



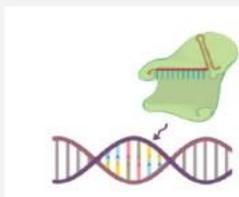
## EDITING PLANT GENOMES : SCIENCE & TECHNOLOGY

NEWS : ICAR, Penn State team makes a tool small enough to edit plant genomes

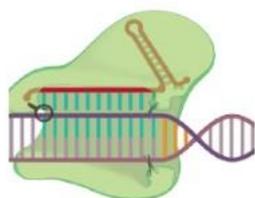
### WHAT'S IN THE NEWS?

This new gene-editing tool, based on the TnpB protein from *Deinococcus radiodurans*, represents a significant step forward in plant genome editing. Its compact size and enhanced efficiency make it a promising solution for overcoming the limitations of previous CRISPR systems, particularly in agricultural applications. The tool's potential to improve crop traits, such as pest resistance and reducing anti-nutrient factors, could lead to more resilient and nutritious crops.

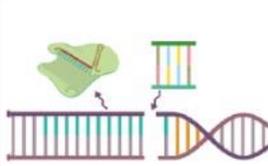
### How Genome Editing Works



"DNA cutters" (nucleases) are guided to a location (the target site) on an organism's DNA.



The DNA cutter docks onto the target site and cuts through the DNA.



The repair of DNA is then initiated and occurs either with or without a synthetic repair template. Alternatively, genes can be inserted.



The DNA is now "edited". However, in reality, genome editing is prone to creating unintended changes and errors that can lead to unexpected effects in the genome-edited organism.

**Genome editing** is a set of new genetic engineering techniques that alter the genetic material of plants, animals and microbes, most often using DNA cutters that are guided to a location within an organism's DNA and used to cut the DNA. This cut DNA is then repaired by the cell's own repair mechanism, which creates "edits" or changes to the organism.

### TnpB-Based Genome Editor

- **Tool Name:** TnpB-based genome editor
- **Source:** Derived from the bacterium *Deinococcus radiodurans*.
- **Size:** Less than half the size of Cas9 and Cas12 proteins, making it more compact.
- **Function:** Targets and modifies specific DNA sequences with high precision.
- **Editing Efficiency:** Achieves an average editing efficiency of 33.58% in plant genomes.
- **Applications:** Effective in both monocots (e.g., rice) and dicots (e.g., Arabidopsis), showing versatility across different plant types.
- **Improvements:** Enhanced through codon optimization and added regulatory elements for improved performance.
- **Capabilities:** Supports both base editing and transcription activation, allowing for precise gene modifications.



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- **Potential Uses:** Can be used to enhance crop traits, improve resistance to environmental factors, and eliminate anti-nutrient factors.

Source : [https://epaper.thehindu.com/ccidist-ws/th/th\\_delhi/issues/96189/OPS/G7VD7PLLS.1+GRLD7PNM9.1.html](https://epaper.thehindu.com/ccidist-ws/th/th_delhi/issues/96189/OPS/G7VD7PLLS.1+GRLD7PNM9.1.html)



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