What is this research about?
In response to stress, wounding, or infection with harmful bacteria, plants can control their growth, repair, and defence processes by changing how their genes are regulated. All of a plant’s genes (which are instructions for building the different proteins a plant needs to survive and grow) are contained in each plant cell. While plants can’t change the physical genes themselves, they can change how often the protein associated with each gene is produced. For example, plants can produce transcription factors, which are proteins that attach to certain genes to increase or decrease their activity. Ethylene response factors (ERFs) are a group of transcription factors involved in plant defence and immunity. Ethylene is a plant-produced hormone that acts as a signal to the plant that it has been infected or wounded. Little is known about how stone fruits such as peaches regulate the amount of ERFs when the plants become infected with harmful bacteria.

What did the researchers do?
Healthy branches were collected from two different peach varieties, one resistant to bacterial spot disease (caused by Xanthomonas campestris bacteria) and one vulnerable to the disease. Next, some of the branches were infected with X. campestris, some were exposed to one of three plant hormones that trigger plant defences, and some were left alone. At regular intervals over the next 48 hours, leaf samples were taken and the levels of activity for five ERF genes were measured. Copies of the ERF genes were also inserted into special plant cells that allowed the researchers to see exactly where the ERF proteins attached to the genes they regulated.

Article citation:
What did the researchers find?

The genetic sequences of the five peach ERFs were similar to those for defence proteins found in other plant species. The ERF proteins preferred to attach to regions in front of the target gene which had certain short, repeat sequences. The activity of all but one of the ERF genes increased strongly and quickly after infection in the resistant peach variety compared to the vulnerable variety. Some ERF genes were quickly and strongly activated by the plant hormone ethylene; others were more strongly affected by the hormone methyl jasmonate, although the process took longer.

What you need to know:

After infection with X. campestris or exposure to plant hormones that trigger defence reactions, peaches increased production of ERF proteins, which are involved in plant defence and immunity. Fast-acting (ethylene) and slow-acting (methyl jasmonate) hormones worked together to precisely control the rate of ERF protein production.

Keywords:
Peaches, stone fruit, wounding, infection, plant defences, ethylene, methyl jasmonate, gene regulation, transcription factors

How can you use this research?

Peach growers can use this research to better understand how bacterial infection, wounding, or environmental stressors can trigger plant defence responses.

Plant scientists can further this research by studying how various plant hormones can encourage or discourage activity of genes such as those for ERFs.

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