Breaking through Leafhoppers

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Researchers believe they are only weeks away from figuring out which type of leafhopper is to blame for transmitting phytoplasma on potato plants. With dozens of species out there, USDA researchers like Joe Munyaneza, Wapato, Wash., are cracking down on which leafhopper it is so they can figure out the best management practices for growers.

Leafhoppers became a big problem in the Columbia Basin in 2002, about the time Munyaneza came to work at the Wapato USDA station. Why leafhoppers weren't a concern before remains a mystery. Judging from what he saw working at the University of Minnesota, Munyaneza has a theory.

"Insect management practices have changed," he explains. "The pesticide chemistry has changed—we are switching to softer pesticides. Unfortunately, they may not be controlling secondary pests like leafhoppers."

While the chemistries have developed into more focused, environmently-friendly pesticides, Munyaneza says, the chemistry isn't the only thing that has changed.

"Most of the new things coming out are sestemic, so you can apply them to the soil. When the plants come up they suck it from the soil. Or you can coat your seed, and it will be protected. Because it's at planting, it takes care of the primary pests, but it doesn't take care of leafhoppers," he says.

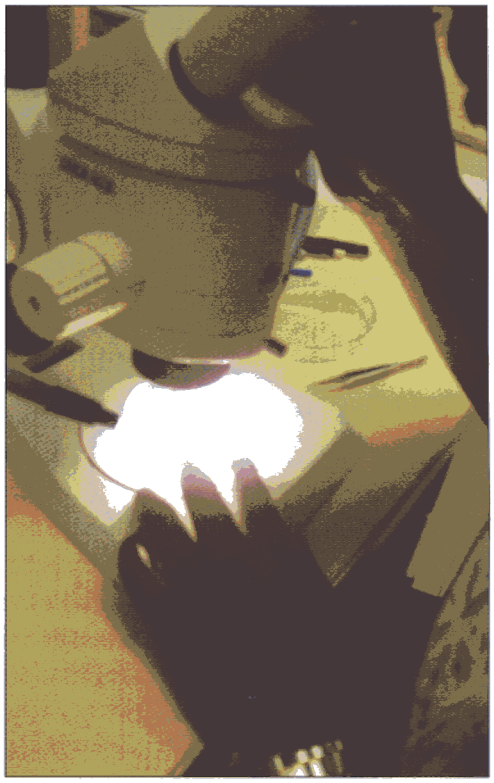
In 2002, a grower in the area working with Pete Thomas at the USDA in Prosser, Wash., had applied chemicals to his potato plants. He had started applying systemically at planting. The machine broke part way through, so later on he treated the rest of his potatoes through foliar application. Leafhoppers moved into the area and devastated a field of his potatoes.

Comparing two pictures of a field displaying systemic application results and the other displaying foliar, it was obvious to Munyaneza the systemically applied chemicals failed to protect against leafhoppers.

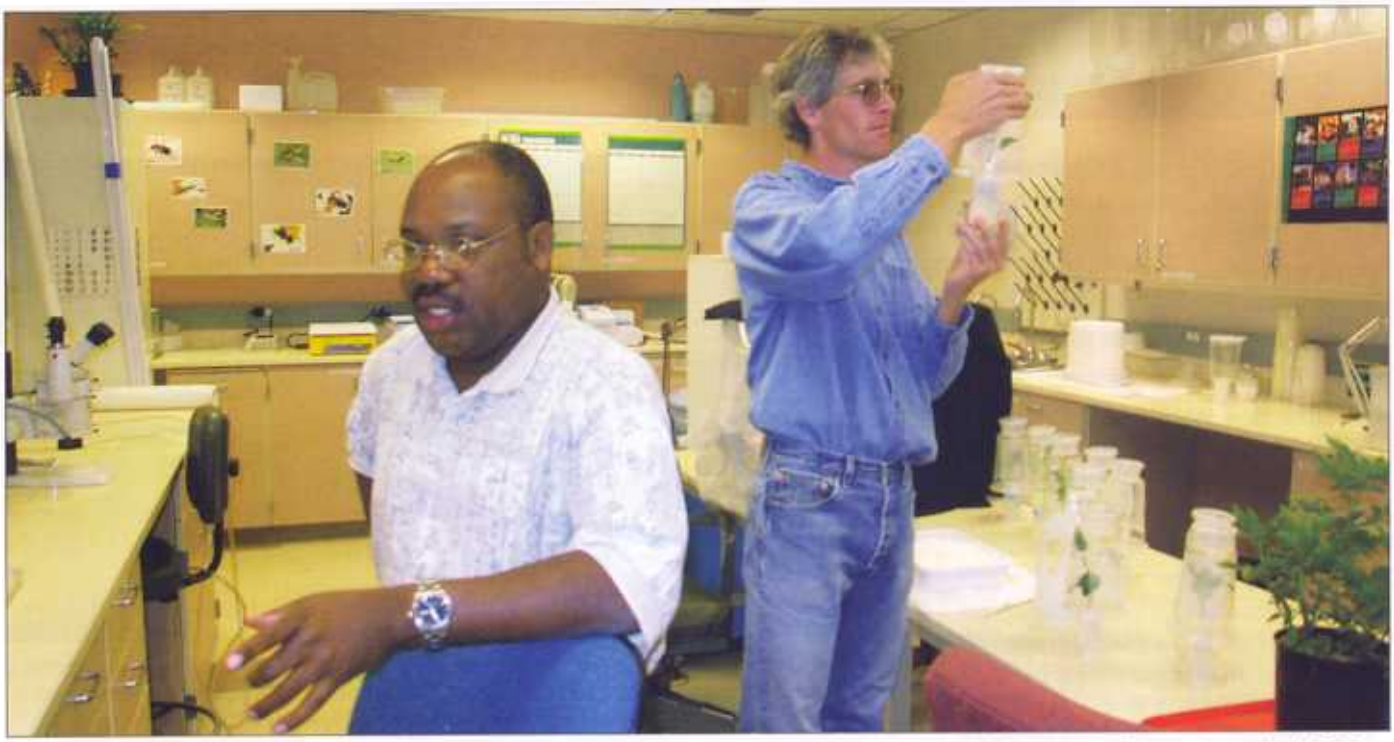
"These were hammered," he says of the systemically applied potatoes. "This is telling me that foliar application at the right time controls leafhoppers."

Leafhoppers have been such a problem the last few years, a team of research-

Joe Munyaneza in the greenhouse where he is studying the behaviors of leafhoppers on different crops.



Munyaneza examines beet leafhoppers under a microscope. "We still have to confirm this, but indications point toward these guys causing the problems in potatoes," he says.



Munyaneza explains his work on leafhoppers as Jeff Upton works to extract leafhoppers for testing. The two work together at the USDA station in Wapato, Wash.

ers from the USDA Wapato and Prosser stations, local universities and the potato industry are working to pin down which leafhoppers cause problems and what to do about it. Andy Jensen, Jim Crosslin, Pete Thomas, Phil Hamm, Keith Pike, Alan Schriber and Hanu Pappu are all studying different aspects of the pests to reach the ultimate conclusion of control.

"This past year we have really made progress," says Munyaneza. Before area growers were hit with leafhoppers, there wasn't much activity, so there isn't much literature for researchers to go by. Working together for the past couple of years, they have been able to find a lot in a relatively short amount of time.

Jeff Upton, who works with Munyaneza, is usually found counting, sorting, tending and observing leafhoppers at the Wapato station. In the lab, thousands of leafhoppers are encased in test tubes for closer study as well as in controlled greenhouse environments on different plants to observe their habits.

"We suspect the beet leafhopper is the one transmitting the phytoplasma, but many other leafhopper species are potential vectors," Munyaneza says.

Once they know for sure, they can study the culprit more closely and figure out exactly when it enters and exits potato fields, where it contracts the phytoplasma and when it transmits it to potato plants.

"We don't know where we are getting the phytoplasma," Munyaneza explains. "Suggestions are that we are getting them from weeds, sometimes late in the spring or early in the summer. Pete Thomas has been collecting weeds, trying to figure that out. Another problem is we don't know how long they stay in potatoes. If they stay in the field for a long time then we'll have to spray multiple times."

"Leafhoppers are very easy to control," Munyaneza continues, "but the

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These potato plants display symptoms of phytoplasma infection transmitted by leafhoppers.

Nitrogen Management on

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Exploring prospects of drip irrigation for potato production i andy soils. USDA-ARS field experiment site in cooperation with AgriNorthwest, Paterson, Wash., 2003.

Growers in Washington, Oregon and Idaho produce 12.7 million tons of potatoes, 55 percent of the total U.S. production. PNW acreage totals about 623,220 acres, 45 percent of the total U.S. potato acreage (www.nass.usda.gov). The farmgate value of potatoes in the Pacific Northwest is estimated at about $1.3 billion. The value-added return from processing and the economic opportunities provided by other related industries are of significant importance to this region.

The Columbia Basin region in the PNW provides ideal conditions for production of high yields (per unit area, i.e. up to 35-40 tons/acre) of good quality processing tubers. Most of the PNW potato production is done in light texture soils with low organic matter content, which have low capacity for retention of nutrients and water. Nitrogen uptake efficiency can be improved by optimizing the rate and frequency of pre-plant and in-season N application. Current N management recommendations are based on the studies conducted mostly on 'Russet Burbank' variety, which was the predominant potato variety grown in the PNW. The acreage under 'Russet Burbank' has decreased steadily during recent years, and is being replaced by new varieties including Ranger Russet and Umatilla Russet.

Two years of field study data on the evaluation of effects of rates/frequencies of pre-plant and in-season N management for Ranger Russet and Umatilla Russet varieties have been conducted. The field experiments were conducted from 2001 to 2002 in a Quincy fine sand near Paterson, Wash., under center pivot irrigation.

2001 Experiment

Ranger Russet and Umatilla Russet cultivars were planted on March 30, 2001, on 8- to 12-inch raised ridges at a 34-inch spacing. Potato-wheat-2-year corn rotation system was followed in the trial site. The land preparation and other cultural practices were similar to those followed by the commercial production practices.

The main treatments included differen rates of pre-plant N (including the residual soil N) at either 50, 100, or 150 lbs/ac with a total N rate of 300 lbs/ac across all pre-plant N treatments. A fourth treatment was included with 100 lbs/ac pre-plant N, with a total N rate of 400 lbs/ac for the

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timing is very important." It's expensive to spray more than you need to, he adds, so if they can zero in on a good time to spray, they can save growers a lot of money.

"We are going to solve this," he says.

Aphid Hopefuls

Munyaneza is also working on aphid control, an important area of study year in and year out. Aphids transmit devastating diseases like the leaf roll virus and potato virus Y.

"Working for the USDA, one of our objectives is to help the environment," he explains. "It's not like we don't want people to use insecticides, but we want to promote the use of beneficials (natural enemies). There are so many beneficials that kill aphids. The problem is, many insecticides kill beneficials.

"If we can do things to manipulate the environment to promote the natural enemies/beneficials, that will help," he says.

The leaf roll virus is a persistant virus, which means the aphid has to feed on the plant for a long time before it transmits the virus to another plant. This leaves a window of opportunity to kill the aphid before virus transmission. PVY, on the other hand, is a non-persistant virus, meaning it only takes a few seconds for the aphid to contract the virus then pass it on.

"That makes things very difficult," Munyaneza says, "because if you come in and spray insecticides, they don't kill the aphid fast enough before it transmits the virus. And some insecticides are like a drug to the aphid, they make it jump around and infect more."

Munyaneza has been exploring other options, including one he used while employed at the University of Minnesota: mineral oil.

"For some reason they interfere with PVY transmission," he says. "Back in the Midwest, mineral oils (like AphOil) are highly recommended to be sprayed on potatoes.

Last year I did a preliminary study at Moxee, Wash., and sprayed them 12 times. It was very hot. To my surprise, my preliminary data indicated that there was no phytotoxicity in those plants, which suggests to me that we can use it in this area. We need to conduct further studies, but it may have potential." ■