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Mine-damaged leaves by *Phyllocnistis citrella* Stainton provide refuge for phytoseiids on grapefruit in Florida and Texas*

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Abstract

Damages caused by pests to leaves can indirectly affect populations of other associated arthropods. The relative abundance of mites was compared across young healthy leaves, mature healthy leaves and mature leaves damaged by the citrus leafminer, *Phyllocnistis citrella* Stainton, on grapefruit in Florida and Texas. The spider mite *Eotetranychus sexmaculatus* (Riley) (Tetranychidae) was significantly more abundant on mined leaves in Florida, whereas in Texas tetranychids were found sporadically. Predaceous phytoseiid mites (Phytoseiidae) were significantly more abundant on mature mined leaves than on mature leaves without mines. *Iphiseiodes quadripilis* (Banks) (n= 139), *Typhlodromalus peregrinus* (Muma) (n= 122) and *Euseius mesembrinus* (Dean) (n= 18) were the most abundant phytoseiids in Florida; *E. mesembrinus* was the dominant species in Texas [>90% of identified specimens (n=13)]. Although relatively high numbers of predaceous stigmaeid mites (Stigmaeidae) were found in some occasions in Florida, they had a patchy distribution, resulting in no significant differences between mined and unmined leaf types in most sampling dates. They were not found in Texas.

Key words: Citrus, leafminer, mite-refuge, *Phyllocnistis citrella,* phytoseiid.

Introduction

Alterations of the leaf surface due to feeding and/or damage by pests may produce changes in the distribution of small arthropod populations, including mites. The citrus leafminer, *Phyllocnistis citrella* Stainton (Lepidoptera: Gracillariidae), is one of the pests that change the surface of attacked leaves. In the United States, it was first reported in Dade County, Florida in 1993, spreading quickly throughout the rest of this state (Heppner, 1993) and to neighboring states, including Alabama, Louisiana and Texas (Legaspi *et al*., 1999). *Phyllocnistis citrella* was initially considered a serious pest in Florida but native natural enemies (Amalin *et al*., 2001), introduced parasitoids (Hoy & Nguyen, 1997) and new IPM programs had an impact on its population densities. Today, *P. citrella* is considered a secondary pest problem (Browning *et al*., 2001), although infested plants become vulnerable to infection by Asiatic citrus canker, caused by the bacterium *Xanthomonas axonopodis* pv. *citri* (Hasse). Adult *P. citrella* females deposit single eggs on young citrus foliage (flush), preferring the midrib on the abaxial surface and occasionally green twigs and young fruits. Immediately after hatching, a larva bores through the leaf epidermis and forms a mine. The mine is serpentine in form and each succeeding larval instar widens the tunnel. Mines caused by *P. citrella* larvae prevent young leaves from expanding uniformly, causing the folding and/or twisting of leaves as they get older. The third instar causes most of the damage, with the prepupa preparing a pupal chamber by folding the edges of the leaf down or upwards and binding them together with silk (Hoy & Nguyen, 1997).

Folded leaves are sheltered spaces that provide refugia to other small arthropods. These spaces may provide more favorable microenvironment conditions than leaves without *P. citrella* damage.

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