

HOST PLANT RESISTANCE TO THE GLASSY-WINGED SHARPSHOOTER IN GRAPES

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INTRODUCTION

Although some of the American native *Vitis* species, particularly those originated from the southeastern United States have been known for resistance to the Pierce's disease (Lu 2000; Lu and Ren 2002), their resistant status against the glassy-winged sharpshooter, *Homalodisca coagulata* (Say), GWSS, the vector transmitting Pierce's disease (PD) pathogen (*Xylella fastidiosa*), have not been reported. It would be interesting to know if there is any correlation between resistance to the disease and resistance to the insect vector transmitting the disease. In addition, understanding the mechanism of host resistance to the GWSS, and the insect/plant interactions will add new dimension to control the insect vector in addition to the existed measures. In this connection, a study to survey the GWSS feeding preference on grapevines with different genetic background was conducted at Florida A&M University, Tallahassee, Florida. Our preliminary study indicated that GWSS has feeding preference for certain grapevines. Since one recommendation to manage the GWSS is establishing riparian vegetation surrounding a vineyard, understanding the GWSS feeding habit on different grapes will also enable us to select resistant grape materials against GWSS. The long term goal of this project is to understand the mechanism of feeding preference (or host resistance) among resistant and susceptible grapevines, and the genetic basis of the host resistance to the GWSS.

OBJECTIVES

1. Determine the feeding preferences of GWSS on different grape species and cultivars.
2. Investigate the mechanisms of host plant resistance to GWSS.
3. Understand the interaction between GWSS feeding preferences and physiological responses of the host plant to feeding, and the genetic basis of the host plant resistance to GWSS.

RESULTS AND CONCLUSIONS

The feeding preference of GWSS on different species/cultivars was evaluated in two different ways: 1) count the number of GWSS feeding on grapevines of different species / cultivars in the field; 2) determine the feeding preference by measuring the excretion of the GWSS feeding on difference grape species /cultivars. For the field-count of GWSS on individual grapevines, two separate investigations were conducted during last two seasons. The first survey was conducted on highly susceptible *V. vinifera* cultivars 'Chardonnay,' 'Cabernet Sauvignon,' 'Thompson Seedless,' and *V. labrusca* cultivars 'Concord' and 'Niagara', with muscadine grape as a resistant control. One-year old vines grafted on muscadine rootstocks (Ren and Lu, 1999) were used for this investigation. The actual numbers of GWSS feeding on these grape cultivars were counted on a daily basis between 10:00 and 12:00 in the morning from late June to the end of August. As shown in Table 1, the PD resistant grape cultivar *V. rotundifolia* (muscadine grape) had significantly fewer visits by GWSS than did the susceptible grape cultivars 'Chardonnay,' 'Cabernet Sauvignon,' and 'Thompson Seedless.' The frequency of GWSS visits to *V. labrusca* cultivars 'Concord' and 'Niagara', the native American grape susceptible to PD, was intermediate between those found on *V. rotundifolia* and *V. vinifera*.

Table 1: Average number of GWSS on different grape cultivars.

Cultivars	Average numbers of GWSS per vine per observation						
	6/25-30	7/1-10	7/11-20	7/21-31	8/1-10	8/11-20	8/21-31
Chardonnay	1.3	1.0	2.9	0.6	0.0	0.0	0.0
Thompson Seedless	1.1	3.4	5.1	4.1	1.7	1.4	0.3
Cabernet Sauvignon	3.3	6.0	6.6	3.8	1.6	0.8	0.3
Concord	1.3	1.4	1.1	0.3	0.1	0.0	0.0
Niagara	0.4	0.4	0.1	<0.1	0.0	0.0	0.0
Muscadine	0.3	<0.1	0.2	0.0	0.0	0.0	0.0

For the second investigation, adults and nymphs of GWSS were assessed by weekly counts during the period when GWSS were observed in the vineyard in 2002 (from June to October). More than 100 accessions, including pure species and complex hybrids, were included in this investigation. However, only a representative of eight accessions / cultivars (Table 2) was included in this report while the rest of the data are being dissected and analyzed. Similar to the first investigation, the PD resistant muscadine vines received very few visits of GWSS, while PD susceptible grape 'Niagara' received high GWSS counts in the same vineyard. PD tolerant Florida hybrid bunch grapes had an intermediate count of GWSS. As expected, the PD resistant *Vitis* species *shuttleworthii* and *mustangensis* had very low counts of GWSS. Interestingly, the PD tolerant *V. cineria* accession had very high counts of GWSS.

Table 2: GWSS population on selected vines during the 2002 growing season.

Ssp. /cvs.	June	July	August	September	October
<i>Vitis rotundifolia</i>					
Fry	0.1±0.4	0.03±0.6	0.04±0.05	0	0
Carlos	0.1±0.4	0	0	0	0
Florida hybrid bunch grapes					
Blanc du Bois	4.2±3.2	1.2±1.3	3.5±2.6	1.0±1.0	0
Suwannee	1.8±1.7	2.6±0.9	1.5±2.4	0.7±1.6	0
<i>Vitis labrusca</i>					
Niagara	6.8±3.6	0.2±0.5	0.8±0.1	0.7±0.6	0
<i>Vitis shuttleworthii</i> (JL 2001)	0.5±0.6	0.2±0.4	0	0	0
<i>Vitis mustangensis</i> (DVIT 2232)	0.8±0.5	0.6±0.5	0.5±0.6	0	0
<i>Vitis cineria</i> (DVIT 2380)	14.8±7.1	2.8±3.1	1.8±1.3	0	0

The feeding preference was also measured on selected grapes, including resistant, tolerant and susceptible grape cultivars, by collecting the excretion of the GWSS. Two GWSS were introduced and confined in a 50-ml plastic tube in which a shoot was running through for the GWSS feeding. Excretion was collected and used for determining the feeding preference. The experiment was repeated three times (June 24, July 15 and July 22) and two vines were used for each cultivar in each experiment. The data in Table 3 are the average excretion per tube (from two GWSS) collected two days after the GWSS were introduced to the confined tube. In general, more excretion was collected from the bunch grapes than from the muscadine grapes. Among the bunch grape cultivars, more excretion was obtained from the PD susceptible cultivars ('Chardonnay', 'Concord', and 'Niagara') than PD tolerant cultivars ('Blanc du Bois' and 'Blue Lake') and PD resistant cultivar ('Champanelle').

Table 3: Average excretion per tube collected two days after two GWSS were confined in a 50 mL tube with one shoot.

Cultivars	Excretion
Muscadine Grapes	
Carlos	0.34
Fry	1.83
Jumbo	0.49
Bunch Grapes	
Blanc du Bois	0.50
Blue Lake	0.50
Orlando Seedless	1.80
Champanelle	0.45
Chardonnay	3.30
Concord	2.69
Niagara	1.33

REFERENCES

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