VINE CONDITION AND XYLELLA FASTIDIOSA SEROLOGY FOR THREE NATIVE GRAPE SPECIES, SELECTED VITIS VINIFERA ON ROOTSTOCKS, AND SELECTED UNGRAFTED ROOTSTOCKS

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**Reporting Period:** The results reported here are from work conducted 2008 to 2011.

**ABSTRACT**

Three native Vitis species in southwest Texas rarely have even minor Pierce’s disease (PD) symptoms or react to Xylella fastidiosa (Xf) ELISA tests. When planted next to highly susceptible Vitis vinifera cultivars with severe PD and a large glassy-winged sharpshooter population, V. cinerea var. helleri, V. monticola, and V. mustangensis developed PD symptoms and reacted to ELISA tests. V. cinerea var. helleri and V. monticola had very little iron deficiency (chlorosis). V. mustangensis had the lowest Xf-ELISA OD values. V. cinerea var. helleri and V. monticola had delayed leaf senescence, which may indicate delayed root senescence, a trait thought to hinder cotton root rot disease (caused by Phymatotrichopsis omnivora) of winegrape. V. monticola crosses should be included in PD and CRR breeding line tandem screening efforts.

**LAYPERSON SUMMARY**

In addition to Pierce’s disease (PD) resistance and other pest and soil problems, we considered which native Texas grapes may have traits indicating potential parents for rootstock improvement efforts to address cotton root rot disease. Cotton root rot occurs in a large area of the PD geographic range, from Texarkana to southern Utah to central Mexico. Delayed leaf senescence in V. monticola suggest it may also contribute rootstock traits to help control CRR.

**INTRODUCTION**

Pierce’s disease (PD) in the warmer regions of Texas and southwestern U.S. has caused early death of high susceptible Vitis vinifera cultivars for at least 300 years. Native Vitis species in the same area usually have no PD symptoms or serological reactions for Xylella fastidiosa (Xf). These wild species continue to be used in cultivar improvement efforts for fruiting and rootstock cultivars (Covert, 2008) including PD resistance. Among the problems previously addressed with crosses involving wild grape species found in Texas and the southwestern U.S. are root pests (grape phylloxera insect, plant parasitic nematodes) and soil problems (high pH calcareous soils, poor drainage, droughty soils). As progress on PD control has increased vine longevity, incidence of cotton root rot disease has increased. The soil borne fungus Phymatotrichopsis omnivora causes cotton root rot disease (CRR) in most of Texas and in five other southwestern states and Mexico. High incidence of CRR has long been linked to high pH soils. Native Vitis species in Texas may be useful in developing rootstocks with resistance to both PD and CRR. Early publications note resistance of several Vitis sp. to CRR, including Vitis monticola, berlandieri and candicans (mustangensis). Plants classified as resistant developed new roots and survived in spite of the fungal infection (Taubenhaus and Ezekiel, 1936).

**OBJECTIVE**

1. Evaluate chlorosis, PD, and leaf condition in V. cinerea var. helleri (V. berlandieri), V. monticola, and V. mustangensis (V. candicans) at an irrigated high pH soil site in southwest Texas with intense PD.

**RESULTS AND DISCUSSION**

Vitis cinerea var. helleri and V. monticola growing in furrow-irrigated calcareous high pH soil had less iron deficiency than V. mustangensis. Under very intense PD, V. mustangensis trended toward lower mean Xf-ELISA optical densities than Vitis cinerea var. helleri and V. monticola in second leaf and third leaf, possibly indicating that mustang grape limits populations of Xf more than the other two species. Both V. monticola entries, two of six V. mustangensis entries, and Salt Creek rootstock always had less than 15% total leaf necrosis.

**CONCLUSIONS**

Three native grapes species found in southwest Texas have been used by plant breeders for many decades to address various soil insect, nematode, PD, and soil problems. In this preliminary trial, leaf chlorosis indicated less iron uptake from high pH soil, ELISA OD indicated Xf cell numbers, and leaf necrosis indicated cumulative effects of iron uptake, PD, and senescence. Cotton root rot disease (CRR), caused by Phymatotrichopsis omnivora, occurs within a large part of the PD geographic range and both pathogens have high optimal temperatures. P. omnivora apparently becomes more aggressive on senescing plants, and our data suggest that senescence varies among grape genotypes. In grain sorghum, plant breeders selected ‘stay green’ stalk and root traits separately from grain maturity date to help solve late season root and stalk diseases (Thomas and Howarth, 2000). Perhaps native Vitis species may be useful parents for rootstocks improvement efforts that address both PD and CRR. Entry numbers in this preliminary trial were not adequate for drawing firm conclusions. However, these data
suggest that *V. monticola* crosses should be included in CRR screening efforts. Genetic resistance alone will probably never eliminate PD or CRR risk.

**REFERENCES CITED**

**FUNDING AGENCIES**
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**ACKNOWLEDGMENTS**
We thank Larry Stein, Armando Pepi, and Noel Troxclair for their assistance.
Table 1. Plant conditions and *Xylella fastidiosa*-serology reactions of three *Vitis* species, selected rootstocks, and selected *V. vinifera* on rootstocks at Uvalde, TX. Green cells had the least chlorosis (rating ≥2.5). Blue cells had OD<0.5 (<0.3 is negative) with ELISA. Yellow cells had lowest leaf necrosis ratings (≤10%).

<table>
<thead>
<tr>
<th>Entry</th>
<th>Chlorosisa</th>
<th>Optical Density, <em>Xylella fastidiosa</em>-ELISA</th>
<th>Leaf necrosis, percentb</th>
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<tr>
<td></td>
<td>14Sep10</td>
<td>12Nov10</td>
<td>7Sep11</td>
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<tr>
<td><em>Vitis cinerea</em> var. <em>helleri</em></td>
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<td>Population 8</td>
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<td><em>V. monticola</em> pooled</td>
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<td>Population 5</td>
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<td>Population 7</td>
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<td><em>V. mustangensis</em> pooled</td>
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<td>Rio Medina</td>
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<td>Marble Falls</td>
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<td>Stonewall</td>
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<td><em>Champenêb</em></td>
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<td><em>Couderc 1613</em> (1613C)c</td>
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<td><em>Kober 5BB</em></td>
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<td><em>Lenoir (Black Spanish)</em></td>
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<td><em>Salt Creek (Ramsey)</em></td>
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<td><em>SO4</em>p*</td>
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- Chlorosis rated as 1=chlorotic, 2=intermediate chlorosis, 3=green.
- Leaf necrosis due to severe iron deficiency induced by high pH soil, PD, and senescence.
N=number of plants evaluated unless indicated otherwise.
SD=standard deviation.
Open pollinated seedlings from one parent.
N=19.
Rooted cuttings from one plant.
V. champinii x V. labrusca.
Includes V. labrusca, V. riparia, V. vinifera.
V. x champinii (V. candidans and V. rupestris).
N=4 plants.
Includes V. labrusca, V. riparia, V. x champinii, V. vinifera.
V. berlandieri x V. riparia.
V. aestivalis, V. cinerea, V. vinifera (50%).
V. x champinii.
V. berlandieri Ressegier x V. riparia.
V. berlandieri x V. riparia.