

Pierce's Disease-Tolerant Grapes

*Jim Kamas, Larry Stein & Monte Nesbitt
Extension Fruit Specialists, Texas AgriLife Extension*

Introduction

The single greatest threat to the long-term survivability of susceptible grape cultivars is Pierce's disease (PD). PD is caused by a xylem-limited bacterium that clogs the vascular tissue of susceptible grape cultivars. The causal organism is a gram-positive, rod-shaped bacterium named *Xylella fastidiosa* that is indigenous to the Gulf Coast region of the United States. Although different races of this organism cause similar diseases in other crops, they appear to be host specific, i.e., the grape strain does not appear to infect peach and vice versa.

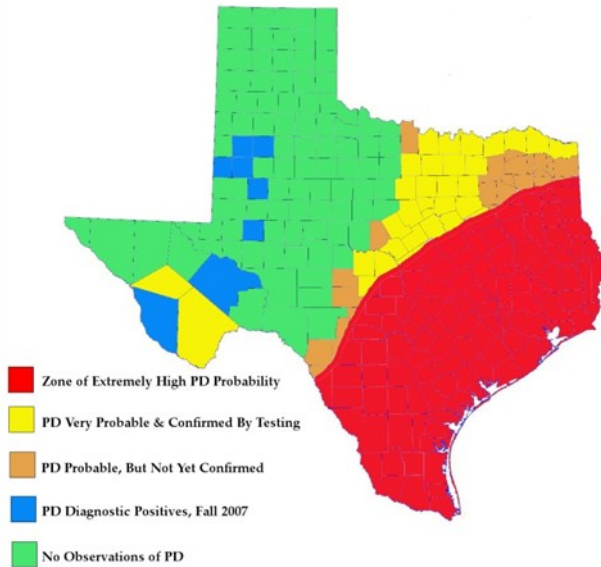
Grapevines become infected when a sharpshooter that carries the bacterium feeds on tender tissue. These insect vectors are very efficient at transferring the bacterium during feeding and infection is likely. It is now known that there are at least thirty species of xylem feeding insects capable of transmitting the disease in Texas. Once a grapevine is infected, the bacteria multiply and colonize the xylem, or water conducting tissue of the plant. This

vascular constriction inhibits the movement of water through the grapevine and often results in first visible symptoms noted during periods of heat or drought stress. Symptoms of the disease include irregular leaf scorch, abscission of the leaf blade with retained petioles (leaf stems) uneven periderm formation and finally cordon die-back and vine death.

The risk of Pierce's disease varies in different parts of the state. Although the disease has been found in all parts of Texas, the risk is much greater in East Texas, South Texas and along the Gulf Coast. The pathogen is sensitive to cold winter temperatures and it is believed that vine infection in the High Plains is most probably alone not fatal. In transition zones such as the Hill Country and North Central Texas, proper vineyard site selection and the following strict management guidelines can mitigate the risk of PD. For homeowners or small commercial operations these steps are not practical. In high risk areas, the disease pressure is so high that planting susceptible



Typical Symptoms of Pierce's Disease



Distribution and risk of Pierce's Disease in Texas.

varieties is simply not recommended. There are, however a series of species or varietal types that are not susceptible to PD and can be grown without risk from that pathogen.

Grapevine species and varieties vary widely in their susceptibility to PD, and most European, American and French-American hybrid



Native Texas Grape Species Such as *Vitis berlandieri* are Tolerant to Pierce's disease

varieties are susceptible to it. Once a susceptible variety is infected, there is no known, approved method of treating the infection and the disease will most probably be fatal to the vine. There are different mechanisms among grapevines that do not die from PD. Some varieties such as 'Black Spanish' and 'Blanc du

Bois' are capable of being heavily infected, supporting very high concentrations of the bacterium, while still growing and producing acceptable crop loads.

Some tolerant varieties may scorch and exhibit typical symptoms of PD under drought or heavy crop loads, but they recover and grow normally the next year. Native species are likewise tolerant or in some cases, resistant. There is a distinction because with resistance, a plant has the ability to suppress the bacterial titer or concentration levels within the xylem tissue. Morphological studies suggest that differences in xylem architecture are at least one mechanism whereby plants can keep the bacterial numbers down by inhibiting movement between xylem vessels but tolerant or even resistant grapevines often carry the disease and are capable as serving as sources of the disease for further spread by sharpshooters. Our strong recommendation is that susceptible cultivars be grown completely isolated from wild vines or plantings of resistant/tolerant grape cultivars.

PD Tolerant & Resistant Varieties

Although the cause of vine death from PD was not known to him, T.V. Munson realized that utilizing grape parents that survived local conditions was important in creating new, improved adapted grape varieties. Many, but not all of Munson's varieties are indeed tolerant of PD. While some of these varieties are commonly utilized in home winemaking, they may not produce a wine of commercial acceptability by today's standards. The most widely planted of these include 'Lomanto', 'Wine King', 'Beacon', 'Edna', 'Ellen Scott' and 'Carman'. 'Champanel' is commonly used for jelly and is perhaps the most widely propagated of all of Munson's varieties. Some of Munson's highest quality wine varieties are being included in ongoing evaluation trials and will be evaluated for wine quality relative to other tolerant varieties. In the 1930's, grape variety trials in the Winter Garden area of Texas identified 'Black Spanish' and 'Herbemont' as resistant to "vine disease" which we now know as PD.

Across the Gulf Coast, commercial wineries have been established using new resistant/

tolerant varieties produced by numerous public and private breeding programs. In many southeastern states, some wineries make wine exclusively out of muscadine grapes. High in antioxidants, muscadine wines are generally finished with relatively high residual sugar. While many consumers enjoy and appreciate the distinct flavor of these wines, the market for muscadine wines is generally limited on premises sales and local distribution.

The most widely planted PD tolerant varieties that also have commercial wine appeal are 'Blanc du Bois' and 'Black Spanish'.

'Blanc du Bois'- Released in 1988 by the University of Florida, this variety is currently perhaps the highest quality named winegrape

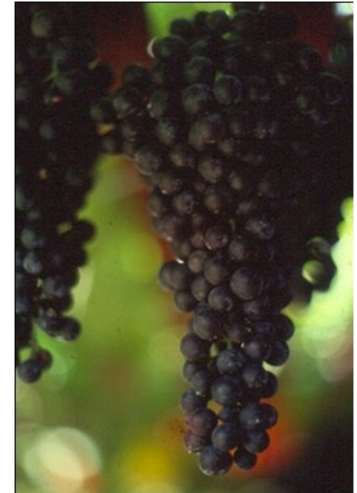


variety that has resistance to PD. This grape is the result of a cross made in 1968 by Dr. John Mortensen which was selected as H18-37 for further evaluation in 1974. It has a complex lineage which includes *Vitis vinifera*, *samliana*, *simpsoni*, *labrusca* and an unknown open-pollinated selection thought to be *V. lincecumii*.

In addition to being resistant to Pierce's disease, 'Blanc du Bois' has reported resistance to downy mildew, *Isariopsis* leaf blight and grape leaf folder. 'Blanc du Bois' averaged approximately 5.5 tons per acre under initial evaluations and ripened in hot climates with good acid retention. Clusters average 133 grams with 45-55 berries per cluster which average 2.9 grams each. Berries are round, light green, slipskin, with a pleasant muscat flavor. While 'Blanc du Bois' is susceptible to other fungal

pathogens, the loose cluster architecture makes it less prone to sour rot complex than more tight clustered varieties. 'Blanc du Bois' typically ripens in early July along the Texas Gulf Coast.

'Black Spanish'- Also known as 'Lenoir' and 'Jacquez', 'Black Spanish' is considered the current highest quality red wine grape variety that is tolerant to PD. The parentage and history of 'Black Spanish' are a subject of debate, and some believe its history goes back several hundred years.



We do know that 'Black Spanish' has produced high yields under severe PD pressure in South Texas since 1889. Vines of 'Black Spanish' are moderately vigorous, and clusters are large and compact with small berries. Juice from 'Black Spanish' is very highly pigmented high in tannins and acidity lending some wine makers to use juice for production of high quality port style wines. 'Black Spanish' is also used for red wine production, but enologists work to come up with winery techniques to deal with the overpowering acidity. While 'Black Spanish' is typically grown successfully on its own roots, it is subject to iron chlorosis in alkaline soils. 'Black Spanish' typically ripens in mid to late July in Texas coastal regions. 'Favorite' is another variety very similar to, and reportedly is an open pollinated seedling of 'Black Spanish'. Some consider the fruit to be of superior quality, but commercial availability of 'Favorite' is quite limited.

'Victoria Red'- A recent joint release by the University of Arkansas, Tarkington Vineyards and Texas AgriLife Extension Service, Victoria Red is a PD tolerant, seeded table grape that produces good yields of high quality attractive fruit. Evaluated as Arkansas 1475, 'Victoria



'Victoria Red'

Red' was bred in 1971 and is the result of a cross between Ark 1123 X 'Exotic'. Although its paternal parent ('Exotic') is purely *Vitis vinifera*, the female parent is a derivation of largely French-American Hybrids produced in France in the late 1800's. While neither of the parents exhibit resistance or tolerance to Pierce's disease, there are several ancestors within the complex lineage of Ark 1123 that have repeatedly been shown to exhibit sustained field tolerance to *Xylella fastidiosa*. Tolerant ancestors include 'Villard Blanc' (S.V. 12-375), 'Jacquez' ('Black Spanish', 'Lenoir'), 'Herbemont', as well as the native Texas species *Vitis berlandieri*.

'Victoria Red' has survived PD for over 25 years with extremely high PD pressure at Tarkington Vineyards near Victoria and has produced reliable crops of high quality fruit. While the primary value of this variety is for home fresh fruit production, this variety may well have a place as a neutral blending wine grape. With soluble solids up to 25° brix, Victoria Red may help Gulf Coast wineries source a higher portion of their fruit from local vineyards.

'Herbemont'- Bred and propagated by Nicholas Herbemont (1771-1839) of South Carolina and France, 'Herbemont' is purportedly a hybrid of *Vitis vinifera*, *borquiniana*, and



aestivalis. 'Herbemont' has long been valued as a reliable producer of wine grapes and the vines are resistant to PD, phylloxera and several fungal pathogens. Along with 'Black Spanish' this variety has been heavily relied upon by Val Verde winery for the production of port wines and is also used at the Maderia winery at Parras, Coahuila and at the Ferrino Winery at Cuatro Cienegas, Coahuila. Herbemont has also been referred to as the "brown grape" throughout the southeast and produces clear juice for white wine. While this variety has been widely used for perhaps 200 years, there is little written record comparing wine quality to that of modern cultivated varieties.

Other Resistant/Tolerant Varieties

Other PD resistant or tolerant vines are available such as 'Miss Blanc', 'Miss Blue', 'Mid-South', 'Orlando' 'Seedless', 'Roucanneuf', 'Daytona', 'Conquistador', 'Stover' and 'Lake Emerald'. While these can be grown without fear of loss due to PD, the ability of these varieties to successfully compete in the commercial marketplace is questionable. There are however at least two ongoing breeding programs using classical techniques that are producing tolerant winegrape seedlings that are under evaluation in Texas.

Of special note is the important finding of Dr. Andy Walker, grape breeder at U.C. Davis, that all of the genes for PD resistance in the wild species *Vitis arizonica* are all located on a single locus. This means that by using marker assisted selection, the time needed to produce and screen seedlings that are resistant has been greatly reduced. Dr. Walker has produced a number of breeding lines currently under evaluation in California that have 87%-97% *vinifera* parentage. Seven of these 87% *vinifera* lines are currently under evaluation in Texas with the intention of identifying resistant varieties without the color and flavor flaws associated with American varieties.

