

## SURVEY OF LEAFHOPPERS ON GRAPES IN THE PIEDMONT AND MOUNTAIN REGIONS OF NORTH CAROLINA

### Project Leaders:

Raul Villanueva  
Department of Plant Pathology  
North Carolina State University  
Raleigh, NC 27695-7405  
[raul\\_villanueva@ncsu.edu](mailto:raul_villanueva@ncsu.edu)

Turner Sutton  
Department of Plant Pathology  
North Carolina State University  
Raleigh, NC 27695-7405  
[turner\\_sutton@ncsu.edu](mailto:turner_sutton@ncsu.edu)

George Kennedy  
Department of Entomology  
North Carolina State University  
Raleigh, NC 27695-7630  
[george\\_kennedy@ncsu.edu](mailto:george_kennedy@ncsu.edu)

**Reporting Period:** The results reported here are from work conducted May 2006 to August 2007.

### ABSTRACT

Results of a 2-year study survey of species of leafhoppers found in vinifera vineyards in the Piedmont and Mountain regions of North Carolina are reported. *Graphocephala versuta* and *Agalliota constricta* were the most abundant and ubiquitous leafhoppers. Five species of sharpshooters were found in this survey: *Cuernia costalis*, *Homalodisca insolita*, *H. vitripennis*, *Oncometopia orbona*, and *Paraulacizes irrorata*. *Homalodisca vitripennis* was found only in one vineyard located in Wake County (Piedmont) in 2007 and this is the first report of this insect in this county.

### INTRODUCTION

Vinifera grapes have become economically important in North Carolina (NC). The acreage of vinifera grapes in the Piedmont and Mountains regions of NC doubled from 600 to 1300 acres between 2000 and 2005, respectively; and in 2005 NC ranked 10th in the nation in grape production (MKF Research 2007). However, Pierce's disease (PD) has been increasing rapidly and may be the most important factor limiting the development of the wine industry in NC. In some cases, entire vineyards have been removed and in others, many plants are being removed by the 4<sup>th</sup> or 5<sup>th</sup> year. Leafhoppers are vectors of *Xylella fastidiosa* (*Xf*), the bacterium that causes PD. These Hemipterans are found in great numbers in NC; however, the identity of the species found on vinifera grapes, their seasonal abundance and habitats are not well known.

We report a survey of leafhoppers that were collected on four vineyards, two each in the Piedmont (Wake and Alamance Co.) and the Mountains (Polk Co.) of NC. This survey was conducted using yellow sticky traps placed at heights 0.5, 1.0, 1.5 and 2.0 m above the soil in 2006 and at 0.5 and 2 m in 2007. The yellow sticky traps were placed in the vineyards on 10 May and 5 March in 2006 and 2007, respectively. They were replaced every 14 days, 8 November 2006 through 20 September, 2007.

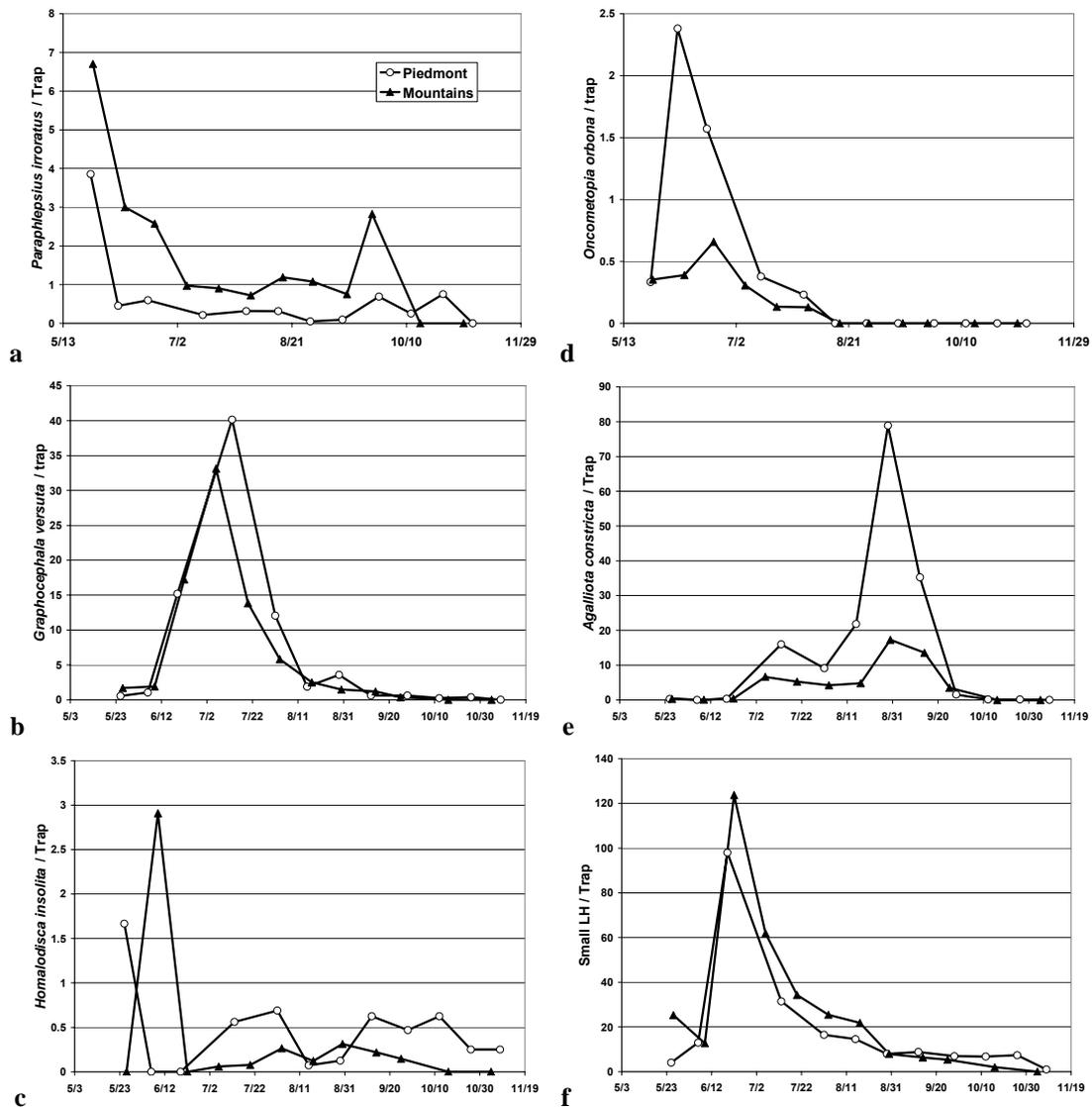
### OBJECTIVES

1. Identify the species of the Hemiptera in the families Cicadellidae, Cercopidae, Clastopteridae and Membracidae that are present in vinifera vineyards in North Carolina.
2. Study the seasonal abundance of the most abundant species of leafhoppers present in vineyards.
3. Identify insects that carry *Xf*.

### RESULTS

Leafhopper identification is still in progress. We have identified a total of 40 species to date. We have found five large species (length  $\geq$  13 mm) of sharpshooters (*Oncometopia orbona*, *Paraulacizes irrorata*, *Cuernia costalis*, *Homalodisca insolita* and *H. vitripennis*), 20 medium size species (length between 6 to 13 mm) including cicadellids (*Paraphlepsius irroratus*, *Graphocephala versuta*, *G. coccinea*, *G. hieroglyphica*, *Scaphytopious frontalis*, *S. acutus*, *Japanus hyalinus*, *Scaphoideus titanus*, *Gyponana* sp., *Colladonus clitellarius*, *Agalliota constricta*, *Stirreus bicolor*, *Norvelina seminude*, *Texanus scultus*, *Idiononus* sp., *Mesamia* sp., *Idiocerus* sp., *Draecucephala antica*, *D. angulifera*, and *Penthimia* sp.), 4 membracids (*Atymna* sp., *Spissistilus* sp., *Microtalis calva*, *Entylia carinata*), 2 clastopterids (*Clastoptera obtusa* and *C. xanthocephala*), 1 cercopid (*Prosapia bicincta*) and 7 small species (length  $<$  5 mm) (*Empoasca fabae*, *Erythroneura vulnerata*, *E. vitis*, *E. tricincta*, *E. ziczac*, *Illinigina illinoiensis*, and *Graminella* sp.). Many of the small species were previously reported on muscadine grapes (Corrette 1981).

The most abundant leafhopper species collected during 2006 were *G. versuta*, *A. constricta*, *P. irroratus*, *O. orbona*. However, in 2007, *G. versuta*, *A. constricta*, *H. insolita* and *O. orbona* were the most abundant. *Paraphlepsius irroratus* is a carrier of *Xf* (Myers 2005), although its ability to transmit *Xf* has not been established. *Homalodisca insolita* was the most abundant sharpshooter in 2007, but it was found mostly in the lower yellow sticky trap (0.5 m). The glassy winged sharpshooter, *H. vitripennis*, was found only in 2007 in the Wake County vineyard and this is the first report of its presence in this county. Most *H. vitripennis* were collected from the upper yellow sticky traps (2.0 m). The presence of *H. vitripennis* may reflect the unusually warm winter in 2007, because this insect has previously reported only from a vineyard located along the coast of NC, in Currituck Co. and crape myrtle (*Lagerstroemia indica*) in Pender Co.



**Figure 1.** Mean numbers of leafhopper species per yellow sticky trap in the Mountains and Piedmont regions of North Carolina in 2006 (a) *Paraphlepsius irroratus* (b) *Graphocephala versuta*, (c) *Homalodisca insolita*, (d) *Oncometopia orbona*, (e) *Agalliota constricta*, and (f) several small species that includes *Empoasca fabae* and *Erythroneura* sp.. Each data point represents the cumulated leafhopper mean numbers for a 2-week period.

## CONCLUSIONS

Our data on the leafhopper species present in NC vinifera vineyards provide a framework for identifying which species of leafhoppers are likely to be important in *Xf* transmission. *Graphocephala versuta* and *O. orbona* have been shown to transmit *Xf* in NC (Myers 2005). Previous research has demonstrated that *C. costalis* (Kaloostain, 1962), *H. insolita* (Purcell 1979), and *H. vitripennis* are vectors of *Xf*. The latter species has the ability to disperse long distances, and its presence in Currituck Co. and Wake Co. may reflect the unusually warm winter in 2007. If we continue to experience mild winters due to global warming, *H. vitripennis* may spread further north and west in NC. Other species such as *P. irroratus* may be important in the spread of *Xf*. To identify other potential vectors of *Xf*, specimens of each species have been collected and stored at ~1°C; they will be subjected to PCR analysis to test for the presence of *Xf* DNA. In 2008 we are planning to continue the survey and study the life history, host plants, and habitat preferences of the most abundant leafhoppers in vinifera vineyards in NC. We will also investigate potential pest management programs for leafhoppers in vinifera grapes.

## **REFERENCES**

- MKF Research LLC. 2007. Economic impact of North Carolina wine and grapes 2005. A report commissioned by the North Carolina department of commerce, the North Carolina division of tourism, film and sports development, and the North Carolina wine and grape council. *Web address:* <http://www.nccommerce.com/NR/rdonlyres/BCCD24D8-5263-401B-AC43-984A8968412B/0/EconomicImpactofNorthCarolinaWine2005.pdf>
- Myers, A. L. 2005. Pierce's disease of grapevines: identifying the primary vectors in the southeastern United States. A thesis submitted to the Graduate Faculty of North Carolina State University - Plant Pathology Department.
- Corrette, K. B. 1981. Identification and biology of grape insects in North Carolina with special reference to phytophagous species on muscadine grapes. A thesis submitted to the Graduate Faculty of North Carolina State University, Entomology Department.
- Kaloostain, G. F. 1962. Leafhopper vectors of Pierce's disease virus in Georgia. *Plant Dis. Report.* 46: 292.
- Purcell, A. H. 1979. Leafhopper vectors of xylem-borne plant pathogens. In: *Leafhopper vectors and plant disease agents* (K. Maramorosch and K. F. Harris, eds.). Academic Press, New York. pp. 603-625.

## **FUNDING AGENCIES**

Funding for this project was provided by the North Carolina Tobacco Trust Fund and the Golden Leaf Foundation.