

Protecting Crops From Alien Invaders

Increased travel and global trade have steadily increased the threat of not only human disease epidemics, but also plant disease and pest epidemics. Never before have so many new and non-native insects, viruses, and plant diseases shown up so rapidly in this country. This is especially true of soybean pests.

Since soybeans are a relatively new crop in the United States, especially as a major crop, it's taken quite a while for its foreign enemies to find it, as was predicted decades ago. For example, the first aphids that attack soybeans were found in this country just 5 years ago. They seem to have first arrived in Chicago, a center of global trade, aboard a plane or ship. Lacking natural controls, they've spread so rapidly since then that it's now hard to find a midwestern county that doesn't have them.

Like all aphids, soybean aphids spread several plant viral diseases. They also diminish yields by sucking sugar water from the plants. They seem to be on a 2-year cycle, and we expect 2005 to be one of the high-infestation years.

In the summer of 2004, soybean rust appeared here for the first time. A fungal disease, it is thought to have been imported—but by trade or by travel—but by bad weather. Strong hurricanes are believed to have carried the rust-causing spores into soy-production areas.

Since any imports can carry foreign aphids or other pests that attack farm crops, great efforts are made to inspect all incoming shipments at various points of entry—and to intercept any potential trouble-making plant pest detected.

But few people know that in the 1960s—well before there was an Animal and Plant Health Inspection Service or Office of Homeland Security to enforce that inspection responsibility—a joint ARS-state team of scientists was formed in Wooster, Ohio. For more than 40 years, it's been serving as a first line of defense against pest invaders of soybean, corn, and other farm crops.

As described in the story that begins on page 4, the team's original task was to cope with a corn disease epidemic. By the time it was formed, USDA and state researchers and specialists were already working together nationally to battle pests of corn, wheat, and alfalfa—the dominant crops at the time. Since soybeans were just coming into their own, state and ARS researchers were ready when the crop—and its pests—began to explode in numbers.

The ARS-Ohio State University (OSU) pest detection team is an excellent example of the longstanding cooperation between federal and state governments that marks ARS research nationwide. The ARS part of the team specializes in protecting against viruses. Together the team members contribute a

wealth of resources, including expertise in cloning, genetics, entomology, and plant biology and pathology. They are all located at OSU's Ohio Agricultural Research and Development Center in Wooster.

Many ARS labs are located on or near such facilities, which include state universities and experiment and extension stations. At Wooster, state and ARS experts constantly work side by side. When there was a report of a possible corn virus outbreak in Serbia, OSU maize researcher Rich Pratt joined ARS plant pathologist Peg Redinbaugh and research leader Roy Gingery on a trip there to study samples and share techniques.

In another cooperative effort, Ron Hammond, an entomologist with the OSU extension service, monitored the soybean aphid invasion in Ohio, working with extension specialists throughout the Midwest and with ARS scientists. He serves on an agronomic crops team of extension agents, state specialists, and researchers.

Hammond was part of the first generation of entomologists trained to fight soybean insect pests. From his first days on the job in 1979, he worked closely with ARS's Dick Cooper, who specialized in soybean breeding research at Wooster. Cooper has since retired, but the federal-state cooperation continues to this day—as it does nationwide—to protect soybeans, along with corn and other U.S. crops.

One of the new pests to reach Ohio in recent years is the bean leaf beetle, which has long infested other states, carrying with it bean pod mottle virus. Hammond and other state scientists and specialists joined forces with the ARS viral team to control the beetle and breed resistance in soybeans to the virus it spreads. The newest member of the Wooster team, molecular geneticist Rouf Mian, has already been working closely with OSU, serving on the bean leaf beetle team.

Despite all these efforts and successes nationally and internationally, plant diseases alone still cause more than \$9 billion in annual losses in the United States. Plant pathogens keep evolving and overcoming once-effective management tactics even as they move from state to state and country to country. ARS scientists will continue to work closely with programs in Ohio and in 27 other states as part of our ongoing national plant-disease research program to devise effective management strategies to keep up with the fast-changing disease situation.

Rick Bennett
 ARS National Program Leader
 General Biological Science and Plant Health
 Beltsville, Maryland

STEPHEN AUSMUS (D073-18)



Close-up of vascular puncture inoculation (shown on cover). Fine pins are passed through a virus-containing (green) extract and then into a corn kernel to inoculate the kernel with the virus. See story, page 4.