SCOTT BAUER (K7244-116)

Protecting Poinsettias

New computer program will aid growers in battling greenhouse pest.

Colorful poinsettias are America's favorite flower for the year-end holidays. In fact, they rank as the nation's top-selling potted flowering plant. More than 80 million poinsettias, known to botanists as *Euphorbia pulcherrima*, are sold each year in this country.

Poinsettia plants are also a favorite of the silverleaf whitefly, *Bemesia argentifolii*. This greenhouse pest, no bigger than the tip of a ballpoint pen, sucks juices from poinsettia leaves and stems, according to ARS research entomologist Gloria DeGrandi-Hoffman. Feeding can weaken the plant.

Now, DeGrandi-Hoffman and colleagues are harnessing the analytical power of computers to help clobber the tiny whiteflies. She has developed user-friendly computer software called BIOCONTROL-POINSETTIA that will help poinsettia growers determine how best to use one of their premier weapons against the whitefly. It is a parasitic wasp, *Eretmocerus eremicus*, that is harmless to humans but deadly to whiteflies. Female wasps lay their eggs in whitefly young. Wasp young then grow inside the developing whiteflies, eventually killing them.

JACK DYKINGA (K9683-1)

Computer software developed by entomologist Gloria DeGrandi-Hoffman will help poinsettia growers determine how many beneficial parasitic wasps they need to control whiteflies in greenhouses.

DeGrandi-Hoffman did the work at the ARS Carl Hayden Bee Research Laboratory in Tucson, Arizona. Her new computer model will help growers determine how many of the helpful wasps they should turn loose in their greenhouses to attack the wayward whiteflies. It will also indicate when and how often they might use the wasps for the best control of the whiteflies.

"We anticipate that growers may become more interested in using the wasps," says DeGrandi-Hoffman, "when whiteflies become resistant to the insecticide most commonly used today in poinsettia greenhouses.

"The parasites are particularly important during the 6 to 8 weeks before poinsettias go to market," she points out. "That's when the plants get their beautiful colors. If they're sprayed then, they'll get splotches. The model estimates the growth of the whitefly population with and without the parasites."

DeGrandi-Hoffman developed the software at the invitation of colleagues John P. Sanderson at Cornell University in Ithaca, New York, and Roy G. Van Driesche at the University of Massachusetts at Amherst.

Sanderson, Van Driesche, and Mark Hoddle at the University of California, Riverside, were the first to discover the wasp's impressive capabilities as a biocontrol agent for the whitefly. But questions about the best use of the little wasp remained. The researchers sought out DeGrandi-Hoffman's help because of

her expertise in creating similar computer-based models.

For example, she developed a model for estimating how many individuals of two different kinds of beneficial parasites should be put to work in alfalfa fields to zap lygus bugs. She authored BIOCONTROL-WHITEFLY for control of whitefly on cotton. And she authored VARROAPOP, which beekeepers can use to estimate growth of populations of the destructive *Varroa* mite and to determine whether it would be economical to apply a miticide.

DeGrandi-Hoffman's whitefly program fits easily on a single floppy disk and runs on any personal computer that is equipped with Windows 98 or later. To build the program, she put information about whitefly and wasp biology—gleaned from years of experiments by Sanderson and others—into mathematical form for the computer to analyze.

For example, the program accounts for the fact that the wasps are brought into the greenhouse when they are pupae—the stage before adulthood—and that they take up to 4 or 5 days to emerge. "That means the number of wasps attacking the whiteflies may vary each day," DeGrandi-Hoffman says.

The program also takes into account the fact that the whitefly's reproductive rate is strongly influenced by greenhouse temperature. That's why growers need to input the temperature of their greenhouses as well as other basic information about their crop. For example, they need to indicate the average number of whiteflies that are lurking on or under the leaves of their poinsettias. They also need to estimate how many parasites they think they want to introduce per week.

"A single release of the wasps isn't enough," DeGrandi-Hoffman explains. "One reason is that the wasps don't live long. So growers have to do sequential releases to replenish the supply of wasps.

"The computer uses all of this information to predict the population growth of the whiteflies in greenhouses based on the interval—such as weekly—that wasps will be released and the number of wasps that will be used. Growers can adjust the number of parasites and the intervals to see what levels of control will result, then pick the best strategy," says DeGrandi-Hoffman. "The computer augments the growers' own expertise and experience, giving them a resource to turn to for an objective analysis."

SCOTT BAUER (K9678-2)

Silverleaf whiteflies, *Bemesia argentifolii,* on a leaf.

Sanderson and Van Driesche will work with poinsettia growers in the northeastern United States this year to test the new program further.—By **Marcia Wood,** ARS.

This research is part of Crop Protection and Quarantine (#304) and Crop Production (#305), two ARS National Programs described on the World Wide Web at http://www.nps.ars.usda.gov.

Gloria DeGrandi-Hoffman is with the USDA-ARS Carl Hayden Bee Research Center, 2000 E. Allen Rd., Tucson, AZ 85719; phone (520) 670-6380, ext. 105, fax (520) 670-6493, e-mail gdhoff@aol.com. ◆