The OTHER citrus pests

By Michael E. Rogers

As citrus greening disease continues to spread in groves throughout the state, psyllid control is a hot topic of discussion. While psyllid control should be one of the main considerations when developing pest management programs, "the other citrus pests" should not be overlooked, especially given the likely increase in other pest problems due to the use of broad-spectrum insecticides. The following are a few of the pests whose populations should be closely monitored so that actions can be taken if needed to prevent additional crop losses.

Figure 1 (left). Citrus rust mites, Phyllocoptruta oleivora, on fruit surface.

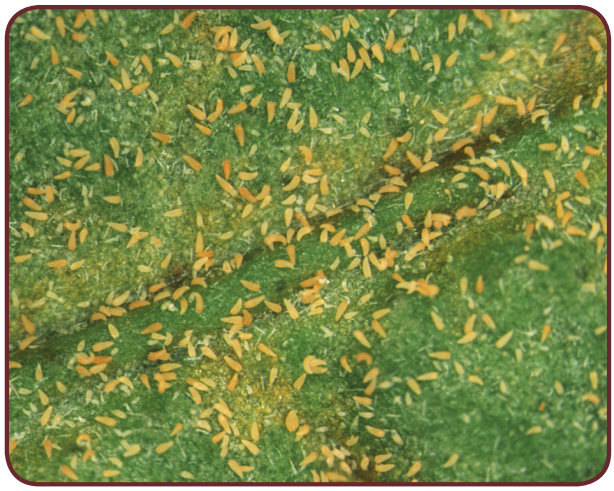

Figure 2 (right). Pink citrus rust mites, Aculops pelekassi, on underside of young leaf in early spring.

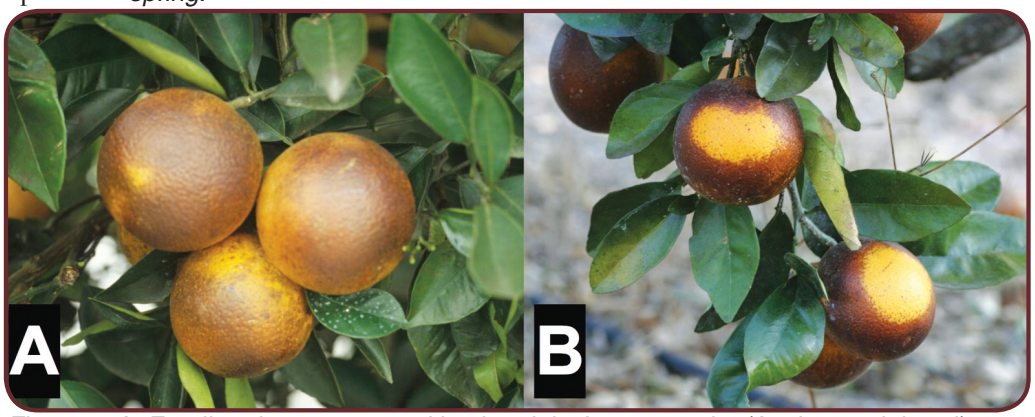

Figure 3. A. Feeding damage caused by the pink citrus rust mite (Aculops pelekassi) which covers the entire surface of the fruit. B. Feeding damage caused by the citrus rust mite (Phyllocoptruta oleivora); 'sun spot' area where mites avoided feeding.

RUST MITES

In Florida, two species of rust mite are commonly found causing damage to citrus fruit: the citrus rust mite (CRM), *Phyllocoptruta oleivora*, (Fig. 1) and the pink citrus rust mite (PCRM), *Aculops pelekassi* (Fig. 2). While both mite species are similar in appearance, there is a difference in the time of year one can expect problems from these mites.

PCRM are most abundant during dry periods of the year with populations typically beginning to increase in April or May. PCRM feeding damage can occur over the entire surface of the fruit (Fig. 3a) affecting appearance. If PCRM populations build up on newly formed fruit, russeting damage to more than 50 percent of the fruit surface can have a noticeable effect on fruit growth.

Populations of CRM begin to increase in May and reach their highest levels by mid- to late-July, after which time populations decline. A smaller but noticeable increase in the CRM population may occur in October or November. Feeding damage by CRM is similar to PCRM except that CRM avoid feeding on the portions of the fruit that receive the most direct sunlight, thus leaving a "sun spot" on the fruit which is free of CRM feeding damage (Fig. 3b).

Over the past four to five years, growers have reported difficulties in managing rust mites, with populations quickly rebounding after miticides have been applied. Much of the difficulty in controlling rust mites has been attributed to the repeated use of copper sprays for canker management, although research studies conducted to date have yet to provide conclusive evidence on the role of copper in mite outbreaks.

Rust mite problems continue to plague more and more growers, particularly following applications of broad-spectrum insecticides used for psyllid control. Of the broad-spectrum insecticides used, pyrethroid insecticides, one of the most effective groups of insecticides for psyllid control, tend to cause the most problems in terms of increased rust mite populations. This is likely due to the long-lasting effect these insecticides have on the natural enemies that help to maintain rust mite populations at manageable levels throughout much of the year. When conditions are favorable, rust mite populations often reach treatable levels within four weeks following a pyrethroid application. If rust mites are below treatment thresholds but a broad-spectrum insecticide (i.e., pyrethroid, organ-ophosphate, carbamate) is to be applied for psyllid control, growers may choose to tank mix a miticide to reduce the need to make a repeat application for mite control.

Scouting for rust mites should begin following fruit set, usually in early- to mid-April and be continued every two to three weeks until harvest. The treatment threshold for processed fruit is 10 mites per cm^2 and 2 mites per cm^2 for fresh fruit.

Figure 4. *Leafminer damage facilitating the growth of canker bacteria.*

LEAFMINER

Citrus leafminer (*Phyllocnistis citrella*) is primarily a concern for young trees, but could warrant control in mature groves where citrus canker is problematic. While leafminer does not directly spread citrus canker, the mining damage to the leaf creates a wound which serves as an ideal location for the buildup of large quantities of canker bacteria (Fig. 4) for dispersal on wind-blown rain.

Adults of the citrus leafminer are active year-round, but populations are lowest during the winter months due to the lack of new flush for egg laying. Leafminer populations begin to increase during the early spring flushes, but are often too low to be noticed at this time without intensive searching. In a typical year, leafminer damage is usually easy to find by late April or early May. If the winter is mild, leafminer activity becomes more noticeable earlier in the season. Such was the case in 2008 when many growers reported leafminer damage in early March followed by sustained high levels of leafminer damage the remainder of the year. After enduring a relatively cold winter this year (2009), leafminer damage did not begin to reach noticeable levels until late April.

Control of leafminer can be difficult during the summer months when trees are continually producing sporadic flushes, which promote continued development of leafminer populations. An insecticide application for leafminer can protect flush present at the time of application, but new flush produced several weeks later is likely to be damaged by the next generation of leafminer that was not controlled by the treatment. For this reason, when applications for psyllid or mite control are being made, choice of a product that will also control leafminer is a more cost-effective approach to reducing leafminer damage. Examples of products that will control leafminer when used to target other pests include Delegate (spinetoram) for psyllid adults and nymphs, as well as Agri-mek (abamectin) and Micromite (diflubenzuron) which both provide control of rust mites and psyllid nymphs. While applications for leafminer are most likely to be combined with applications for these other pests, the optimal timing for a foliar insecticide application to control leafminer is just after the feather leaf stage or about 13 days after budbreak when the first signs of leaf mines are observed.

SCALE INSECT PESTS

In the past, insects such as red scale (*Chrysomphalus aonidum*), purple scale (*Lepidosaphes beckii*) and more recently snow scale (*Unaspis citri*) were important pests requiring insecticide applications to maintain populations below damaging levels. Ultimately, all of the significant scale pests of Florida citrus were reduced to pests of minor importance due to the success of past classical biological control programs. In fact, the numerous success stories of biological control of scale insects in citrus are often referred to as some of the best examples of classical biological control in all of agriculture.

The overwhelming success in controlling scale insects is due to their biology. Adult female scales do not have wings or legs and usually have a hard outer covering. Beneath the covering of the female, hundreds of eggs are hatched over the life of the female and the first stage crawlers disperse usually no more than a few inches from the female where they lose their legs and become settled crawlers. The settled crawlers then develop to adults with little or no additional movement. Because scale insects are relatively immobile and reach high populations in a concentrated area, the predators and parasitoids that feed on scale insects don't have to spend much time searching for their prey … it is like going fishing in a fish hatchery!

The successful biological control of scale insects has been maintained in Florida citrus due to the reduced need for longer use broad-spectrum insecticides in controlling them. With the current use of broad spectrum insecticides for psyllid control, which are detrimental to the predators and parasitoids of scale insects, many of these scale pests are beginning to reappear in low levels in Florida citrus groves.

Currently, the most noticeable scale insect in Florida groves is the citrus snow scale which is found primarily on the trunks of citrus trees. Female snow scales are purple in color and look similar to the purple scale. Male snow scales are white and are at the stage that is easily observed coating the trunk of the tree. While the trunk of a tree may be covered with snow scale, trees can tolerate relatively high populations of this pest. It is not until bark splitting begins to occur (Fig. 5) that control measures should be considered.

Figure 5. Early stages of bark splitting caused by a moderate infestation of citrus snow scale.

The best control for snow scale, or any scale pest, is to eliminate use of broad spectrum insecticides and allow the natural enemy population time to regain control. However, given the

need for psyllid control and the associated risk of greening disease, ceasing use of these products altogether is not feasible. If scale problems were to increase to economically damaging levels in a grove, one possible solution may be to use broad-spectrum insecticides during the early spring and late fall periods when scale populations are not rapidly increasing and use the more 'beneficial friendly' psyllid control products, such as Movento (spirotetramat) and Delegate (spinetoram), during the late spring and summer months when the parasites and predators of scale insects are most likely to be negatively affected by broad spectrum insecticide use. Work is currently under way to evaluate the effectiveness of some of the newer more selective insecticides for control of scale insects in the event that pesticide applications for scale control once again become necessary.

To aid growers in the selection of pesticides for control of these and other pests, the "Quick Reference Guide to Insecticides and Miticides" (ENY-854) can be downloaded in PDF format from the following Web site: http://www.crec.ifas.ufl.edu/extension/greening/PDF/PestTables03-09.pdf

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