

Dealing with rust mites

Scientists research biological and chemical controls

LIONS AND TIGERS UNDER A MICROSCOPE

By Ernie Neff

On a leaf under a microscope lens, two mites are in a life-or-death race. Today, it'll be death.

When the hunter from one species catches the hunted from another species – a citrus rust mite – he immediately has lunch.

"It's lions and tigers down there," Carl Childers said.

Watching this struggle for survival isn't amusement for Childers, a professor of entomology at the University of Florida's Citrus Research and Education Center at Lake Alfred. It's a very real depiction of biological control methods that he thinks may someday help growers more effectively control

citrus rust mites and other problem mites such as spider mites. Although spider mites haven't been a widespread problem in recent years, they can become a problem quickly in dry years.

Childers' proposed research was intriguing enough to receive support a few years ago from the Florida Citrus Production Research Advisory Council, which allocates research funds collected from the sale of each box of Florida citrus. Childers' project also has received funding from the Polk County Trade Show Committee, the U.S. Department of Agriculture and the U.S. Environmental Protection Agency. The funds have allowed him to initiate research on the role of predatory mites and their ability to suppress both citrus rust mites and spider mites.

"If it weren't for the Florida Citrus Production Research Advisory Council support in funding two projects, I wouldn't have gotten the Sustainable Agriculture Research and Education (SARE) and Agriculture in Concert with the Environment (ACE) Southern Region grants from USDA and EPA," Childers said. But the advisory council funding and the grants from the federal agencies have allowed him to aggressively pursue his research on predatory mites. A post-doctoral research associate and several research assistants are helping in the exhaustive studies. "I believe we're going to make significant headway in the next three years," Childers said.

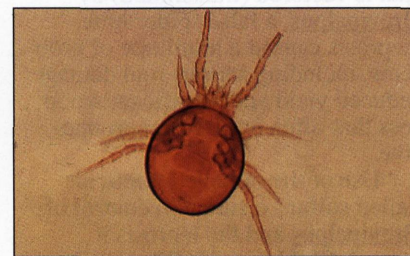
To start his research, Childers initiated a survey of groves that had either "no-spray" or modified spray programs so he could identify the natural predators of citrus rust mites and spider mites. Groves treated with normal pesticide applications might have already suppressed or eliminated the natural predators, making them difficult if not impossible to find.

In addition to determining what natural predators exist in Florida groves, Childers obtained or collected several species of exotic predators that feed on citrus rust mites and spider mites. He and associate researcher Mohamed Abou-Setta are conducting preliminary laboratory evaluations to identify the predatory mites that will both feed and reproduce on problem

mites. "Some species of the predators will feed but they can't lay eggs," Childers said. "We are interested in determining which predatory mites can feed and reproduce on citrus rust mites."



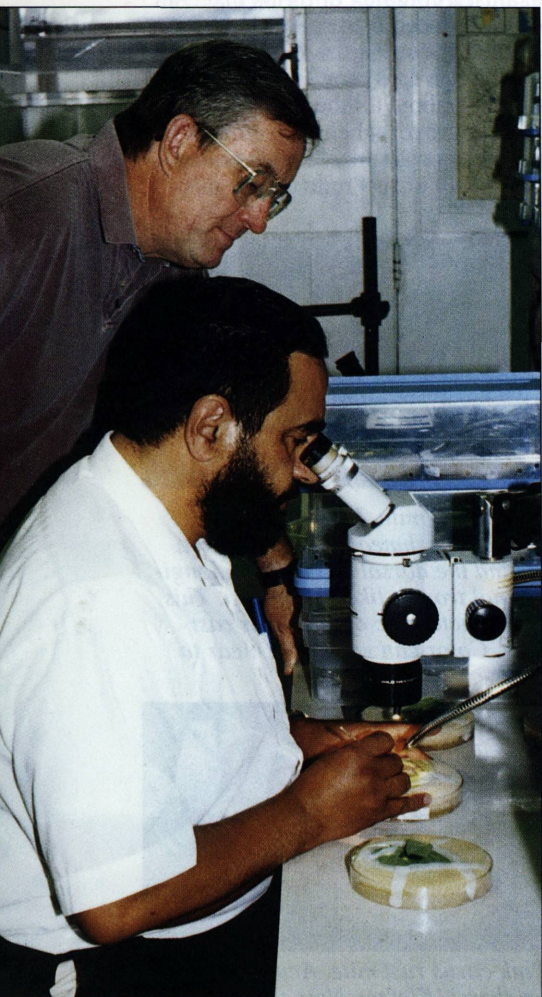
A predaceous mite in the family Phytoseiidae and in the genus Euseius that will feed on spider mites and citrus rust mites. They are very common in many citrus grove sites throughout the state. This species is slightly larger than a spider mite. They move very quickly and will avoid direct sunlight.



Another phytoseiid mite in the genus Lphiseiodes that is predaceous on both spider mites and citrus rust mites. It is reddish-brown and larger than a spider mite.



A predaceous mite in the family Stigmaeidae and in the genus Agistemus that will feed on both spider mites and citrus rust mites. This mite is referred to as the strawberry mite due to its brilliant red color. This mite is slow moving and about half the size of a spider mite.



Carl Childers watches as Mohamed Abou-Setta uses a microscope and a hair to move predatory mites from one rearing arena (a leaf) to another.

STRONG CANDIDATES

We have identified predatory mites from three families that are very promising for suppression of citrus rust mites and spider mites," Childers said. "We will be looking at the comparative toxicities of several pesticides against selected species of predaceous (predatory) mites during 1997. Based on these results, we will incorporate the less toxic compounds to predatory mites and use them in conjunction with selective releases of native and/or exotic predaceous mites."

When researchers introduce selected native or exotic predator mites into groves in 1998, cooperating growers will be asked to modify their spray

programs. The researchers need to examine conditions under selected pesticide regimens to optimize predaceous mite numbers to effectively suppress citrus rust mites and spider mites. They want to avoid pesticides known to drastically suppress populations of the predatory mites.

"In my view, the citrus industry in general may be using one or more pesticides that are disruptive to beneficial populations of predators and non-target mites," Childers said. "I'm looking to optimize conditions in Florida citrus groves for the beneficial complex (of predator mites)." He believes that under optimum conditions, the predators will be able to thrive, reproduce and effectively suppress populations

of citrus rust mites and spider mites. Certain non-target fungal-feeding mites are important as alternate food sources for the predaceous mite species.

WE ALSO NEED PESTICIDES

Childers hopes his research will result in some additional strategies for the control of citrus rust mites and spider mites. He doesn't envision growers being able to prosper by using only biological control methods. "I don't think it's realistic," he said, explaining that production is diminished in many parts of the world where growers lack either good pesticides or proper application methods. 🍋

FROM SULFUR TO CURRENT MITICIDES

When citrus researchers found a way to control citrus rust mite, they also found an excellent control for the industry-threatening leprosis virus in the mid-1920s.

"Prior to 1926, the Florida citrus industry was near collapse from leprosis," said Carl Childers, professor in entomology at the University of Florida. Leprosis is a viral disease that is vectored (transmitted) by *Brevipalpus*, a false spider mite. Leprosis caused a multitude of problems, including serious rind damage, reduced yield and significant wood loss that often left trees unproductive.

"Use of the miracle insecticide called sulfur" resulted in control of *Brevipalpus* and the leprosis it spread, Childers said. When many growers started using sulfur, there was a significant decline in *Brevipalpus* mites, leprosis and citrus rust mites.

Sulfur remained Florida's leading miticide for years until citrus red mite (spider mite) and scale insects became serious problems from the 1940s through the early 1960s. It turned out that repeated use of sulfur was killing the natural enemies of spider mites and scale insects. The industry sorely needed pesticides that were effective in controlling target pests and that would not cause disruption to non-target pests.

Ethion and dicofol were developed and are still in use today. The broad-spectrum miticide Vendex was registered for citrus rust mite and spider mite control in the 1970s and is also still used.

The systemic miticide Temik came along in the 1970s. Its use is restricted between Jan. 1 and April 30, and it is effective for both citrus rust mites and spider mites.

Micromite, which became available in the 1990s, is targeted at citrus rust mite and can be effectively used in the summer spray.

PETROLEUM OIL

In recent years, there's been growing concern with declining prices, and growers are looking to reduce production costs," Childers said. Many who grow fruit for processing are getting effective citrus rust mite and spider mite control from less expensive petroleum oil applications. Petroleum oil provides three-to-six weeks of control of mites.

Childers said petroleum oil is currently the most widely-used miticide on citrus grown for processing.

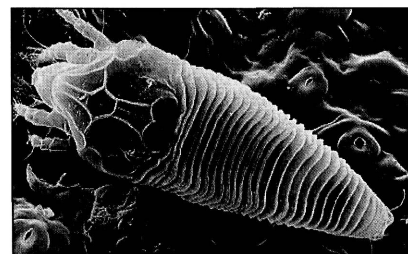
Both petroleum oil and Agri-mek and oil are used widely on fresh fruit. Vendex, Micromite and ethion and oil are also widely used miticides in Florida.

Childers has recently been doing the primary screening of two new pesticides that appear promising for control of citrus rust mite. BASF's Nexter is a broad spectrum pesticide that appears to be effective against rust mites, spider mites and false rust mites. Childers thinks it might be on the market this year. He's also evaluating American Cyanamide's new miticide Alert for use on rust mite.

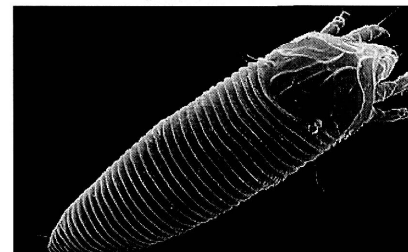
"We have to continually be looking for pesticides that are more efficacious and more cost effective,"

said Childers, who also is conducting studies on insecticides for use against a complex of thrips that cause reduced fruit set or rind blemish injuries on citrus.

Childers said growers need to be thinking about all the various pests in their groves when they embark on pesticide programs. "Just focusing on control of rust mite can be mis-



Citrus rust mite, Phyllocoptruta oleivora (Ashmead). Note the area behind the dorsal shield has a longitudinal trough-like depression. This is characteristic of the citrus rust mite. Color can vary from clear to yellow.



Pink citrus rust mite, Aculops pelekassi (Kieffer). Note the area behind the dorsal shield is rounded. Color can vary from yellow to pink.

leading,” he said. “It’s not the only problem out there.” For example, he said the use of Agri-mek and oil to control citrus rust mite won’t simultaneously control the orchid thrips and related thrips species on citrus. Consequently, growers using Agri-mek also need to tank mix Lorsban with the Agri-mek, or use ethion and oil for both insect and mite control. “We have really a complex of pests and selection of miticides is just one component.”

Many growers are not aware that there are actually two species of rust mites on Florida citrus – the citrus rust mite and the pink citrus rust mite that was first identified in the early 1960s. “They both can cause similar types of damage,” Childers said, adding that a grove that previously had essentially a pure population of pink citrus rust mite changed to citrus rust mite within one season. “The industry has been told about citrus rust mite, but we actually have two species.” All miticides kill both of the damaging mite species, “but there’s a question in my mind whether all registered miticides are equally effective against both, and the only way that will be determined is with field studies.”

Childers provided the accompanying table of miticides that are effective at different times of the year. The table warns against using miticides other than petroleum oil more

than once a year. “Repeated use will accelerate the potential for resistance development,” the entomologist explained.

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CITRUS MITICIDE SELECTION				
Supplemental (Early Spring)	Post Bloom	Summer	Fall	Supplemental (Late Fall)
_____	Agri-mek+oil	Agri-mek+oil	_____	_____
_____	Carzol	_____	_____	_____
_____	_____	_____	Comite	Comite
dicofol	dicofol	_____	_____	_____
_____	ethion+oil	ethion+oil	_____	_____
_____	_____	Micromite	_____	_____
_____	Petroleum oil	Petroleum oil	Petroleum oil	_____
_____	_____	_____	Sulfur	Sulfur
Temik	_____	_____	_____	_____
Vendex	_____	_____	Vendex	Vendex

Except for petroleum oil, do not use a miticide more than once a year.