

# Population Dynamics of the Citrus Leafminer in Arizona<sup>1</sup>

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## Abstract

*Citrus leafminer (CLM) was monitored in a five year old block of lemons on the Yuma Mesa for one year. Unlike 2001, no CLM were found in the spring or early fall. From mid-November through mid-December CLM populations were very light ranging from 1 to 4% infested flush. In early January 2003, the CLM population began to increase peaking on 23 January at 68% infested flush. Although 68% appears to be a large infestation, the CLM population was not numerically high since there was not a great deal of fresh flush growth in the grove at that time. Thus, the CLM were concentrated on what little flush was present. Additionally, CLM larvae were tagged and monitored in January and February 2003. Of the 25 CLM larvae tagged, within five weeks only 9 had survived. Most of those killed appeared to have been killed by predators; most likely Yuma spider mite, *Eotetranychus yumensis*, and to a lesser extent *Tydeus* spp. Six of the larvae were killed by parasitoids, comprising two species; *Cirrophilus coachellae* and an unknown species that was damaged and could not be identified.*

## Introduction

The citrus leafminer, *Phyllocnistis citrella*, is a small moth whose larvae mine young leaves of citrus and causes those leaves to lose their photosynthetic capacity. The citrus leafminer (CLM) is one of the major constraints to citrus production in Asia, and is a major pest of citrus in the Mediterranean, Middle East, Africa, and Australia. The CLM invaded Florida in 1993, and within a few months had completely inundated that state causing great damage. By 1994, CLM was found in Louisiana, Texas, and Eastern and Southern Mexico. In 1999, CLM were found in Northwestern Mexico, Southern California and Southwestern Arizona. In Arizona in 1999 and 2000, the CLM was almost undetectable. In 2001 it was easily found throughout most areas of the central portion of the Yuma Mesa. However, the damage inflicted by CLM was minor and of no economic concern. In Florida, the CLM was severe pest for several years until parasitoids brought the population under control. Currently in Florida, most insecticide applications targeting CLM are on nursery trees. However, in areas where citrus canker occurs, CLM is a major concern since its feeding damage serves as an entrance wound for the pathogen. Thus far in Arizona, the CLM does not appear to be spreading as rapidly as it has elsewhere. However, it is important that we evaluate the population cycle of this pest to determine when to expect population peaks and valley. Additionally, it is important that we evaluate natural control factors of CLM to determine naturally occurring predators and parasitoids will help mitigate existing CLM populations. In this study, we monitored CLM populations in a lemon grove for one year, and recorded parasitism and predation activity.

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## Materials and Methods

This study was conducted in a eight acre block of five-year old 'Limoneira 8A Lisbon' lemon trees grown on the Yuma Mesa. This site was selected because it had a history of CLM infestation the previous year. CLMs were monitored by randomly selecting 100 pieces of flush growth and counting the number of those flush with active CLM mines. The grove was monitored for CLM on a weekly basis for one year.

In addition to monitoring the CLM infestation, active mines were tagged with flagging tape and monitored throughout their development. Twenty-five leaves with live CLM larvae were tagged and monitored twice weekly beginning 1 January 2003. During this period, larval development was recorded and parasitism and predation was noted. Parasitized larvae were removed for the trees and taken to the laboratory where they were placed in ventilated one gallon clear plastic jars kept at room temperature. The jars were monitored daily for emerged parasitoids which were collected for identification.

## Results and Discussion

Citrus leafminer populations were non-detectable from 10 April 2002 until 12 November 2002 (Figure 1). This finding was unexpected since low populations were observed in April and May 2001 and relatively high populations of CLM were evident in late-September through October in 2001. From mid-November through mid-December CLM populations were very light ranging from 1 to 4% infested flush. In early January 2003, the CLM population began to increase peaking on 23 January at 68% infested flush. Although 68% appears to be a large infestation, the CLM population was not numerically high since there was not a great deal of fresh flush growth in the grove at that time. Thus, most of what little flush was present was infested with CLM. By late February 2003, the CLM population had declined to non-detectable levels and remained such for the remainder of the sampling period. The reason CLM populations in 2001 were notable higher than in 2002 is not certain but may be due to the presence of large numbers of natural enemies in 2002.

CLM mortality due to natural enemies was high in this grove beginning in early January (Figure 2). Of the 25 CLM larvae tagged, within five weeks only 9 had survived. Most of those killed appeared to have been killed by predators. These larvae were found dead in the mine and desiccated suggesting that predators with sucking mouthparts were responsible. The most common predators observed during this period were mites; primarily Yuma spider mite, *Eotetranychus yumensis*, and to a lesser extent *Tydeus* spp. Yuma spider mites were very common and were actually observed feeding on CLM larvae. Six of the larvae were killed by parasitoids, comprising two species; *Cirrophilus coachellae* and an unknown species that was damaged and could not be identified. *C. coachellae* is a know parasitoid of the citrus peel miner, *Marmara gulosa*, which is commonly found infesting late summer cotton and fall citrus. The rapid decline of the CLM population in late January was undoubtedly due to the activity of these natural enemies.

Because of the high mortality of the CLM larvae, it was difficult to adequately determine the in-field development rate for CLM larvae. The temperatures during the period when tagged larvae were monitored, was averaging approximately 55°F, and it appeared that the larvae were requiring as many as 21 days to complete their development.

Although we cannot be certain of the economic risk of CLM to Arizona's citrus industry, the fact that we have a diverse array of predators and parasitoids of CLM already present is a positive note. In Florida, once introduced parasitoids were established, the CLM ceased to be a major economic pest of citrus.

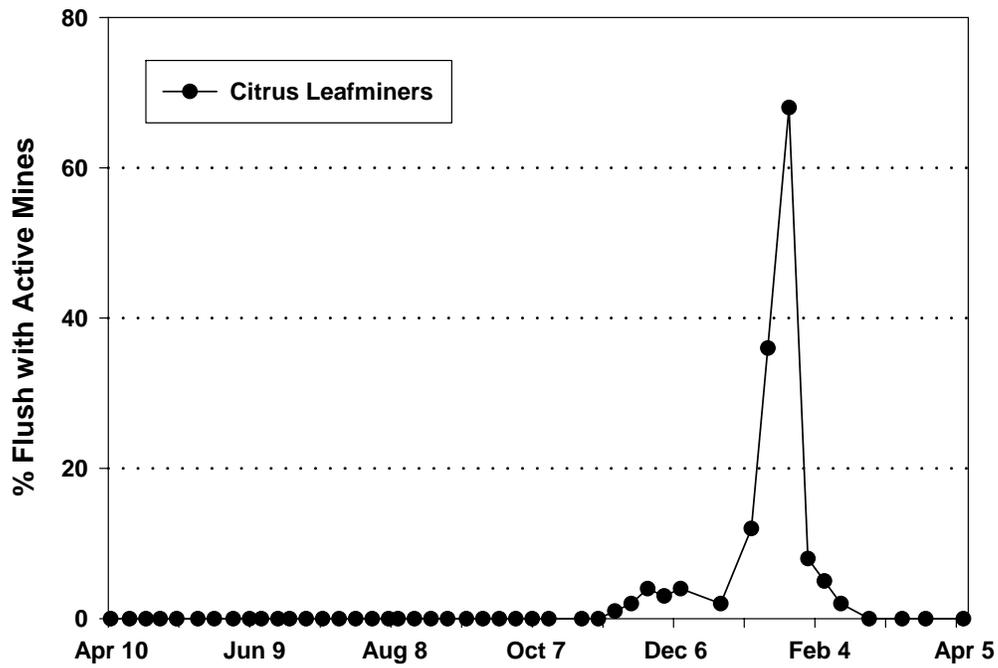


Figure 1. Seasonal abundance of citrus leafminer larvae on five year old lemons on the Yuma Mesa, 2002-2003.

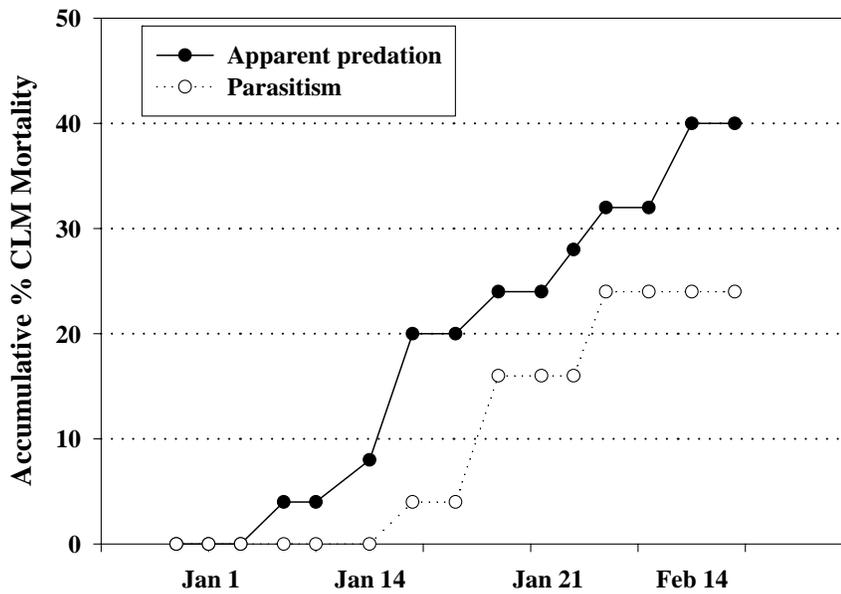


Figure 2. Accumulative percentage of citrus leafminer larvae killed by apparent predation and parasitism, Yuma Mesa, 2003.