

Plants can regulate protein production in response to harvesting: implications for genetic modification

What is this research about?

Plants, like all living things, need to be able to respond to changes in their environment. To accomplish this, there are specific genetic switches within plant cells (called promoters) which control the production of substances inside the cell. These switches can be activated by external triggers such as drought, extreme temperature, or the stress brought on by harvesting. The impact of harvesting on the alfalfa plant has not been well-studied, although there is a definite change in the types of proteins that are produced by alfalfa shortly after it is harvested. The change in protein production shows that there is at least one switch that is activated by harvesting. The researchers had previously identified one of these switches (called the hi12 promoter) and one goal of this study was to see if it was activated by other factors besides harvesting. A second goal was to see if it could be successfully transplanted into another type of plant. This would help researchers that are working on genetically modified plants by giving them more control over when certain proteins are produced.

What did the researchers do?

Alfalfa plants were given one of the following three external triggers: they were harvested normally, their leaves were wounded by cutting with a scalpel, or they were exposed to a high growing temperature of 38°C. Some alfalfa plants were left untreated to provide a baseline measurement for unaffected plants. Afterwards, plant tissue was collected, and the amount of specific proteins present in the tissue was measured.

In a second experiment, the hi12 promoter was introduced into two different plant species (tobacco and barrel clover). Plants were either left to grow undisturbed or were harvested, and the plant tissue was tested for the amount of protein present.

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What did the researchers find?

The researchers found that the switch was activated only when the plant was harvested or when it was wounded; heat treatment had no effect on protein production. The ability of the switch to respond to wounding (rather than harvesting) may be useful for plant scientists who are working on ways to resist plant pests such as insects. In the two other species that were tested, the switch was also similarly activated by harvesting.

Keywords:

Plant stress, wounding, heat, harvest, promoter, alfalfa

What you need to know:

A genetic switch in alfalfa plants that regulates protein production responds to harvesting or wounding, but not heat stress. This switch can also be successfully transferred into other plants, where it is activated by the same external factors. These two characteristics suggest that this switch may be useful in future research into the genetics of plants.

How can you use this research?

Plant scientists can use this research to understand how plants are affected by stresses in the environment, as well as by harvesting.

Genetic engineers can use this research to further their studies on pest-resistance, as well to control the production of foreign proteins in genetically modified plants.

About the University of Guelph researcher:

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