PD/GWSS Fact Sheet – Controlling Pierce's Disease in Southern California

Pierce's Disease: How It Is Transmitted

Pierce's disease (PD) is the result of a three-part interaction involving the plant host, the insect vector, and the causal bacterium, *Xylella fastidiosa* (*Xf*). The Glassy-winged sharpshooter (GWSS) plays a major role in spreading PD, so researchers immediately began projects to better understand, monitor, and control this little- known insect.

The Temecula and General Beale PD epidemics were much more severe than California's traditional patterns of PD, and researchers found that vineyards in these areas acquired new infections of *Xf* in a different way than vineyards in the northern costal areas north. In the north, PD is the result of vector insects that acquire the bacterium from infected native plants that were growing outside the vineyards. These insects then flew into vineyards early in the growing season and transmitted *Xf* to the grapevines. This pattern is known as "primary spread."

By contrast, the GWSS-vectored epidemics in Southern California were almost entirely the result of "secondary transmission," also known as vine-to-vine transmission. This happens when insects acquire the bacterium from infected vines, then fly to uninfected neighboring vines and transmit the bacterium. It was this pattern of vine-to-vine transmission that caused the Southern California epidemics to be so rapid and devastating. Before GWSS became established, vine-to-vine transmission of PD was virtually unknown anywhere in the state.

Understanding the Mid-Season Window of Vulnerability

The vine-to-vine spread of PD depends on three things: (1) what time in the season the new infections occur, (2) the occurrence of "over-winter recovery" of the vines, and (3) what point in the season the bacteria in a diseased vine begin to multiply, move in the plant and populate the new foliage.

Research found that vine-to-vine transmission cannot begin until that time in the season when the surviving bacteria have arrived in the new growth. When that happens in Northern California it is too late for any new infections to survive the following dormant season. Thus, in general, vine-to-vine transmitted infections cannot survive dormancy. Only infections from the very early season transmissions from sources outside the vineyard can survive.

However, in Southern California vine-to-vine transmitted infections that occur in June and July have enough growing time left in the season to become established, survive the winter, and progress to cause PD during the next growing season. So in Southern California there is a window of vulnerability in the middle of the season for vine-to-vine transmission leading to devastating losses from PD.

Armed with this information, researchers and government officials working with winegrape growers in Temecula developed a protocol to virtually eliminate the vine-to-vine spread of PD by GWSS by using one carefully timed application of a persistent, systemic insecticide such as imidacloprid.

Protecting Vineyards: A Single Application of the Right Systemic Insecticide at the Right Time

During the devastating Temecula epidemic, close to half the vineyards were so severely damaged that they had to be replanted. From 2000 to 2007, California Department of Food and Agriculture and U.C. Cooperative Extension scientists and industry advisors conducted tests and have advocated that Temecula vineyards be treated each May with imidacloprid. The goal in Southern California is to protect against vine-to-vine transmission from early May through the rest of the season. Imidacloprid, when applied in the drip irrigation system in early May, will persist in xylem at sufficient concentrations to protect against GWSS for the rest of the season. Thus, vineyards are protected during the critical window of vulnerability when the populations of GWSS in vineyards peak in July, the worst time for vine-to-vine transmission. GWSS nymphs that may have been developing in the vineyard are killed before they reach the adult stage in July and are ready to fly. Also, any GWSS that fly into the vineyard are quickly eliminated when they start to feed and so do not have the opportunity to transmit the bacteria from one vine to another.

For the last several years following the epidemic, GWSS populations have been low thanks in large part to an area-wide control program. Most of the Temecula area vineyards have been receiving imidacloprid treatment while a few vineyards have not been treated. When a cooperative UC-CDFA-industry team surveyed vineyards in 2007, they found that the treated vineyards were almost disease free, while the non-treated vineyards were heavily damaged by PD. The damage in these non-treated vineyards happened during the years when GWSS populations were controlled by the area-wide control program. The last few years of imidacloprid treatment have demonstrated in actual field conditions that treated vineyards can remain virtually free of PD, even in the presence of low to medium levels of GWSS, while non-treated vineyards continue to sustain major losses.

Recommendations

These observations, along with the combined findings of several lines of research, have led to a new recommendation that growers in Southern California adopt two preventive practices:

1. Apply a persistent systemic insecticide, such as imidacloprid, in May of each year, for a cost of about $75 per acre, (cost is subject to change).
2. Survey vineyards late in the season, just after the last watering but before the vines begin to go dormant, to identify those vines with symptoms of PD. Suspected vines can be confirmed by submitting samples to county agricultural agents and U.C. Extension advisors, who will send the samples to the CDFA Plant Pest Diagnostics Laboratory in Sacramento for testing. Vines confirmed to be infected with *Xf* should be removed. If the rate of infection is low (less than 0.5%), experience has shown the cost of survey, testing and removal can be less than $5 per acre.