The costs and benefits for plants of transgenerational immune priming

October 8 2014

In 2012 plant scientists at Lancaster were among the first in the world to publish data explaining how plants exposed to pests or disease can pass on their immunity to their seedlings, giving them an inherited advantage which can still be seen several generations down the line.

This ability was particularly intriguing as the DNA sequence of the plants remained the same, yet a genetic 'memory' of how to cope with stressful conditions was passed down from one generation to the next. Researchers concluded a more subtle process was at play, meaning that defensive genes 'switched on' or 'expressed' in the plant would then remain in a 'primed' state, able to more rapidly respond to stress in their offspring.

A new three-year project led by Lancaster University will further investigate the complex biological mechanisms behind this process, which they believe has an epigenetic basis.

Funded by the Biotechnology and Biological Sciences Research Council (BBSRC), the research will also examine the costs and benefits for plants of transgenerational immune priming, giving researchers a better idea of how the mechanism could benefit farmers and growers.

Dr Mike Roberts, a senior lecturer at the Lancaster Environment Centre, who is leading the project said the breakthrough in understanding of how environmental factors could influence plant genetics mirrored similar breakthroughs in human biology.

"This mechanism we are exploring runs alongside genetics as we previously understood it – DNA is less like the static 'barcode' we originally thought because we now know environmental factors can cause some of our genes to be expressed more strongly, almost like a volume control, making some of them very loud and others almost imperceptibly quiet."

He said properly understanding the effects of this ability in plants could lead to new approaches to growing and have immediate environmental benefits.

"Different groups of hormones regulate how plants respond to different stresses and, sometimes, these responses can work against each other – for example, the way a plant protects itself against disease could actually make it more vulnerable to insect attack.

"We will be exposing plants in our laboratories at Lancaster to a series of different stresses in different combinations and different generations to measure the effect on the plants.

"Once we have that level of detailed understanding of how this impacts upon plants it will open the door to different approaches to growing - methods which are less dependent on pesticides and potentially less harmful to the environment."

More information: The paper titled "Next-Generation Systemic Acquired Resistance" is available online: www.plantphysiol.org/content/158/2/844.full

Provided by Lancaster University