TRANSMISSION OF *XYLELLA FASTIDIOSA* TO ALMONDS BY THE GLASSY-WINGED SHARPSHOOTER

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INTRODUCTION

The glassy-winged sharpshooter or GWSS (*Homalodisca coagulata*) is a newly introduced vector of *Xylella fastidiosa*, the causal agent of almond leaf scorch (ALS) and Pierce's disease (PD) of grapes (Blua et al. 1999, Purcell and Saunders 1999). GWSS and ALS now occur in Kern, Tulare, and Fresno counties. The introduction of GWSS is expected to dramatically increase ALS from its very low levels currently in the southern Central Valley over the coming years. Our experiments are designed to determine the efficiency of transmission (acquisition and inoculation) of *X. fastidiosa* to almond by GWSS to new growth and to mature (> 1 year) woody tissues of almond and to estimate natural populations of this bacterium within almonds at different times during the growing season. Population densities of *X. fastidiosa* are important in how efficiently vectors of *X. fastidiosa* can acquire the bacterium from plants.

Pruning branches on trees with early symptoms was promising for control of ALS (Mircetich et al., unpublished progress reports to Almond Board in 1970s), but feeding of GWSS on larger branches may defeat the effectiveness of pruning and increase the importance of almond to almond transmission of *X. fastidiosa* (Purcell and Saunders, 1999).

OBJECTIVES

1. Determine the efficiencies of acquisition and inoculation of *Xylella fastidiosa* by the GWSS to almonds.
2. Quantify populations of *Xylella fastidiosa* in infected almonds in the field throughout a season.
3. Determine the ability of the GWSS to inoculate and acquire *Xylella fastidiosa* from mature (> 2 years) woody tissues of almond.

RESULTS AND CONCLUSIONS

In our transmission experiments, we exposed GWSS adults to almonds with ALS symptoms for 4 days and then transferred them in groups of 4 GWSS per plant for 1, 2, or 4 days to Peerless almonds in the lab. Infection was assessed after 3-6 months by culturing *X. fastidiosa* (Hill and Purcell 1995). Transmission rates of *X. fastidiosa* from almond to almond for these groups were 13% (3 of 24 test plants) for one day, 29% (6/21) for 2 days, and 67% (14/21) after 4 days access feeding on test plants. Test plants from experiments on acquisition rates from almond and inoculation rates from grape (a better source of the bacterium) to almond have not yet been diagnosed for *X. fastidiosa*. The rates of transmission from almond to almond are lower than those we have found for grape, using the same experimental methods, but transmission of *X. fastidiosa* to plants in experiments with GWSS tend to be more variable than with other vectors. Our results for both almond and grape suggest that some GWSS are not capable of efficient transmission, and we will investigate possibilities that other, competing microbes limit transmission by GWSS.

Experiments to determine if GWSS can inoculate *X. fastidiosa* into mature woody tissues of almond plants in the greenhouse resulted in transmission to both green shoots and older than one year trunks of almond seedlings in the greenhouse, but final results are still pending diagnosis by culture assays. We plan to test the ability of GWSS to transmit *X. fastidiosa* to dormant almond plants during the winter of 2002. The possibility of a year-round inoculation cycle would increase the spread of ALS by increasing the time during which infection of almond could occur more inoculation events would occur during the year. For grapes, this may be one of the main factors explaining why GWSS can create such devastating rates of increase of Pierce's disease in vineyards (Purcell and Saunders 1999).

We estimated the population sizes of *X. fastidiosa* per gram of plant tissue using dilution plating (Hill and Purcell 1995b) from plants with ALS at Davis, California in April, June, and September. Populations were low in April: log 10 (10,000) cells per gram. Populations in June and September averaged about log 6 (one million) colony-forming cells of *X. fastidiosa* per gram. The higher population levels in summer and early fall would promote higher rates of vector acquisition. Population

levels of log 4 are marginal for vector acquisition in grape (Hill and Purcell 1995a), suggesting that summer and fall months should be more efficient for almond to almond transmission. However, GWSS has been observed to occur most frequently in Kern County almonds in February.

REFERENCES

Blua, M. J., P.A. Phillips and R.A. Redak. 1999. A new sharpshooter threatens both crops and ornamentals. California Agriculture 56:22-25.

Hill, B.L. and A.H. Purcell. 1995a. Acquisition and retention of *Xylella fastidiosa* by an efficient vector. Phytopathology 85: 209-212.

Hill, B.L. and A.H. Purcell.1995b. Multiplication and movement of *Xylella fastidiosa* within grape and four other plants. Phytopathology 85:1368-1372.

Purcell, A. H. and S. R. Saunders. 1999. Glassy-winged sharpshooters expected to increase plant disease. California Agriculture 56:26-27.