Pest e-alerts

Entomology and Plant Pathology, Oklahoma State University
127 Noble Research Center, Stillwater, OK 74078
405.744.5527

Vol. 8, No. 30 http://entoplp.okstate.edu/Pddl/ **Oct 6, 2009**

Pierce's Disease of Grape – A Growing Concern in Oklahoma

Damon L. Smith, Turfgrass and Horticulture Crops Extension Pathologist
Jennifer Dominiak-Olson, Asst Ext Spec, Plant Disease Diagnostician

You will likely remember that we wrote last season about the first report of Pierce's disease of grape in Oklahoma. You will remember that in that case, 'Concord' grape samples exhibiting symptoms of disease were submitted to the Oklahoma State University Plant Disease and Insect Diagnostic Laboratory (PDIDL). These samples were taken from four grapevines found in a home gardener's backyard in Canadian county. Our tests confirmed the presence of the Pierce's disease strain of the bacterium, *Xylella fastidiosa*. The plants were removed and destroyed after confirmation of this finding.

This season, more extensive surveying for Pierce's disease by the Oklahoma Department of Agriculture, Food and Forestry (ODAFF), has resulted in an array of vineyards being tested for the disease and a large number of grapevine samples being submitted to the OSU-PDIDL. From these samples, Pierces disease has again been identified, this time in two vineyards in the State. Testing is on-going, so there may be additional finds. The two vineyards have mostly *Vitis vinifera* cultivars planted. Oklahoma State University extension specialists have visited both vineyards after the initial positive confirmation of Pierce's disease, and have determined that the disease is widespread in both locations. The vineyards are located in Tulsa and Creek counties. These locations seem a bit unusual for identifying Pierce's disease because traditional dogma suggested that locations which experienced freeze events were not conducive for the survival of the pathogen. However, given the widespread nature of the infestation in both vineyards, survival has obviously occurred.

Recent research in North Carolina and Georgia examined the low-temperature thresholds as they related to risk of Pierce's disease in grapevines. From those multi-year/multi-site studies they concluded that winter-time temperatures at or below 10 °F for two to three (2-3) days were required for a vineyard to be considered at low-risk for Pierce's disease. Otherwise, vineyards were considered at medium to high-risk based on other temperature thresholds (Anas et al., 2008).

We investigated the winter-time temperatures for Craig, Tulsa, Payne, Lincoln, and Kiowa counties for the past 10 years using our Oklahoma Mesonet weather stations. We specifically investigated the numbers of days for which surface air temperatures were at or below 10 °F. Only Craig Co. met the required thresholds to be considered a "low-risk" county in all but one year (Fig 1). In other counties, thresholds were not met in many of the years, or thresholds barely reached the absolute minimum of two days with temperatures ≤ 10 °F. In 2007, temperature data indicate that vineyards in all counties examined were at moderate-risk for Pierce's disease (Figure 1). Considering this information, Craig county and surrounding areas are likely at relatively low-risk for developing Pierce's disease. I would consider the other counties examined (Tulsa, Payne, Lincoln, and Kiowa) to be at moderate-risk for the development of Pierce's disease when we consider winter-temperature duration and possible survival of *X. fastidiosa*.

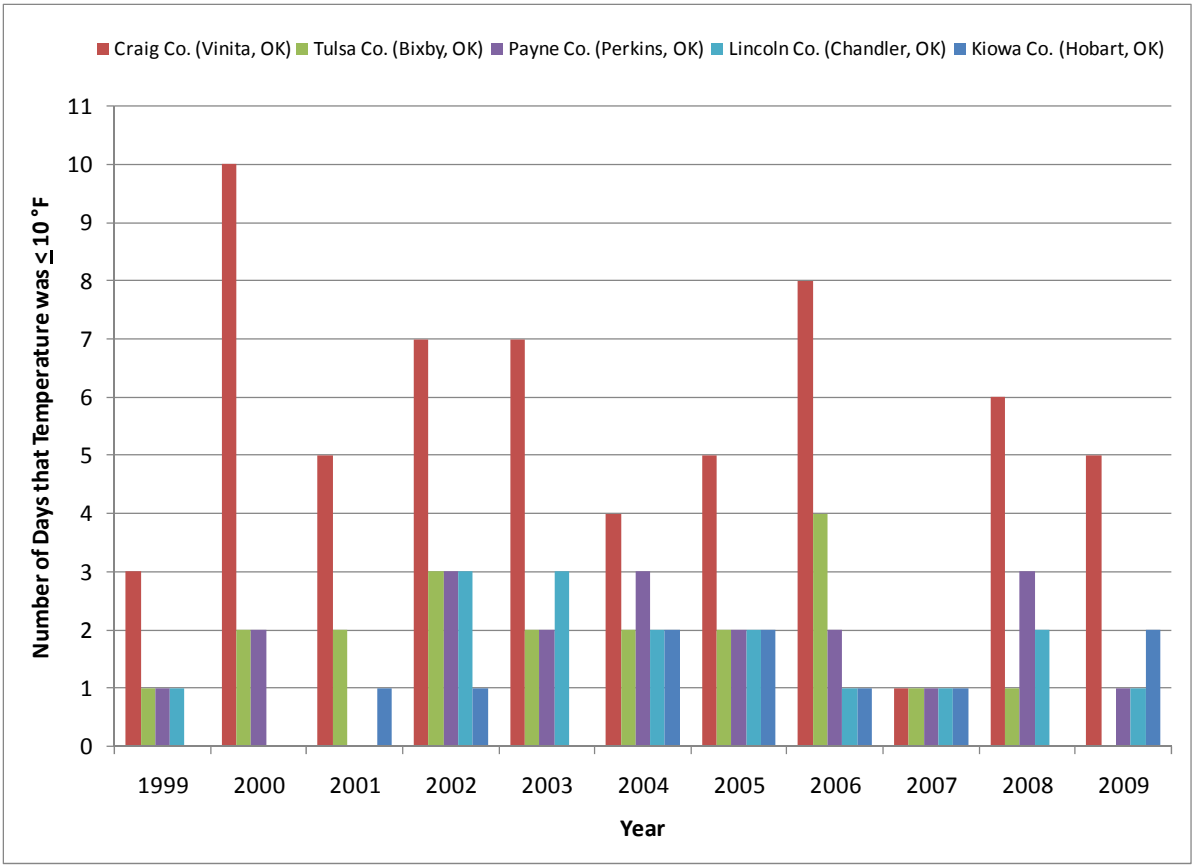

Figure 1. Number of days that surface air temperatures were ≤ 10 °F for five Oklahoma Counties from 1999-2009. Winter-time temperatures ≤ 10 °F for two to three (2-3) days are required for a vineyard to be considered at low-risk for Pierce's disease. Temperature data were retrieved from Oklahoma Mesonet Stations located in each county.

Pierce's disease is spreading in the State and it appears that the bacterium can over-winter. Growers throughout the vineyard production regions of Oklahoma should be on the lookout for symptoms of Pierce's disease. The symptoms are perennial and will appear late in the summer when weather conditions are predominately hot and dry, or when plants are under drought stress. Plants will exhibit stress, with wilting of shoots, and premature defoliation typically occurring (Fig 2). Plants will also yield no fruit or have limited fruit production with poor quality. Chlorosis and green fading colors will develop at the edges of leaves, which dry and turn brown (Fig 3). Some vines will have a 'matchstick' symptom where the leaves have dropped from the plant, but petioles remain attached (Fig 4). Marginal browning can take on an undulating appearance as it moves toward the veins of the leaf. A yellow to red-brown band may be present between the green and scorched areas of the leaves (Fig 3 and 5). Leaf symptoms of Pierce's disease can look very similar to drought stress symptoms, however, the yellow or red-brown band between green and scorched areas will be absent in vines suffering from drought stress.

Figure 2. Wilting and premature defoliation symptoms of grapevines, indicative of Pierce's disease.

Figure 3. Dry, brown scorch symptoms of grape leaves infected with *Xylella fastidiosa.* Note the presence of the yellow border between green and brown tissue.

Figure 4. 'Matchstick' symptom of Pierce's disease, where the leaves have dropped from the plant and petioles remain attached.

Figure 5. Symptoms of grape leaves with Pierce's disease, photographed in late August. Note green tissue separated from brown tissue by yellow borders.

Xylella fastidiosa is typically transmitted from plant to plant by an insect vector (Purcell and Hopkins, 1996). The bacterium is primarily transmitted through xylem-feeding insects; including spittle bugs (Cercopidae), sharpshooters (Cicadellidae: Cicadellinae), cicadas (Cicadidae), and tube-building spittlebugs (Machaerotidae) (Almeida et al., 2005). Transmission of the pathogen can occur mechanically, although the risk of this happening is considered low. However, recent studies have shown that inoculation of trees by needle injection is possible (Sanderlin, 2005). The risk of spreading the bacterium through pruning practices is also considered low during the winter months when major dormant pruning practices are occurring. The risk is much higher when pruning practices occur during periods of active vine growth. Regardless of the timing of pruning, it is recommended that pruning equipment be "sanitized" after working on each vine. This will help reduce the risk of mechanical transmission from infected vines to healthy vines. A 10% solution of household bleach is sufficient for killing the bacterium. Maintain a set of pruners in a bucket containing the bleach solution while you use another set of pruners. The set in the bucket will be "sanitizing" while you work. When you move to the next vine, simply switch to the set of pruners that have been "sanitized". This will not only reduce the risk of spreading *X. fastidiosa*, but also reduce the risk of transmitting other types of pathogens that can cause disease in grapevines.

The bacterium can also be transmitted through use of infected propagation material taken from infected grape vines (Robacker and Chang, 1992). Spread of the disease through the use of

contaminated propagation material presents many challenges for Oklahoma growers. Many rely on propagating their own plants from cuttings, however, we suggest that this practice be avoided in order reduce the risk of spreading the bacterium that causes Pierce's disease. If you insist on propagating your own planting stock from mother plants, the mother plants should be tested for the bacterium prior to propagation to ensure that the plants are free of *X. fastidiosa*.

The source of the infection of the grapevines in Oklahoma is not currently known. Contaminated propagation material could be to blame and investigation into the origin of the grape vines is on-going. Various insects from the sites have also been collected in an effort to test for the presence of *X. fastidiosa* associated with potential vectors. These analyses will be completed in the future.

Unfortunately, there is no chemical control or cure for Pierce's disease. If Pierce's disease is identified in a vineyard setting, affected vines should be removed and destroyed to limit spread of the pathogen to healthy plants. Propagation of grape plant material should be avoided. Grape growers should purchase plants from reliable viticulture suppliers and resist the temptation to root cuttings received from friends and neighbors. By purchasing clean stock from a reliable source, the likelihood of introducing *X. fastidiosa* into the vineyard is greatly reduced. The only way to confirm whether a vine is infected by the pathogen that causes Pierce's disease is to submit samples to the Plant Disease and Insect Diagnostic Laboratory (PDIDL). The sample should include a cane with several symptomatic leaves attached. The leaves should be placed within a ziptop bag with no added moisture and mailed to the PDIDL. Be sure to include a completed sample form with your sample. Sample forms can be found at http://www.ento.okstate.edu/pddl/pdidl-form.pdf. The cost of the Pierce's disease test is $50 for polymerase chain reaction (PCR; highly sensitive). If multiple samples are submitted at one time, the cost is reduced. Please call the PDIDL at 405-744-9961 if you need additional information regarding sampling or testing. Any pertinent digital pictures should be sent to jen.olson@okstate.edu. Results for the Pierce's disease test are generally available in 3-5 business days.

References:

Almeida, R. P. P., M. J. Blua, J. R. S. Lopes, and A. H. Purcell. 2005. Vector transmission of *Xylella fastidiosa*: Applying fundamental knowledge to generate disease management strategies. Annals of the Entomological Society of America. 98 (6): 775-786.

Anas, O., Harrison, U.J., Brannen, P.M., and Sutton, T.B. 2008. The effect of warming winter temperatures on the severity of Pierce's disease in the Appalachian mountains and piedmont of the southeastern United States. Online. Plant Health Progress doi:10.1094/PHP-2008-0718-01-RS.

Purcell, A. H., and D. L. Hopkins. 1996. Fastidious xylem-limited bacterial plant pathogens. Annual Review of Phytopathology 34: 131-151.

Robacker, C. D., and C. J. Chang. 1992. Shoot-tip culture of muscadine grape to eliminate Pierce's disease bacteria. Horticultural Science 27: 449-450.

Sanderlin, R. S. 2005. Cultivar and seedling susceptibility to pecan bacterial leaf scorch caused by Xylella fastidiosa and graft transmission of the pathogen. Plant Disease. 85 (5): 446-449.

Dr. Richard Grantham
Director, Plant Disease and Insect Diagnostic Laboratory

Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Oklahoma Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural.