

Pierce's disease of grapevines

Introduction: Pierce's disease (PD) of grapevines is a lethal disease caused by the bacterium *Xylella fastidiosa* (Xf). The Xf bacterium resides in the xylem (water conducting system) of the grapevine and is transmitted to the grapevine by insects, specifically sharpshooter leafhoppers and spittlebugs. Numerous diseases in a range of crop plants are caused by Xf including almond leaf scorch, oleander leaf scorch, citrus variegated chlorosis, oak leaf scorch, and alfalfa leaf scorch, among others. Pierce's disease severely limits areas where Vinifera vines can be grown. Within the United States, Xf diseases are restricted to areas of the country with warmer winter temperatures. Pierce's disease has been present in southeast Virginia vineyards at least since 1990, when suspicious symptoms on Eastern Shore Chardonnay vines were confirmed as being caused by PD. Since then, symptomatic vines have also been confirmed in the southeastern portion of the state's Tidewater area, but not further west or north. Recently, reports of PD have appeared in Kentucky and portions of North Carolina where the disease had previously not occurred. At least two factors may be contributing to the appearance of PD in these previously unrecognized areas: the introduction of susceptible hosts into these regions as vineyard expansion occurs, and the possibility of changing climate that facilitates disease spread. Both factors have potential ramifications for Virginia growers.

Symptoms: In disease-susceptible vines, the bacteria can multiply to such levels that they cause vascular blockage, either directly or via defensive gums produced by the vine. The vascular blockage ultimately leads to the characteristic disease symptoms including drying or scorching of leaves in irregular patterns in sections or along margins of the leaf blades (Fig. 1). Additionally, leaf blades abscise leaving petioles attached to the cane (matchsticks) (Fig. 2), periderm develops irregularly (green-islands) (Fig. 3), and fruit clusters shrivel (Fig. 4). Pierce's disease may kill the vine within



Fig. 1



Fig. 2



Fig. 3

one to two years. Symptoms first develop during the latter part of the growing season after the bacteria have colonized the vine. Drought conditions and hot temperatures speed symptom development. Spring symptoms develop if infection occurred the previous year. This is called chronic infection. Spring symptoms appear as delayed budbreak, stunted growth, and zig-zag internodes on developing shoots. The infected vine may die within a year of infection or vines may persist for five or more years.



Fig. 4

Pathogen Life Cycle and Conditions for Disease: *Xylella fastidiosa* is widely distributed in native plants throughout its host range. Within native plants and grapevines Xf survives and multiplies in the xylem tissue. Sharpshooters (Cicadellidae) and spittlebugs (Cercopidae) (insects with piercing/sucking mouthparts) feed on grapevines and/or reservoir hosts plants ingesting xylem fluid during feeding. Often these insects move into vineyards during spring and feed on grapevines, potentially transmitting Xf to the xylem of grapevines. Once inside the xylem, Xf multiplies and colonizes the vine, eventually producing disease symptoms by blocking water flow from the roots to the leaves. The impaired water transport leads to the characteristic “scorching” or drought-stress symptoms.

Cultural control:

- The use of tolerant cultivars is the only effective control for Pierce’s disease in areas at high risk for PD development. The muscadines (*Vitis rotundifolia*) are not immune to PD, but appear to tolerate the disease. Hybrids and other native American grapes, such as *Vitis aestivalis* (e.g., 'Norton') may have variable tolerance, but this has not been fully evaluated in Virginia.
- Minimize the amount of reservoir host vegetation within and around the vineyard. The most extensive list of reservoir hosts can be found at <http://www.cnr.berkeley.edu/xylella/>.
- Rouging symptomatic vines may slow disease spread from vine to vine.

Chemical control: Insecticides are available and registered for leafhopper control on grapes. Attempts to eliminate the vectors with insecticides are generally ineffective because the vectors are quite mobile and their rates of transmission are high. Please refer to the 2006 VT Pest Management Guide at <http://www.ext.vt.edu/pubs/pmg/hf3.pdf> for current information.

Notes: For more detailed information on PD see Viticulture Notes: Mar-Apr 2002, The Pierce’s disease website <http://www.cnr.berkeley.edu/xylella/>, UC IPM: UC Management Guidelines for Pierce’s disease on grape www.ipm.ucdavis.edu/PMG/r302101211.html

References: see Viticulture Notes Vol. 17 No. 2 Mar-Apr 2002.

Pearson, R. C. and Goheen, A. C. 1988. Compendium of Grape Diseases. APS Press pg. 44-45.