

The Citrus Peel Miner, *Marmara salictella*, in Arizona Grapefruit in 1994

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Abstract

The life history of the citrus peel miner was investigated. The peel miner larvae were found in low levels in grapefruit throughout the summer. In September the infestation level rose to 10%. Peel miners were also found in oleanders, mesquites, grapes and tree cottons. Peel miners were found to infest at higher levels in the skirt of the tree (less than 3'). A parasitic wasp of the larval stage was discovered.

Introduction

The citrus peel miner, *Marmara salictella* (Lepidoptera: Gracillariidae), has been present in Arizona for a number of years (Gerhardt, 1968). It is usually found in low numbers, but in certain years it can be a significant pest in citrus groves. The peel miner is a tiny moth that lays its eggs in the fruit peels. The eggs hatch into larvae (Figure 1) that mine under the epidermis causing a light-colored serpentine scar that reduces the value of the fruit. This is in contrast to the citrus leaf miner, *Phyllocnistis citrella*, which has been found recently in Florida, Louisiana and Texas. As its name suggests, the leaf miner feeds within the leaves, which causes leaf curl and loss of photosynthetic area, although if the populations are very high it may attach the peels of the fruit as well.

In 1993, several groves experienced high levels of citrus peel miners. Several materials are available for citrus peel miner control, but little information is available about when to spray. The purpose of this study was to investigate the life history of the citrus peel miner, and to determine when adult moths were active. Activity periods of adult moths were targeted because they are the stage most susceptible to conventional pesticides, and because it is necessary to stop egg laying to prevent the scars on the fruit. We also examined whether landscape and native desert plants serve as significant alternative hosts, and how many generations of moth are present per year.

Materials and Methods

Ten trees were tagged and numbered in a red grapefruit grove (20-3-W) located on the Gila River Indian Reservation at Smith-Enke Road near Bapchule, AZ on July 1, 1994. Sweep samples, fruit samples, and yellow sticky trap collections were taken weekly to monitor citrus peel miner populations. Sweep samples consisted of twenty sweeps of the tree foliage around the entire tree using a standard insect sweep net. The samples were brought back to the laboratory in a plastic bag and the material was sorted under a microscope.

Sticky Aphid/Whitefly Traps were obtained from Seabright Laboratories, Emeryville CA. One trap was placed on the north side of the tree at 5', and a second trap was placed on the south side of the tree at 5'. Traps were replaced with fresh traps weekly and taken back to the laboratory for examination. Traps were not reused.

Other crops, landscape plants, and desert plants were examined for citrus peel miner activity. Oleander and grapefruit samples were gathered at the Bill Clark Farm. Backyard citrus and a Minneola grove were also examined.

To test the hypothesis that peel miners infested the lower part of the tree in higher numbers, three fruit were sampled from each tree: one from below waist height (lower than 3') one at eye level (5') and one at maximum reach (7').

Results and Discussion

The citrus peel miner was found to infest a number of alternative hosts. They had been known to attack oleander (*Nerium oleander*) stems and sometimes leaves, and willow stems (Atkins 1961). The heaviest infestation of peel miners at the Bill Clark Farm was near an old row of oleanders, which were also heavily infested. During this study, larvae were found mining in mesquite (*Prosopis*) and grape (*Vitis vinifera* 'Thompson Seedless' and 'Flame') stems. In addition to being a fruit peel miner, the larvae were also found to be a stem miner in the spring new growth of young citrus (grapefruit, dwarf lemon and Minneolas).

Peel miner larvae were discovered in the stems of some tree cottons (*Gossypium barbadens*) grown by Dr. Richard Percy at the Maricopa Agricultural Center. Stem mining is not reported in upland cotton, and the leaf miner commonly found in cotton is not his moth, but a tiny fly, *Agromyza*.

The finding of *Marmara* in tree cottons was interesting because Roger Stone of the Gila River Farms had observed that the number of miners appeared to rise in citrus fruit at about the time cotton was being defoliated, which is what we observed in this study. Live miner larvae were first found in backyard grapefruit peels (unsprayed) on 5/18/94. These were grapefruit that had been left on the tree from the previous year. Miners were found in low numbers (less than 1%) throughout July and August in the trial grove (Figure 2). Percent fruit infested jumped to more than 10% in October. Although this correlates with the observation that peel miner numbers rise when cotton is being defoliated, we have no idea if there is any causative link.

The number of adult moths trapped is also shown in Figure 2. We found that monitoring adult moths was not practical using a sweep net. No moths were caught this way. A few moths were trapped on the sticky traps, but not enough to make accurate population estimates.

During the fruit collection portion of the study, an observation was made that a higher percent of the fruit in the skirt of the tree (lower 3') was found to have peels with mines or mine scars. Because it was possible that this pattern was the result of aerial application of pesticides in the commercial grove, the number of infested fruit was investigated on unsprayed trees. The results suggest that miners do infest fruit found near the bottom or the skirt of the tree (Figure 3).

When inspecting infested fruit, some of the peel miner larvae were found that had been attacked by a parasitic wasp from the family Eulophidae. Species was not determined.

Recommendations for Further Research

1. It is critical to develop a better sampling method for adult moths so growers know when to spray. Although traditional insect sampling techniques did not seem to be useful, there are some ways to increase success. We recommend that if the miner continues to be a serious pest, that efforts be initiated to identify the citrus peel miner pheromone to be used as a lure in sticky traps.

It was noticed that the infested grapefruit seemed to be a certain minimum size, below which the fruit seemed not to be attacked. It would be relatively simple to weigh and take the diameter of a sample of infested fruit versus a random sample from the tree to determine if size seemed to be important. It is possible the grower would not need to spray until the fruit reached a certain size. In the same vein, the peel miner populations might take off in September because of the internal changes in the sugar concentration of the fruit. It might be relatively simple to use sugar content as a gauge when to spray (if there is a good correlation with miner activity).

2. Because the miners concentrate in the tree skirt, it seems likely that ground applications would be more effective than aerial applications, but this should be tested.

3. Identify and determine the impact of the parasitic wasp and other biological control agents. The citrus peel miner seems to be a problem sporadically. It is possible that the recent use of certain insecticides (for example, for whitefly control) is disrupting biological control agents that normally keep these insects at low levels.

Literature Cited

Atkins, E.L. 1961. Citrus Peel Miner. California Citrograph. 46: 367-71.

Gerhardt, P.D. 1968. Citrus Peel Miner. Report to Granting Institution. 6 pp.

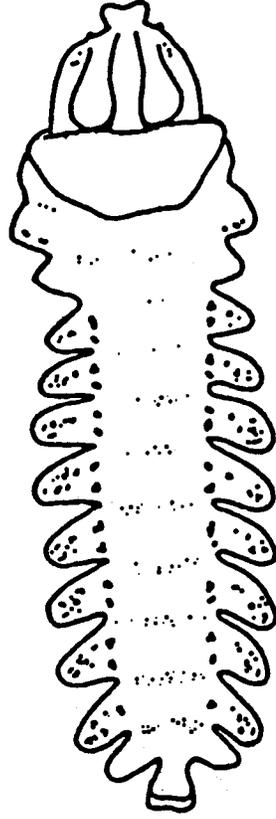


Figure 1. The larva of the citrus peel miner, *Marmara salicella*, can be found within its mine. It is quite flat, transparent and has a distinctively shaped head capsule. The larvae leaves the mine to pupate.

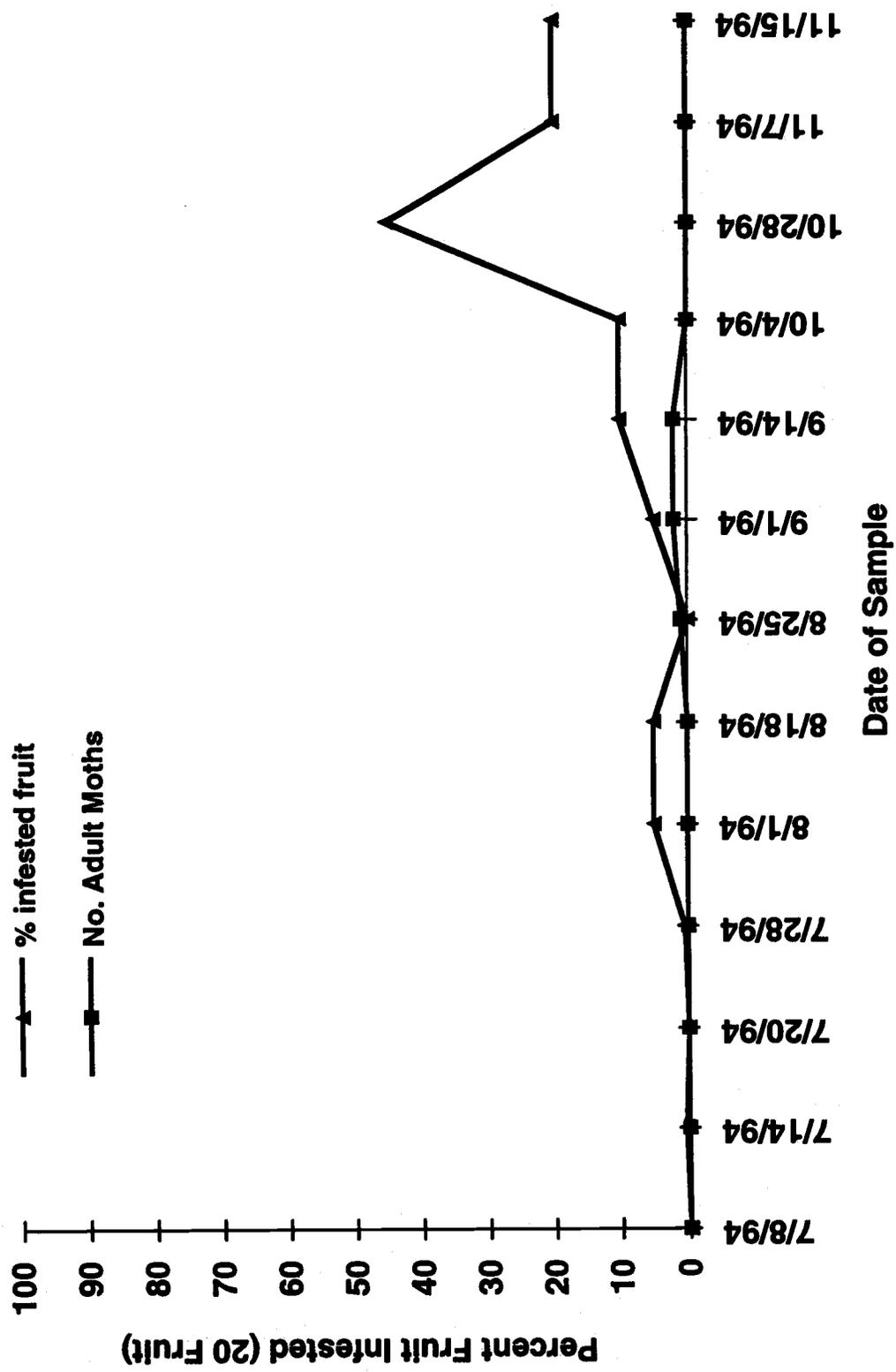


Figure 2. Citrus peel miner activity in ten grapefruit trees during 1994. The number of adult moths was the number found on yellow sticky traps.

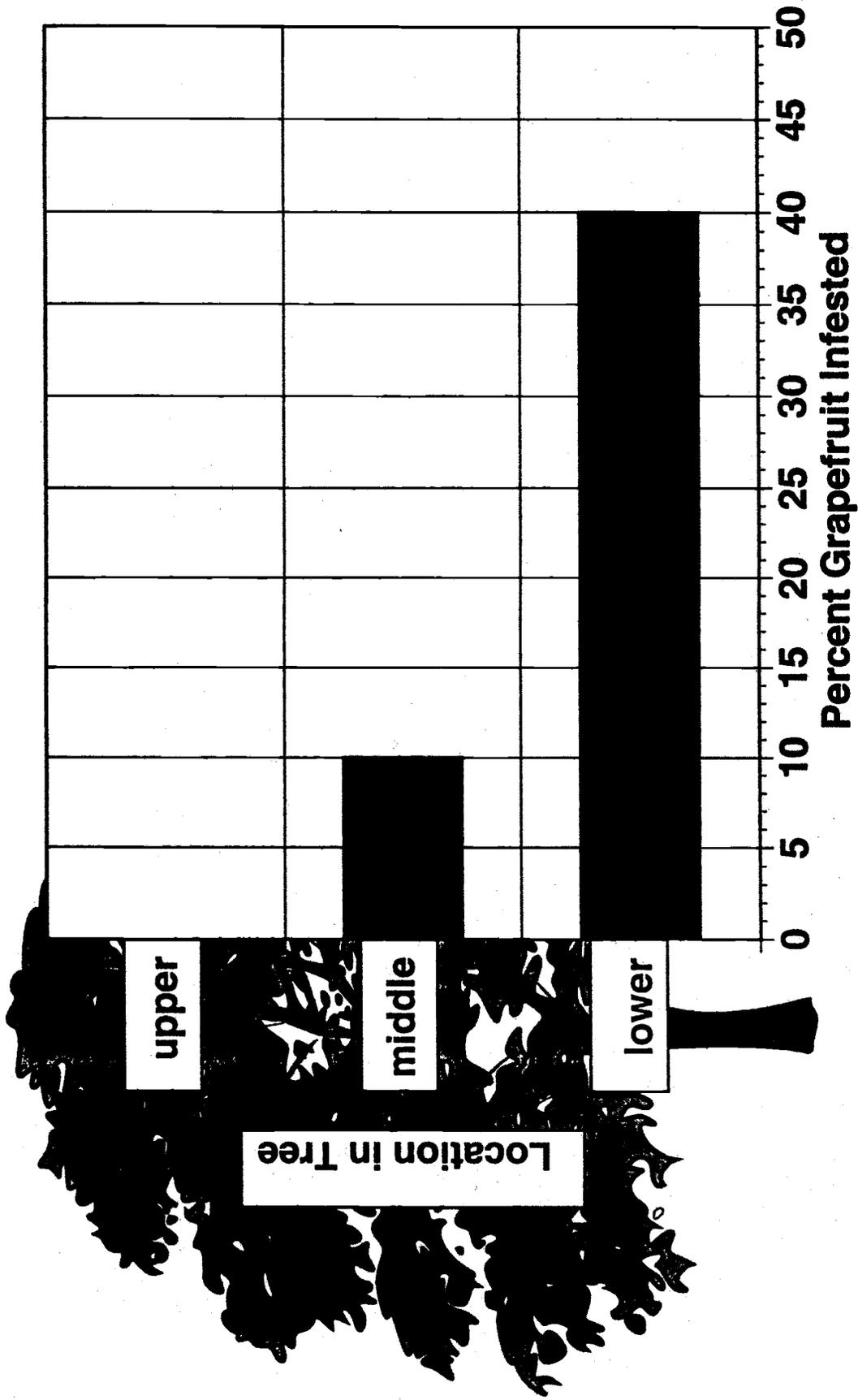


Figure 3. Percent grapefruit infested at three levels within the tree. The lower level is below 3 ft., middle is at 5 ft. and upper is 7 ft. from ground level.