Texas Cooperative Extension
TEXAS PD NOTES

Texas Cooperative EXTENSION The Texas A&M University System

JULY 31, 2006 VOLUME 2, ISSUE 4

Summer Stresses Reveal Xylella Infection– Jim Kamas

At this point in the growing season, symptoms of Pierce's disease infection become more apparent than any other time of the year. High transpiration rates brought on by a full canopy and high summer temperatures test a vine's xylem tissue's ability to deliver water to the canopy. Obstructions to this plumbing system result in the typical symptoms associated with Pierce's disease. Although no grower wants to see infected vines in their vineyard, this window of opportunity provides a critical time for identification and removal of infected vines.

With all of the work done on Pierce's disease, researchers still do not know the whole story of how this pathogen kills susceptible vines. This is what we do know:

* The bacterium multiplies rapidly under warm conditions. It is believed that disease progression is more rapid under Texas conditions as compared to California.
* Bacteria colonize the xylem tissue, stick together through more than one means and directly obstruct water conductivity in infected tissue.
* The pathogen triggers the production of resin-like substances called fastidian gum (formerly refered to as xanthum gum) which further occludes xylem tissue.
* The pathogen also affects normally occurring plant structures called tyloses. In infected vines, tyloses are more frequent and larger which further obstructs the movement of water.
* It is speculated that *Xylella fastidiosa* triggers the production of a toxin that may further damage tissues in susceptible vines.

Varietal Differences

Among susceptible varieties, there are considerable differences in how initial symptoms appear and how quickly they appear. For example, if 'Chardonnay' is infected early in the season, it often shows initial leaf scorch later in the same season. 'Cabernet Sauvignon' however, may take two to three years to show initial symptoms of infection. Symptom development is also affected by how many times a vine is challenged with the pathogen. If a vine is inoculated one time by a sharpshooter carrying *Xylella*, it may or may not come down with the disease. If it is inoculated ten times over say a week, it has a greater chance of becoming infected. If that same vine is inoculated one hundred times over a week, not only is the vine much more probable to becoming diseased, it will also show symptoms much more rapidly than a vine challenged fewer times. This explains why vines die so quickly in the "PD Hot Zone" as Lisa Morano would say.

While field longevity may be a good thing to the overall productive life of a given grapevine, it is not necessarily a benefit in managing a vineyard at risk to PD. If a 'Cabernet Sauvignon' block only has 2% infection in a given year, the lack of symptoms means that the grower has no knowledge that infected vines exist and consequently those vines will not be rogued. Those vines then serve as sources of inoculum for one or more years and could be the cause of much more widespread infection throughout the block. 'Chardonnay', however, could be recognized the same season it is infected, then tagged and removed so that infected vines don't carry over to the next growing season. 'Chardonnay', however, could be recognized the same season it is infected, then tagged and removed so that infected vines don't carry over to the next growing season. Regardless of the variety, take the opportunity this time of the year provides to at least identify vines that appear to be infected.

TEXAS PD NOTES IS PRODUCED AND EDITED BY

- Mark Black, Extension Plant Pathologist, Uvalde TX
- Ed Hellman, Extension Viticulturist, Lubbock, TX
- Jim Kamas, Extension Fruit Specialist, Fredericksburg, TX

Additional Articles Contributed by Members of the Texas Pierce's Disease Task Force

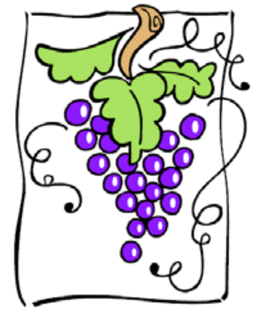
INSIDE THIS ISSUE:

Summer Stresses Reveal Xylella Infection– Jim Kamas 1

Feature Article– The Importance of Vine Roguing in Texas– Dave Appel 2

Symptoms of Pierce's Disease– Jim Kamas 3

Texas Cooperative Extension
Texas PD Notes
VOLUME 2, ISSUE 4



The Importance of Vine Roguing in Texas-

David Appel, Dept. of Plant Pathology & Microbiology, Texas Agricultural Experiment Station, College Station, TX

A common recommendation for controlling many plant diseases is to prune or remove infected plants. This recommendation, termed *roguing*, is only effective when there is a thorough understanding of the disease epidemiology. For example, the first, or *primary* infections to occur in a crop may come from *inoculum* formed on plants growing nearby. Inoculum in the case of Pierce's disease is bacteria. Current research is leading to identification of many plant species in Texas suspected of harboring the inoculum for primary infections coming into a vineyard. For this reason, control recommendations for Pierce's Disease include some form of roguing plants in the vicinity of the vineyard.

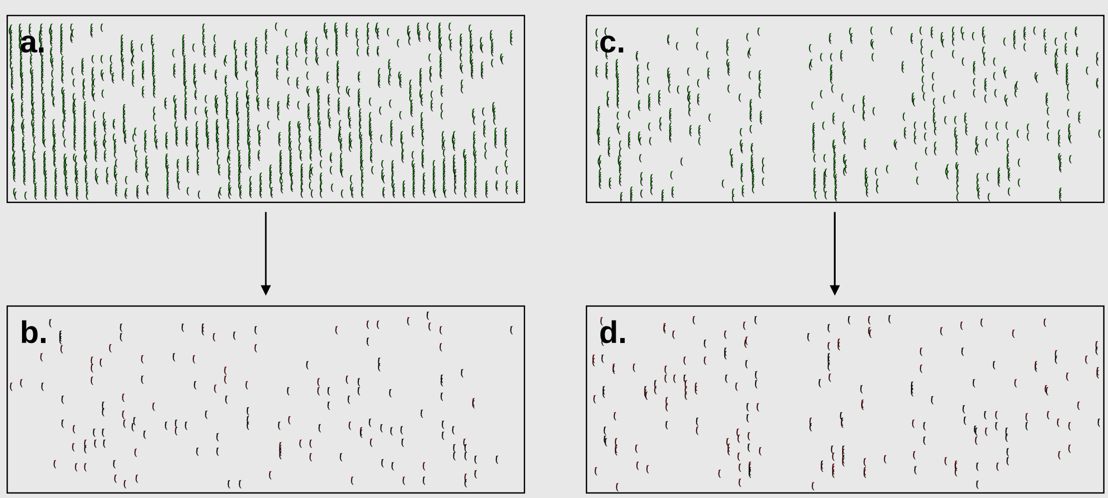
Spread within the vineyard from vine to vine, resulting from *secondary* inoculum has also been the subject of a great deal of research wherever Pierce's Disease occurs. Secondary spread has traditionally been considered to be unimportant in northern California vineyards because of limitations by the red headed and blue green sharpshooters. However, introduction of the glassy winged sharpshooter into southern California has increased the importance of secondary spread in Pierce's Disease. Prior to the GWSS, limited roguing in the form of pruning canes from infected vines annually was successful in eliminating the pathogen from infected vines. This was possible only because the other sharpshooters were unable to infect lower portions of the vines. Secondary spread is also considered to be an important factor in susceptible Texas vineyards, where the GWSS and other capable sharpshooters exist in abundance.

In order to deploy roguing to manage secondary spread, one additional concept must be considered. This is the *latent period*, the time between the infection of the vine and appearance of symptoms. In order to effectively rogue to control secondary spread, vines with latent infections must be removed along with any symptomatic vines. By studying the epidemiology of secondary spread in a Texas vineyards comprised of the variety 'Viognier', some insights on how best to rogue vines are emerging. This analysis is made possible through the use of mapping in a computerized geographic information system. The fate of each vine can be monitored from one year to the next by building a series of linked maps based on sequential annual surveys. For example, In Figure 1a below, the vineyard is illustrated as if the grower rogued all symptomatic vines at the end of the growing season (October) in 2003. One year later in 2004, 143 (Figure 1b) of those vines were dead. Presumably most, if not all of those dead vines were carrying latent infections the previous year but were missed during the 2003 roguing operation. This same exercise, repeated for the 2004 -2005 seasons, indicates that 180 symptomless vines would have to be removed in order to effectively eradicate the latent infections.

In analyzing the spatial distributions of the dead vines, it becomes apparent that many are the result of not removing sufficient numbers of vines along the rows or across the rows, adjacent to the diseased vines. I therefore recommend that if roguing is to be deployed in an extremely susceptible variety such as 'Viognier', then a minimum of one symptomless vine along the row, on either side of the symptomatic vine, be rogued. In addition, the vine directly across the row and the two adjacent to that vine should also be destroyed. I suspect that these recommendations can be amended for varieties with tolerance or resistance to Pierce's disease. This supposition is being investigated during the 2005 -2006 seasons.

Secondary spread is considered to be an important factor in susceptible Texas vineyards, where the GWSS and other capable sharpshooters exist in abundance.

Figure 1. Maps of disease progress in a Viognier vineyard, illustrating how latent infections can complicate roguing to eradicate *Xylella fastidiosa* and reduce losses: a. vines (n=1327) rated 1, or healthy in Oct. 2003, b. Vines (n=143) rated 4,5, and 6 in Aug. 2004, c. Vines (n=519) rated 1, or healthy in Aug. 2004, c. Vines (n=180) rated 4,5,and 6 in July 2005.



To Effectively See Apple's Graph, Enlarge in Photoshop to Greater Than 100% Standard Size– JK

Symptoms of Pierce's Disease– *Jim Kamas*

There are numerous symptoms expressed by vines infected with Xylella fastidiosa. The first sign if infection is non-uniform leaf scorch. Whereas drought and salt injury usually scorch leaves uniformly, PD leaf

scorch is normally somewhat irregular. On red cultivars, it is not uncommon for a red "halo" to accompany the scorch.

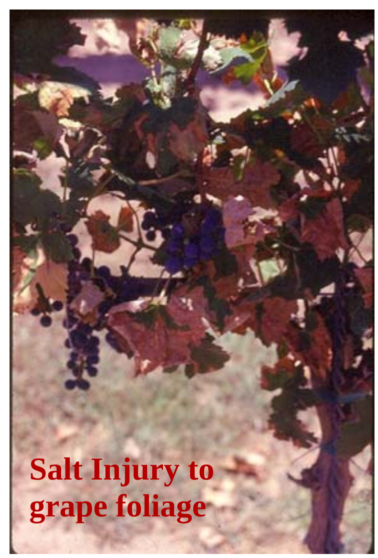
The second sign is early leaf blade defoliation with the retention of petioles. The development of this "matchstick" symptom is commonly considered to be the real first red flag to alert growers to possible infection.

The third symptom to watch for is the uneven maturation of green shoots. As the shoots mature into canes periderm or brown bark begins to form, The node or juncture where the leaf attaches to the shoot remains green while internodal areas turn brown. This is considered a definitive field symptom of Pierce's disease.

Fourth, with the continued stress of sugar accumulation in ripening process, fruit clusters commonly collapse in the advanced stages of infection. This is commonly accompanied by further collapse of vegetative tissue and even whole cordons or vines. While we can observe cordon collapse as a result of winter injury, it sometimes begs the question why was the hardiness of that particular cordon compromised. Could have been PD or any number of other physiological reasons.

Don't Be Fooled

Confirmation of suspected vines is still strongly recommended to help train a growers eye prior to vine rouging. It is still quite easy to be fooled especially in a hot, dry year. Downy mildew can cause the abscission of leaf blades and many site and water issues such as drought, mechanical injury, phytotoxicity from sprays, salt problems or shallow soil can lead to leaf scorch.



Salt Injury to grape foliage

Many physical or chemical problems can lead to foliar symptoms that resemble Pierce's disease. Confirmation of symptoms from a reliable lab is strongly recommended.