

If the perfect orange exists, it would be the Satsuma mandarin. Its sweet, delicate fruit is gently encased by a thin, leathery skin that easily separates from the fruit. Adapted to soils in Alabama, Satsumas are a familiar sight on the coast. Because temperatures less than 23 degrees Fahrenheit can injure or kill the trees, however, the fruit is rarely found in markets abroad. But their easy peeling, virtual seedlessness and sweet taste has made them highly popular—so popular that Alabama has made them the main fruit offered in their schools.

The younger market for Satsumas made finding alternative ways to controlling their pests a priority for Alabama. Because Satsumas are so fragile, they are highly susceptible to damage by pests, diseases, cold weather and handling. According to Alabama's IPM Coordinator, Henry Fadamiro, a hard freeze can practically wipe out an entire crop. However, efforts by Dr. Robert Ebel, a fruit breeder at Auburn University, to develop cold-hardy cultivars and improved tree protection methods have begun to yield results.



Satsuma mandarins exhibit damage from pests.

But even though growing them is such a challenge, their increasing popularity and their historical significance—the Satsuma has been grown in Alabama since the early 1900s—has made them an important crop for the state, so important that the state and federal governments have begun to provide assistance to farms that grow them, in particular in the area of new markets development. In fact, the federally-funded Farm-to-School program has made the Alabama school systems a major buyer of Satsumas in the state with up to one-third of the crop being sold annually to schools. While growers enjoy the increased income, they are now under more pressure to ensure a healthy crop. Often that means spraying pesticides.

"Farmers typically use a lot of pesticides," said Fadamiro. "They are used to spraying multiple times a year to get rid of pests, including mites, scales, whiteflies, and leafminers. Some relied on a pre-set spraying schedule rather than scouting first to see if a spray could be eliminated. That's one of the reasons we felt it was necessary to develop an IPM program."

The program began with a general survey of what farmers knew about managing pests. Surprisingly, most of them were unsure about what pest problems they had.

"We found out that the farmers didn't even have a clear knowledge of what pest problems they had," Fadamiro said. "They didn't have any idea of what beneficials existed in their fields. Some growers were even spraying preventively."

Fadamiro and a team of research and extension specialists (especially Monte Nesbitt and Terry Hargroder) also surveyed a selection of farms in the two Alabama counties that grow Satsumas: Mobile and Baldwin, to learn what insects existed in the fields. For the entire first year, the team scouted for different pests, when they started gathering on the fruit and when they became a major problem. With that information, Fadamiro applied for an Environmental Protection Agency Strategic Agriculture Initiative Program Grant in 2005 to continue the project.

"The goal of the project was to fully understand the challenges of the pest problems and develop a program to reduce the dependence on pesticides," Fadamiro said.

With an experiment station in Fairhope with a Satsuma plot and ready cooperation from some of the growers, Fadamiro's team implemented a moratorium on spraying to establish an action threshold.



A beneficial mite attacks a mite pest.

Reducing Pesticide Usage in Alabama Satsuma Citrus through Implementation of Integrated Pest Management Practices

Grant Amount: \$76,000

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Alabama (continued)

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The idea was to base the use of chemical control on sampling rather than prevention. In addition, halting the spraying helped beneficial insects regain their populations. While many farmers grew nervous as they watched the pest populations increase, Fadamiro said they were happy to have a team handling their pest management problems.

Fadamiro also took advantage of research on Satsuma pest management conducted in Florida by Dr. Carl Childers. Childers' studies proved that several species of beneficial mites could easily control the mite pest population, cutting pesticide use in half.

"Almost half of the sprays are for mites," said Fadamiro. "We needed to determine what the beneficial mites were in Alabama, and we found good, beneficial mites in our system that could play a major role in controlling the mite pests."



A grower learns how to use a hand lens to identify insects.

In addition to testing that theory, Fadamiro is rearing some beneficial mites in the lab to augment field populations. Through some small grants from the USDA IR-4 Biopesticide grant program, Fadamiro is also evaluating some new biopesticides and reduced-risk miticides that are potentially compatible with beneficial mites.

Educating the growers was a large part of the project. During a workshop in 2006 for growers, extension specialists trained growers how to conduct sam-

ples for pests, how to distinguish pests from beneficial insects, how to use beneficials to control pests, and how to identify pests based on leaf damage. Pesticide use was also addressed; growers learned types of sprayers to use and how to calibrate them.

"We had to talk about pesticides," Fadamiro said. "But our motto was, 'if you don't need to spray, don't spray, but if you need to spray, spray judiciously.'"



Dr. Carl Childers

Fadamiro has relied on Dr. Childers' expertise greatly during the project. In fact, he invited Dr. Childers to participate in the 2006 workshop.

Although growers are beginning to consider some of the techniques they have learned during this project, Fadamiro said the project is far from over. To increase the likelihood that natural enemies will control the mite population, he is continuing to rear beneficial mites in the lab. Other plans include a citrus production and pest management guide for farmers that includes photos of pests and beneficial insects as well as management recommendations. A 2006 crop profile on peaches and Satsuma oranges, funded by a Southern Region IPM Enhancement grant, may be the first step towards such a guide.

Fadamiro is presently seeking continued funding for the project. But even though he has much to do before defining a system that significantly reduces pesticide residue on the oranges while not compromising fruit quantity or quality, he feels that the program is already a success.

"We believe this is one of the areas where we can make a difference in terms of IPM," he said. "Farmers are very cooperative. They are losing many of the pesticides they have been using."