



## Rosy Outlook for Greenhouse Roses

To keep ahead of mite populations in the greenhouse, entomologist Michael Parrella and graduate research assistant Christine Casey recommend that growers examine 38 rose plants for every 10,000 square feet of greenhouse.



Spider mites and a disease called powdery mildew can make life miserable for roses growing in greenhouses. But ARS is helping these splendid plants fight back. The agency is among the sponsors of research at the University of California at Davis that will yield effective, environmentally friendly ways to control mites and mildew.

Roses produced in greenhouses, instead of outdoors, are the ones you find for sale as cut flowers at your local florist shop. ARS plant pathologist Edwin L. Civerolo, the agency's representative for the greenhouse-roses research, says the investigations may help rose growers reduce the number of times they have to spray chemicals. Sometimes that's as many as 25 to 45 times a year.

Fewer sprayings may actually boost the number of blooms that growers can harvest. Right now, because of safety concerns, workers must wait 24 to 48 hours after spraying before they can re-enter the greenhouse. That means they may miss the opportunity to harvest blooms that could otherwise be sold. Vigorously blooming rose plants can be harvested twice a day, according to Civerolo. He leads the ARS Crops Pathology and Genetics Research Unit at Davis.

### Spider Mite Sampling Scrutinized

The spider mite research will give growers new, science-based techniques for monitoring and sampling mites that infest rose plants. About the size of the

period at the end of this sentence, spider mites use their mouthparts to suck out the contents of leaf cells. By removing cell components called chloroplasts, for example, mites interfere with the plant's ability to convert sunlight into food.

"With a statistically valid sampling procedure," says Civerolo, "growers could correctly estimate the size of a greenhouse's mite population and from that determine whether the population poses a threat to their plants. Low-level populations may not harm the roses, so they may not need to be treated. If so, that would reduce growers' costs."

Preliminary results from spider mite research by Christine A. Casey and Michael P. Parrella of the University of California at Davis suggest that growers need to inspect, or sample, 38 rose plants for every 10,000 square feet of greenhouse. Most commercial rose greenhouses are anywhere from 50,000 to 100,000 square feet, and most operations have

from 5 to 10 greenhouses, says Casey, a graduate research assistant.

"Roses bloom on shoots, or canes, that sprout from the crown of the mother plant," Casey notes. "Growers allow only the strongest canes to grow upright and produce flowers. The others are deliberately bent. The correct place to look for mites is the first leaf above the bend in the cane, or main stem." This recommendation is based on studying samples collected weekly, for more than a year, from commercial greenhouses in central and southern California, Casey says.

Next, Casey and Parrella want to determine the population density that triggers overcrowding and causes mites to crawl away from the bend and up the stem.

"You want to catch the population before it becomes so large that mites are traveling higher than the third leaf—the point where the stems are typically cut and sold," Casey explains.

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Scanning electron micrograph of a two-spotted spider mite feeding on a rose leaf. Magnified about 200X. (Photo by Eric Erbe. Digital colorization by Chris Pooley.)

PEGGY GREB (K9619-1)

Right now, the sampling scheme won't work for growers who use a popular biological control agent, a beneficial mite known as *Phytoseiulus persimilis*. "Because it's time-consuming to distribute the helpful mite," says Casey, "growers tend to put it only on plants that they know are infested. That, of course, skews our sampling design."

The solution may be a handy dispenser, being developed elsewhere, that will make it fast and easy to distribute mites evenly throughout a greenhouse.

### All Mildews Are Not Alike

Meanwhile, investigations of powdery mildew will determine whether an early-warning system for outbreaks of this pathogen in grapevines can be successfully adapted to rose production. The monitoring system tracks conditions favoring proliferation of the fungus. It relies on readings from a package of instruments that record and report greenhouse conditions, such as temperature, according to Linda L. Bolkan, staff research associate at the university. Bolkan and James D. MacDonald of the university's Department of Plant Pathology are conducting the powdery mildew studies.

"Each species of powdery mildew," Bolkan says, "is specific to a particular crop. Grape powdery mildew, for example, is different from rose powdery mildew. We can't expect rose powdery mildew to behave exactly as the grape species. That means we have to fine-tune the computerized, mathematical model that drives the grape mildew forecasting system so that it will be useful in roses.

"For example, we started our rose work with a system that assesses conditions when temperatures range between 18°C and 30°C. Research has shown that temperatures between 18°C and 27°C for several hours are better for powdery mildew to reproduce and spread in roses," says Bolkan. "So by feeding this new temperature information into the model, we can make more precise and accurate



Plant pathologists James MacDonald (left) and Edwin Civerolo examine rose leaves for the presence of powdery mildew.

forecasts of rose powdery mildew."

"The grape model, for outdoor production, is temperature driven. It doesn't rely heavily on relative humidity as a variable. However, we're investigating relative humidity because we think it might be important in greenhouse rose production," Bolkan says. "We're also looking at leaf wetness, because powdery mildew can't grow on totally saturated leaves.

"Through a telemetry system that connects us to the commercial greenhouses participating in our project," says Bolkan, "we receive readings every 15 minutes. Scouts hired by cooperative extension advisers helping with this study visit these greenhouses every week and inspect plants for powdery mildew incidence. We can compare their on-site observations with the off-site forecasts we've made here in the laboratory and can see what needs to be done to improve the accuracy of the model."

In addition to ARS, other sponsors of the research include the State of California Department of Pesticide

Regulation; Roses, Inc.; the American Floral Endowment; and the California Cut Flower Commission.—By **Marcia Wood, ARS.**

*This research is part of Crop Protection and Quarantine, an ARS National Program (#304) described on the World Wide Web at <http://www.nps.ars.usda.gov>.*

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