Putting Leafminers In The Line Of Fire

New research suggests application timing might be more effective for major citrus pest.

By Moneen Jones and Phil Stansly

The citrus leafminer (CLM), *Phyllocnistis citrella* Stainton (*Lepidoptera: Gracellariidae*), was first detected in Florida in 1993 and quickly spread throughout the state. Leafminer damage to young shoots leads to reduction in photosynthesis, malformation of leaves, and increased susceptibility to citrus canker disease, an increasing problem for citrus production.

Calendar sprays for Asian citrus psyllid (ACP) management, particularly broad-spectrum insecticides, likely has impacted natural enemies of CLM and caused its rebound. Thus, CLM and ACP management are inextricably connected. Efforts to control CLM with foliar insecticides generally meet with limited success, in part because growers aren't treating.

Lures, Traps, And Timing

A synthetic blend of synthetic compounds that mimic the CLM female sex pheromone is being tested for mating disruption as well as timing insecticide spraying, tracking adult emergence, and monitoring CLM within citrus groves. While control of CLM by mating disruption has excellent potential, cost is still prohibitive. Instead, we are evaluating the economics of using sticky traps placed in groves to monitor CLM distribution and density.

Timing and application methods also are important considerations for effective management of CLM. Recommended insecticides target larvae, which are present only in young tender shoots. Systemic insecticides (neonicotinoids) can be applied as soil drenches with long residual action, but foliar sprays targeting larvae must be directed at ephemeral foliar flush. The common practice of waiting until flush becomes heavily damaged to begin spraying may not be the best strategy for effective control. CLM populations suffer attrition during the winter dormancy period. The first spring flush provides resources necessary for survival in the next season and therefore a vulnerable target for an early, well-timed application.

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Preliminary Trials

Last year we used Citrus Research & Development Foundation (CRDF) funding to test pheromone traps in citrus groves as a tool to improve grower management of CLM. Two grower trials were designed to see whether heavy damage from CLM typically seen in late spring and early summer could be mitigated by controlling the first generation of the year in the spring flush. We used Intrepid 2F (methoxyfenozide, Dow AgroSciences), a selective insect growth regulator effective against CLM and other species of *Lepidoptera*, in three 15-acre blocks comparing three application timings: (1) an early spray on Feb. 28 based on first flush; (2) a slightly later spray on March 14 corresponding to the first peak flight; and (3) a grower standard that included sprays of Delegate (spinetoram, Dow AgroSciences) on March 27, Actara (thiamethoxam, Syngenta Crop Protection) on April 20 on all plots, Govern 4E (chlorpyrifos, Tenkoz) on May 17, and Dibrom 8E (naled, AMVAC) on May 23. Peak moth flights are determined when pheromone trap captures fall after a period of increase.

In a separate trial, two 20-acre blocks were used to test two application timings of Intrepid: an early application on March 14 followed by a spray of Delegate applied after peak moth flight on April 19 (when the majority of egg/larval stages are present) compared to a grower standard of calendar sprays (March 27, Delegate WG).

Aerial applications have not been used often for CLM control, so we also initiated a trial in July with two treatments of Intrepid (ground vs. aerial) compared to Delegate applied by air. We monitored moth flight using pheromone traps and assessed CLM damage using ranking protocol based on the Horsfall-Barratt system. Finally, we also tested three densities of traps (1 trap peracre), (1 trap per 3.5 acres) and (1 trap per 5 acres) in grapefruit to determine optimal spacing.

What We Learned

Trial 1: Significantly fewer moths were caught in plots treated according to first flush or first peak flight compared to the grower standard. These differences in moth flight between treatments and the grower standard were still visible after the third peak. Because the second application of insecticide was identical for each plot, it suggests the prior spray of Intrepid was responsible for this difference in moth catch. Likewise, differences in CLM damage were less on trees sprayed at first flush or first peak flight compared to the grower standard.

Trial 2: Fewer moths were captured in the block sprayed following peak moth flight until the third peak when both blocks were inadvertently sprayed by the grower on the same date with the same insecticide. However, differences in moth counts were still present for two months, which suggests that the earlier sprays were beneficial for CLM control.

Aerial Vs. Ground: Significantly less leaf damage was seen on trees sprayed with Intrepid 2F (aerial or ground) compared with Delegate or untreated July 20. On July 29, significantly less damage was observed in response to the Intrepid 2F ground and Delegate treatments compared to the untreated check.

Trap Density: While the pheromone manufacture recommends placement of pheromone traps at 1/acre, this grower was still able to note peaks for spray application timing with fewer traps (1trap per 3½ to 5 acres), although a greater density of traps (1 trap per 2½ acres) produced more refined peaks. Therefore, one trap per 5 acres for large (i.e., more than 60 acres) blocks or one trap per 3½ acres for smaller plots should be sufficient.

Where We're Headed

Preliminary results indicate accurately timed sprays immediately after the dormant season and efficient monitoring methods are effective to manage CLM. The plan is to continue with replicated studies to monitor CLM populations by use of pheromone traps. We are developing a degree-day model for CLM that could be used instead of traps to predict peak flights. FG

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