic modification of plants by RNA-guided genome editing with applications to monocot and dicot commodity crop species. The inventors have developed two classes of vectors and relevant methods for precisely editing the plant genome and producing genetically modified, non-transgenic crops. The first class of vectors allows transient expression and genome editing in plant protoplasts, tissue cultures or plant tissues. Precise editing and targeted mutation of the OsMPK5 gene in rice, a model crop, was confirmed by DNA sequence analysis with estimated mutation efficiencies of 3-8%. The second class of vector is designed for the Agrobacterium-mediated transient expression and stable transformation. The use of either class of vectors can lead to the production of non-transgenic, but genetically-modified plants or crops. In combination with different donor DNA fragments, the invention will be useful for modifying one or more agronomic traits for genetic improvement of the desired plant. Since the gene targeting specificity in this system is based on nucleotide pairing rather than the protein-DNA interaction, this invention offers a much simpler, more specific and more effective method for plant genome editing than ZFN or TALEN.

Status of Invention

The subject invention offers the promise of reducing the costs to produce new generations of genetically modified crops with various improved agronomic traits, such as herbicide resistant, disease resistant, abiotic stress tolerance, superior crop quality and high yield. The inventors continue to conduct follow-on research on rice and other plant species. A provisional patent application has been filed and a manuscript is under review by the Proceedings of National Academy of Sciences USA.

Contact: **Matthew D. Smith**
Sr. Technology Licensing Officer
The Pennsylvania State University

Phone: (814) 863-1122
Fax: (814) 865-3591
E-mail: mds126@psu.edu