Plants remember stress to help protect themselves

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Credit: Scott Bauer, USDA

A new generation of plants better adapted to mitigate the effects of environmental change could be created following a fundamental step towards understanding how plants are able to retain a memory of stress exposure.

The research, led by the University of Warwick and published in the journal eLife, provides the first compelling evidence that plants have evolved ways to remember previous exposures to stress, in this case high

salinity conditions, which can help subsequent progenies withstand the same stress in future.

The international study, led by Dr Jose Gutierrez-Marcos from Warwick's School of Life Sciences, has revealed that this "stress memory" is programmed epigenetically by chemical modifications in the form of cytosine methylation to the DNA at specific locations of the plant genome.

"With the rising threat of climate change, there is a need to create future plant varieties that provide stronger yields and are able to grow in a wide range of challenging climates. By uncovering the mechanisms by which plants are able to remember previous exposures to stress and develop adaptive responses, we have opened up the possibility of breeding a new generation of plants to address these requirements."

The new research has found that in the absence of stress this memory is gradually reset especially when transmitted through the male lineage. In addition, the researchers found that stress memory can be fixed by mutations in genes responsible for resetting DNA methylation.

"Before our discovery, the extent of a stress memory in plants was unrecognized but we now have evidence for some of the molecular mechanisms implicated in this process. The next step is to manipulate plant memory and translate this knowledge to produce crops that are better adapted to environmental change"

More information: Anjar Wibowo et al. Hyperosmotic stress memory in Arabidopsis is mediated by distinct epigenetically labile sites in the genome and is restricted in the male germline by DNA glycosylase activity, *eLife* (2016). DOI: 10.7554/eLife.13546

Provided by University of Warwick