Dead Or Alive? A New Test To Determine Viability Of Soybean Rust Spores

URBANA, ILL.

Spores from Asian soybean rust (*Phakopsora pachyrhizi*) pose a serious threat to soybean production in the United States because they can be blown great distances by the wind. University of Illinois researchers have developed a method to determine whether these spores are viable.

"Finding spores is different from finding spores that are living and able to infect plants," said USDA Agricultural Research Service (ARS) scientist and crop sciences professor Glen Hartman.

Soybean rust, which first appeared in Japan at the beginning of the 20th century, is a foliar infector that reduces plant photosynthetic activity and causes defoliation, premature death, and high yield loss. An obligate pathogen, it grows only on plants and dies when the plant dies or is harvested.

The fungus first appeared In the U.S. in 2004. It is concentrated in the southern states where it is able to overwinter on kudzu. Spraying with fungicides is the only way to control it because resistant soybean cultivars are not yet available to U.S. farmers.

To monitor the spread of the disease, researchers established a network of sentinel plots in 2005 (see http://sbr.ipmpipe.org/cgi-bin/sbr/public.cgi). Traps in these plots capture airborne spores and can serve as an early warning system for farmers. However, spores that travel long distances are often not viable. There have been many instances where spores have been found in the traps, but rust has not appeared in the fields.

Up to now, because farmers have had no way to determine if the captured spores are dead or alive, they have been faced with a dilemma. They know that spraying too little or too late can lead to yield loss, so they may decide to spray immediately. This raises their costs, damages crop quality, and poses risks to human health and the environment. Spraying can also accelerate the development of fungicide-resistant strains.

"In 2005, there were some farms in the Midwest and the north-central area that were sprayed with fungicide because the word was out that somebody found some spores," Hartman said.

Hartman, Ramya Vittal, a postdoctoral researcher in the Laboratory for Soybean Disease Research, and James Haudenshield, a USDA-ARS research plant pathologist, have just developed a method that uses two different staining techniques to determine spore viability.

The first technique uses two dyes: carboxyfluorescein diacetate (CFDA) and propidium iodide (PI). Viable spores stain green with CFDA; non-viable spores counterstain red with PI.

The second technique uses a two-color fluorescent viability probe that causes cylindrical vacuolar structures to form within living spores, which then fluoresce red. Non-viable spores show only faint fluorescence.

Hartman said that these tests are rapid and reliable. Early detection coupled with timely fungicide application can help slow the pathogen's spread and minimize yield losses.

The next step is to integrate this method with passive spore sampling to develop a tool to detect and monitor the movement of viable P. pachyrhizi spores during the soybean growing season.

The article, "A Multiplexed Immunofluorescence Method Identifies *Phakopsora pachyrhizi* Urediniospores and Determines Their Viability" by R. Vittal, J. S. Haudenshield, and G. L. Hartman has been published in *Phytopathology* and is available at http://apsjournals.apsnet.org/doi/pdfplus/10.1094/PHYTO-02-12-0040-R. Δ