

Biologists discover an on/off button on plants' alarm system

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Scientists connected to VIB and Ghent University have discovered how plants turn their defense mechanisms on and off. The system is apparently controlled by a key protein that the researchers have named "NINJA." The discovery offers possibilities for increasing the yield of therapeutic substances from plants. The authoritative scientific journal *Nature* is publishing the results today.

Plants respond to attacks by herbivores or pathogens by activating defense programs that drive off or even kill the attackers. These defense responses require a great deal of the plant's energy and reserves, which would otherwise be invested in growth and reproduction. So, it's very important to strictly control the activity of defense genes. Hormones, such as the jasmonates, are crucial in this process - and the plant produces these hormones when subjected to stress conditions.

The presence of the jasmonates sets a complex <u>chain reaction</u> in motion, starting with the degradation of the so-called JAZ proteins. This in turn frees up another <u>protein</u> (MYC2), which is the signal for launching the genetic defense programs and stopping the plant's growth. The presence of the JAZ proteins keeps the defense mechanism 'turned off'. Until now, it has been unclear how the JAZ proteins are able to block the MYC2 protein's activity.

A trio of NINJA, JAZ and TPL



Thanks to the work of Laurens Pauwels and Jan Geerinck from the team of Alain Goossens (VIB/Ghent University), that problem has now been clarified. It turns out that a newly discovered protein called NINJA (Novel INteractor of JAZ) connects the JAZ proteins with still another protein called TPL. As long as these proteins appear as a trio, they bind to MYC2 and that protein remains inactive. The moment that the JAZ proteins disappear - as the consequence of stress and the subsequent production of the jasmonates - MYC2 springs into action, triggering the plant's defense mechanism. The researchers have worked with Spanish colleagues from the CSIC/University of Madrid and have used a proteomics-based technology developed by Geert De Jaeger (VIB/Ghent University) and Erwin Witters (VITO/University of Antwerp). This technology makes it possible to determine the composition and production of protein complexes in plants.

Link between growth and stress

It has previously been known that TPL suppresses the expression of genes controlled by the growth regulator auxin. The VIB researchers are now demonstrating that TPL proteins suppress other genes as well. In fact, they not only influence the regulation of a plant's growth but also other hormonally driven processes by interacting with proteins like NINJA.

This new insight reveals how stress- and growth-related signaling pathways use the same molecular mechanisms to regulate gene expression in plants and fills a major gap in our understanding of how plant hormones such as jasmonates regulate gene expression.

Pharmaceutical application

When plants turn on their defense mechanism, they start the production



of secondary metabolites, a group of chemical substances exhibiting various therapeutic activities. Now that more is known about the regulation of these secondary metabolites, scientists can look for ways to step up their production.

Provided by VIB (the Flanders Institute for Biotechnology)

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