

Cooperative Extension

Citrus Leafminer (*Phyllocnistis citrella*)

The University of Arizona \$ College of Agriculture \$ Tucson, Arizona 85721 (part of the publication "Citrus Arthropod Pest Management in Arizona")

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DESCRIPTION AND LIFE HISTORY: The citrus leaf miner appeared in Arizona in the spring of 1999, and currently infests citrus only in the Yuma area. Although citrus leafminer has been a serious pest of citrus in other parts of the world, it has not been especially damaging to Arizona citrus. The citrus leafminer is in the same family as the citrus peelminer, (Gracillariidae), and is similar in general appearance, biology and habit. However, unlike peelminer, the leaf miner is not highly polyphagous and feeds primarily on plants within the citrus family, Rutaceae. In citrus, the leafminer can be found mining the underside of newly formed leaves of flush growth, and are rarely found mining the stems or fruit peel. Leafminers appear to favor grapefruit and navel oranges, but can be found mining lemons in large numbers as well. Mines are found in greatest number in October through December, but can be found on new flush growth throughout the year.



Figure 35. The citrus leafminer moth is about the size of a mosquito with front wings that are silvery in color with darker stripes and black spots on the tips.

The adult has white and silvery iridescent scales on its forewings. The forewings have several black and tan-

colored stripes and distinctive black spots on the tips. The hindwings are feathery in appearance. At rest the wings are folded straight over the back. The moth is small; about the size of a mosquito (4 mm in length). The moths are active during early morning and early evening and can live about 11 days. The adult female lays her eggs singly on the underside of small new flush leaves less than 6.5 mm length. Under high leafminer population densities or when flush growth is limited, multiple eggs may be laid per leaf. Eggs are usually laid along the leaf's midvein usually towards the petiole of the leaf.



Figure 36. Citrus leafminer larva (top) is translucent

This document and others on citrus insect pests can be found at <http://cals.arizona.edu/crops/citrus/insects/citrusinsect.html>

and yellow-green in color, and leaves a serpentine mine (bottom) on the underside of young citrus leaves.

The number of eggs produced per female may range from 30 to 75 eggs. Immediately following oviposition, the eggs are translucent and whitish in color, and resemble tiny water droplets. After several days they become yellowish and opaque. They are extremely small measuring 0.2 X 0.3 mm. The eggs will hatch in 2 to 10 days depending on temperature.

The citrus leafminer produces four larval instars, with a total development time of 5 to 20 days. The first three instars are sap-feeding forms, while the fourth instar is a non-feeding spinning form. The hatching larva immediately begins mining beneath the epidermal cell layer of the leaf leaving nearly invisible mines. These larvae are translucent, light green in color and very difficult to detect. The second and third instars are translucent, yellowish-green and can reach a length of 3 mm. The larger larvae are clearly visible and the mines are easily seen due to increased size and the presence of larval feces within the mine. The mines will meander along the underside of the leaf in a serpentine pattern. The mines resemble a translucent trail of silicone with darkened areas of excrement. The larvae will rarely cross the midvein or to the upper side of the leaf unless overcrowded. The third instar will make its way towards the leaf margin where it will molt into the fourth instar which forms a silken cocoon within the mine. As the silk dries it curls the leaf edge over the cocoon forming a protective pupal cell. The pupa is yellowish-brown and darkens with age. It can easily be revealed by peeling open the pupal cell. The pupation stage requires 6 to 22 days to complete. The entire life cycle requires 14 to 50 days depending on temperature.



Figure 37. Citrus leafminer forms a cocoon within a

pupal cell at the leaf margin.

DAMAGE: The citrus leafminer damages citrus by mining the underside of young citrus leaves; the fruit is rarely mined. Leaf mining results in leaf deformation, partial leaf chlorosis, necrosis, and some leaf drop, which ultimately results in a reduction in the tree's photosynthetic capacity. Additionally, the mines provide an entry point for a number of plant pathogens including citrus canker. A single larva can consume 1 to 7 cm² of leaf area and leave a 6 to 11.5 inch mine. Leaves with only one mine will often drop from the tree. Leaves with 2 to 3 larvae may receive damage to 50% of the leaf surface, and will often remain on the tree.

Yield reduction in mature trees is uncommon, but has been reported in limes heavily infested with citrus leafminer. Mining of spring flush is more damaging than fall flush since the spring flush is primarily responsible for supporting fruit development. Trees three years of age or less are especially susceptible to leafminer damage. Severe damage to young trees may result in delayed maturity of 1 to 2 years.



Figure 38. Citrus leafminer mining results in leaf deformation, partial leaf chlorosis, necrosis, and some leaf drop.

MONITORING: Pheromone traps can be used to monitor adult male citrus leafminers, which can aid in determining when high populations occur. However, control decisions should be based on sampling for active larvae, primarily on trees three years of age or less. Monitoring should begin when 50% of the trees are actively flushing, usually February through May and September through October. Randomly check ten leaves

from ten pieces of flush and with a hand lens, look for live larvae. The larvae may have to be excised to determine if they are alive. On young trees, treat when 30% of the leaves have active mines with live larvae. Older trees should not be treated with insecticides unless severely infested.

CONTROLS:

Cultural: There are no specific cultural control techniques utilized for citrus thrips.

Biological:

•**General Predators and Parasitoids.** Naturally occurring biological control of citrus leafminer has been important in keeping this pest from reaching economically damaging levels in Arizona. In one study in December 2002, over 60% of citrus leafminers were killed by predators and parasitoids in Yuma, AZ. It appears that many of the predators and parasitoids that prey on citrus peelminer prey on citrus leafminer as well.

In The parasitoid *Cirrospilus coachellae* has been reported preying on leafminers. This parasitoid is common, particularly during late summer and early fall. Predators also appear to be important biological control agents of leafminers. The predacious mites, the Yuma spider mite and a *Tydeus* sp. have been observed feeding on citrus leafminer larvae though the leaf's upper epidermal layer.

Commonly used Chemicals: Although rarely required in Arizona, chemical control of citrus leafminer has proven effective. The addition of narrow range spray oil with the insecticide will significantly increase efficacy.

•**Abamectin.** 7 day PHI. Abamectin (AGRI-MEK) is applied at a rate of 0.006 to 0.024 lbs-ai per acre. It cannot be applied to nurseries or by aircraft. It should always applied in combination with a horticultural spray oil at a rate of not less than 1.0gal per acre. Abamectin is relatively nontoxic to beneficial insects and mites. Do not exceed three applications or 0.048 lbs-ai per acre per year, and allow at least 30 days between applications. The restricted entry interval for abamectin is 12 hours.

•**Imidacloprid.** 0 day PHI. Imidacloprid (PROVADO, ADMIRE) is a neonicotinoid insecticide that mimics the nerve poisoning action of nicotine. Admire is the soil-applied formulation and Provado is the foliar formulation of this chemical. When applied to young trees via the soil through a drip-irrigation, emitter system, or drench, Admire has effectively controlled citrus leafminer.

However, at this time, it is not certain if similar efficacy would occur if Admire were injected around trees with a shank applicator followed by flood irrigation. Regardless of application method, it may take as long as six weeks before a fully effective dosage of Admire is distributed within the tree. Admire is applied at a rate 0.25 to 0.5 lbs-ai per acre. No more than 0.5 lbs-ai per acre of Admire may be applied per acre per year. Provado has shown good activity towards leafminers and can be applied at 0.125 to 0.25 lbs-ai per acre. Provado may not be applied during bloom or within 10 days before bloom. Do not exceed 1.0 lbs-ai per acre of Provado per year, and allow at least 10 days between applications. Imidacloprid is safe towards many beneficial insects, especially when applied as a soil treatment. The restricted entry interval for imidacloprid is 12 hours.

•**Spinosad.** 1 day PHI. Spinosad (SUCCESS, ENTRUST), a macrocyclic lactone isolated from the soil microorganism *Saccharopolyspora spinosa*. Spinosad is normally applied to citrus at rates of 0.06 to 0.15 lbs ai per acre, and is relatively nontoxic to beneficial insects and mites. Spinosad may not be applied more than twice per year, and may not be used in nurseries. The restricted entry interval is 4 hours.

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