IMPACT OF LAYERING CONTROL TACTICS ON THE SPREAD OF PIERCE'S DISEASE BY THE GLASSY-WINGED SHARPSHOOTER

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INTRODUCTION

Solutions to managing and controlling Pierce's disease of grapes are often conceptualized as ways of breaking at least one two-way interaction among the insect, plant, and bacteria components that are required for successful disease spread and propagation. Hypothetical solutions may also involve altering the abiotic and biotic environment within which these interactions take place. On the basis of our understanding of Pierce's disease epidemics, as well as other insect transmitted plant pathogen systems, one single control tactic (especially focused upon the insect) will not be sufficient to substantially reduce vector populations such that the incidence of disease is below an economically acceptable level. One management and control strategy that potentially may be utilized to limit the damage brought about by Pierce's disease involves layering separate vector and disease management tactics together such that vector population densities are reduced, their interactions with grapevines are inhibited or disrupted, and the interface between grapevines and the disease organism, *Xylella fastidiosa*, is disrupted. Here we report on our efforts to simultaneously implement (i.e. "layer") various control strategies currently available to limit the spread of Pierce's disease transmitted by the glassy-winged sharpshooter, *Homalodisca coagula.*

OBJECTIVES

Our specific objectives are to determine the ability of a variety of treatment and treatment combinations on 1) their ability to reduce glassy-winged sharpshooter density and feeding and 2) their ability to reduce the rate of spread of Pierce's disease in newly planted vineyards.

RESULTS AND CONCLUSIONS

The research site was established in April of 2001 at the Agricultural Operations facility located on the campus of the University of California, Riverside. One thousand grape vines were acquired from SunRidge Nursery in early may and planted on May 16, 2001. The variety utilized in this study is Chardonnay 04 on S04 rootstock. Vines were planted with 6 ft spacing between plants and 12 ft spacing between rows and watered with drip irrigation. At total of 10 rows of 100 vines per row was planted. Treatment and treatment combinations evaluated are 1) imidacloprid at full rate, 2) imidacloprid at 1/2 rate, 3) a combination of imidacloprid plus acetamiprid, 4) metalosate, 5) kaolin, 6) imidacloprid-acetamiprid combination plus kaolin, 7) imidacloprid-acetamiprid combination plus metalosate, 8) metalosate plus kaolin, 9) imidacloprid-acetamiprid combination plus kaolin plus metalosate, and 10) control (water only). Treatments involving acetamiprid could not be evaluated until Fall of 2002.

Results indicated that there was a significant difference among treatments with respect to the number of sharpshooters found on experimental plants for both 2001 and 2002 (2001: $F_{8,91}$ =17.14, $P<0.0001$, 2002: $F_{9,90}$ =20.74, $P<0.001$, Figure 1). As replicates involving acetamiprid are only included in the 2002. As expected plants treated only with metalosate (a potential prophylactic treatment for Pierce's disease) supported similar numbers of sharpshooters as untreated control plants. Overall plants treated with kaolin demonstrated reduced numbers of sharpshooters relative to the untreated controls, and plants treated with imidacloprid exhibited the lowest numbers of sharpshooters. There were no significant differences in the numbers of sharpshooters found on plants treated with kaolin as compared to the numbers found on insecticide treated plants. These patterns have been maintained for the duration of the experiment thus far. No experimental treatment has yet resulted in complete protection from sharpshooters; consequently, all treated plants remain at risk of exposure to *X. fastidiosa.* With the exception of metalosate, all treatments were reasonably effective in reducing sharpshooter numbers throughout the fall season. Differences among treatments were lost as sharpshooter numbers naturally declined at the end of fall. A combination of imidacloprid, acetamiprid and kaolin was most effective at reducing overall sharpshooter numbers; however, it should be noted that a significant number of sharpshooters was found on all treated plants throughout the growing season.

Results of our latest feeding trials demonstrated that imidacloprid, imidacloprid-acetamiprid, and imidacloprid at half-rate applied per twice year significantly reduced sharpshooter feeding (Figure 2). Regardless of treatment type, imidacloprid reduced sharpshooter feeding by approximately 95%. Treating with imidacloprid at half-rate twice a year or combining full rate imidacloprid with acetamiprid did not significantly reduce feeding any further than a single application of imidacloprid at the full label rate.

As of September 2002, several treatments have significantly reduced the incidence of Pierce's disease symptoms in experimental plants. Imidacloprid at full rate, kaolin, kaolin plus metalosate imidacloprid-acetamiprid-kaolin, imidacloprid-acetamiprid-metalosate, imidacloprid plus acetamiprid plus kaolin plus metalosate all significantly reduced the incidence of Pierce's disease relative to untreated controls. Other treatments and treatment combinations (including just metalosate) did not significantly reduce the incidence of PD. Unfortunately, while the above treatments did reduced the incidence of PD relative to controls, they still suffered an approximate average of 30% infections (30% of the treated plants showed symptoms after 1.5 years). Control treated plants displayed an average of 69% infection.

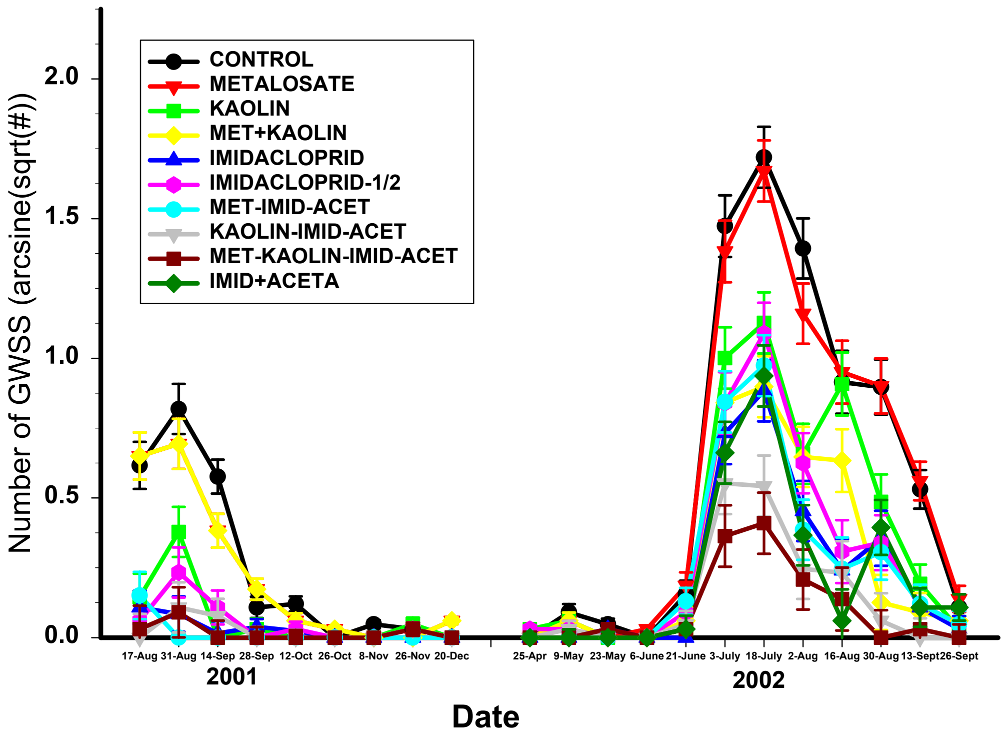

Figure 1: Effect of treatments on numbers of glassy-winged sharpshooters detected in grape plants.

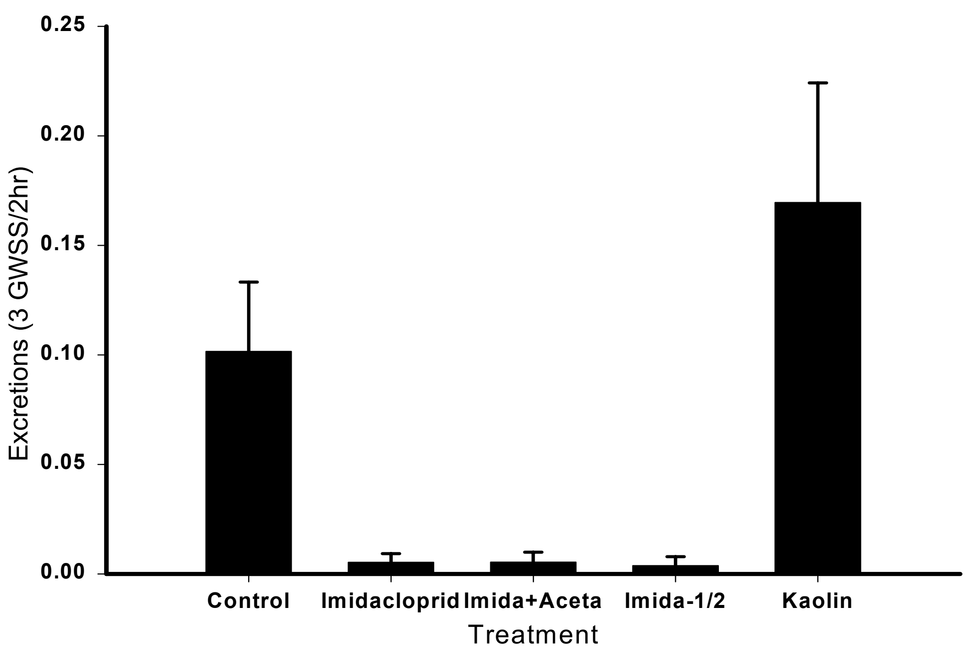

Figure 2: Effect of treatment on feeding rate of glassy-winged sharpshooter on grapes

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