CRISPR gene-editing possible in temperature sensitive organisms, plants

November 4, 2022

In news– Recently, scientists of Raman Research Institute, an autonomous institute of the Department of Science and Technology have found that CRISPR gene-editing possible in temperature sensitive organisms, plants & crop varieties.

Key findings-

- **Indian scientists have demonstrated for the first time** that the associated Cas9 enzyme, which acts as molecular scissors to cut DNA at a location specified by a guide RNA, **can bind to and cut the target DNA at very low temperatures.**
- This work has shown the highly efficient functioning of this platform **at temperatures as low as 4oC**, making it possible to edit genes in temperature sensitive organisms, plants, or crop varieties.
- **CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) are short DNA sequences found in the genome of prokaryotic organisms** such as bacteria, which are reminders of previous bacteriophage (viruses) attacks that the bacteria successfully defended against.
- **Cas9 enzyme** (part of bacteria's defence mechanism) **uses these flags to precisely target and cut any foreign DNA**, thus protecting the bacteria from future attacks by similar bacteriophages.
- The unprecedented precision of targeting the DNA sequences and then efficiently cutting them is the basis for CRISPR-Cas9 technology, which has been recently demonstrated in editing genes in cells and organisms.

- So far, most binding trials were typically performed at 37 °C.
- As a further step to advance this platform into the forefront of biomedical and analytical biotechnology, **scientists have explored temperature-dependent binding and release of cleaved products by the Cas9 enzyme.**
- They have **demonstrated that the Cas9 enzymes strongly bind to the target at very low temperatures and remains bound to the cleaved DNA products** even after the enzyme has done its job.
- Subsequently, the bound products were released in a controlled fashion using high temperature or chemical denaturant (that make proteins and DNA lose their 3-dimensional structure and become non-functional).
- Their observations on high efficiency of Cas9 binding to target at very low temperatures also **provide opportunities to edit genomes of the less explored organisms called cryophiles** with an optimal growth temperature of 15°C.

Further reading: https://journalsofindia.com/crispr/