Researchers find a key to plant disease resistance

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University of Kentucky plant pathologists recently discovered a metabolite that plays a critical role early on in the ability of plants, animals, humans and one-celled microorganisms to fend off a wide range of pathogens at the cellular level, which is known as systemic immunity. This mode of resistance has been known for more than 100 years, but the key events that stimulate that resistance have remained a mystery.

The findings of the UK College of Agriculture researchers, led by Pradeep Kachroo and Aardra Kachroo, were published online in Nature Genetics March 27. Researchers from the UK Department of Statistics and Washington State University also contributed to the article.

"If you can generate systemic immunity, you can have great benefits in disease resistance," Pradeep Kachroo said. "It is particularly gratifying to be able to describe a mechanism for a type of immunity; pioneering studies were incidentally carried out by our own emeritus faculty, Joe Kuc."

Using soybeans and Arabidopsis, a model laboratory plant, the scientists were able to identify the metabolite glycerol-3-phosphate as a key mobile regulator of systemic immunity. A metabolite is a substance produced in the body through normal metabolic processes. The glycerol-3-phosphate transforms into an unknown compound and uses a protein, called DIR1 to signal systemic immunity. Scientists already identified the protein as a necessary component to trigger systemic

immunity.

"The metabolite and protein are dependent on each other to transport immunity from one location in the plant tissue to the other," Pradeep Kachroo said. "Metabolite levels increase in plant tissues after the plant has been inoculated by a pathogen."

While the research was conducted on plants, Pradeep Kachroo said all organisms have a similar process of triggering systemic immunity.

"The metabolite is a highly conserved compound in all species across the board," Pradeep Kachroo said. "Another great thing is increased levels of this metabolite do not affect plant productivity, unlike other known inducers of systemic immunity."

He said the metabolite could be an effective tool to control plant diseases and enhance pathogen tolerance in plants.

In 2008, these UK plant pathologists discovered that the same metabolite was a key component in organisms' basal resistance, which allows organisms to have strong immune systems. They wondered whether there was a connection between the metabolite and systemic immunity, which led them to their current research.

Their research was funded by the National Science Foundation's Division of Integrative Organismal Systems. The plant pathologists will continue to study the process that induces systemic immunity.

"We want to know how glycerol-3-phosphate is metabolized in plants and identify various compounds derived from glycerol-3-phosphate," Pradeep Kachroo said. "We also want to know how the metabolite relates other molecules known to be important for systemic immunity."

Provided by University of Kentucky