SEASONAL APPEARANCE OF *XYLELLA* IN VINEYARDS AND CONTROL OF PIERCE'S DISEASE IN SOUTHERN CALIFORNIA

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ABSTRACT

Five vineyards in Temecula Valley CA were monitored for the appearance of the pathogen, *Xylella fastidiosa*, responsible for Pierce's disease in grapevines. Organically grown vineyards showed the appearance of *Xf* by April 29th, 2007 (the fourth week of the experiment). Commercial vineyards treated with the systemic insecticide, Imidacloprid (Admire®) did not show the appearance of the pathogen as late as June 9th, 2007 (the fourteenth week). Treatment of commercial vineyard by Imidacloprid by late April was considered ideal to prevent the glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis*, from acquiring and spreading the pathogen within vineyards. These data suggest that growing citrus and grapevines organically in the Temecula without treatment by insecticides that can control GWSS are likely to continue to provide an inoculation source for vineyards that are protected. However, there was no evidence that the pathogen was successfully spread from organic vineyards to treated commercial vineyards by GWSS. We conclude that it would not be possible to grow grapevines in Temecula without control of the vector insect in the absence of some other technology to control PD.

INTRODUCTION

In 1997-1999 the wine and grape growing area of Temecula CA suffered an epidemic of Pierce's disease caused by the pathogen, *Xylella fastidiosa*, that was transmitted by the glassy-winged sharpshooter (GWSS), *Homalodisca vitripennis* (Takiya et al., 2006). Since the initial appearance of the disease, GWSS has been controlled by treatments of the systemic insecticide imidacloprid (Admire®) on commercial vineyards and on commercial citrus in the Temecula Valley wine country (Toscano et al., 2006).

Similar treatments have also controlled PD in the General Beale grape growing area east of Bakersfield CA. The timing of appearance of the pathogen in grapevines in the Bakersfield area suggested that vine-to-vine transmission of the pathogen within vineyards by GWSS is the predominant source of the spread of PD (Feil et al., 2003). It was also noted that infection of grapevines by transmission of the pathogen by GWSS did not lead to permanently infected grapevines and that a given grapevine could "cure" itself of the pathogen during the winter dormant period of the grapevine and not provide an inoculation source the following spring (Hill et al., 2006).

Therefore the timing of appearance of the pathogen in grapevines emerging from winter dormancy is critical in determining when to begin treatments of imidacloprid to prevent spring GWSS incursions from acquiring Xylella and beginning the transmission cycle. Also, the Temecula area in particular has a small but significant number of organically grown vineyards. It was important to test those for the presence of Xylella to estimate their contribution as inoculation sources for other vineyards nearby, both treated and untreated.

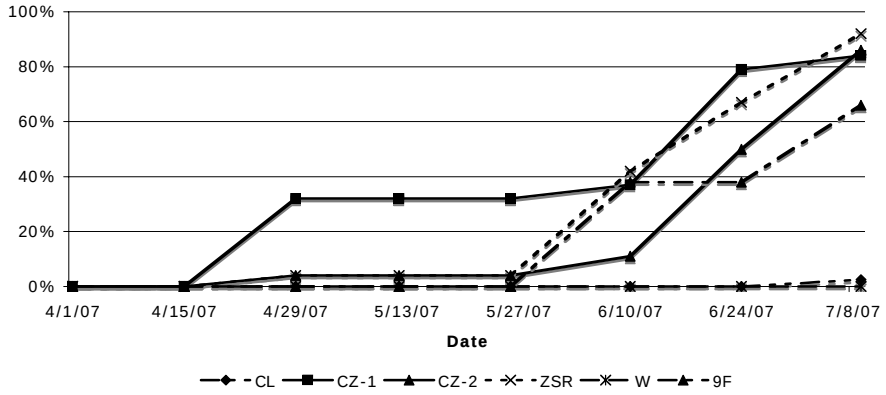
RESULTS

Five Temecula vineyards, including Weaver's Admire-treated vineyard (W), Cziraki's organic vineyards (CL, CZ-1 and CZ-2), abandoned vineyard (ZSR), and an experimental control vineyard (9F, the UCR Agricultural Operation field experiment) were tested for the presence of *Xf* using ELISA Pathoscreen kit. The survey was focused on the seasonal appearance of *Xylella fastidiosa (Xf)* in grapevines in the vineyards. A summary of the survey is shown in Table 1 and Figure 1 below. In organic vineyards except CL, the *Xf* appeared in late April. Later in late May, more than 50% of those samples form the organic vineyards tested positive for *Xf*. In contrast; the Weaver vineyard did not show the appearance of *Xf*. This *Xf* appearance was crucial for the correct timing of Imidacloprid treatments to stop vine-to-vine transmission by GWSS during the peak season.

Table 1. Percentage of positive plants of survey results from Temecula vineyards.

	number of vines	1-Apr-07	15-Apr-07	29-Apr-07	12-May-07	26-May-07	10-Jun-07	24-Jun-07	9-Jul-07
CL	41	0%	0%	0%	0%	0%	0%	0%	2.50%
CZ-1	19	0%	0%	32%	32%	32%	37%	79%	84%
CZ-2	28	0%	0%	4%	4%	4%	11%	50%	86%
ZSR	24	0%	0%	4%	4%	4%	42%	67%	92%
W	3	0%	0%	0%	0%	0%	0%	0%	0%
9F	8	0%	0%	0%	0%	0%	38%	38%	66%

Figure 1.: A graph of percentage of positive plant of survey result from Temecula vineyards



DISCUSSION

The result of the survey was obvious that the Imidacloprid-untreated vineyards turned positive and Imidacloprid-treated vineyard was negative for *Xf*. Thus the treatment of Imidacloprid in late April was necessary to control the spread of PD in a vineyard. If vineyards were not treated in April, then *Xf* would be spread and cause substantial loss.

The organic vinyard owners are concerned about the use of non-organic insecticides. At this point there is no effective organic insecticide to control PD comparable to imidacloprid. We are searching for a nonrecombinant endophyte that can be approved for use to control *Xylella* in organic vineyards.

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BIOLOGICAL CONTROL OF PIERCE'S DISEASE OF GRAPEVINE WITH BENIGN STRAINS OF *XYLELLA FASTIDIOSA* SUBSP. *PIERCEI*

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ABSTRACT
This project involves the evaluation of the biological control of Pierce's disease (PD) with a strain of *Xylella fastidiosa* (*Xf*) that is benign to grapevine. The benign strain, EB92-1, will be evaluated in two vineyards in Southern California/Temecula that are hotspots for PD and in two vineyards in the Napa Valley. Different methods of utilization of the biocontrol strain are also being evaluated, including using cuttings from mature vines that are infected with the EB92-1 strain, injection of plants in the vineyard compared with those injected prior to transplanting, and injection of the rootstock, scion, or both.

INTRODUCTION
Pierce's disease (PD) of grapevine is a chronic problem for the California grape industry and has become more of a threat to the industry with the introduction of the glassy-winged sharpshooter (GWSS). The only feasible control for PD is resistance. Through 10 years of research on the biological control of PD of grapevine in Florida by cross protection with weakly virulent strains of *Xylella fastidiosa (Xf)*, we demonstrated that this also is a potential means of controlling this disease. The overall goal of this project is to develop a biological control system for PD of grapevine that would allow the production of *Vitis vinifera* (*V. vinifera*) in California and other areas where PD and GWSS are endemic.

OBJECTIVES
1. To evaluate strain EB92-1 of *Xf* subsp. *piercei* which has provided effective biocontrol of PD in previous greenhouse and vineyard tests in Florida for possible commercial application for the biological control of PD of grapevine in the vineyard in California.
2. To compare different methods of treatment with strain EB92-1 of *Xf* subsp. *piercei* for the biocontrol of PD in *V. vinifera* in the vineyard.

RESULTS
This project is being initiated. We are in the process of locating two test vineyards in the Temecula/Southern California area, where the PD is chronic and severe. We are also locating three test vineyards in the Napa Valley area. Plants for the test vineyards will be obtained this winter/early spring, injected with the biocontrol strain when new growth is two-three feet in length and transplanted into the vineyard in the spring of 2008.

Experiments to evaluate different methods of treatment with EB92-1 were established in the MREC vineyard in Apopka, Florida during the summer. Four treatments were applied to the cultivar Merlot/101-14 on May 29 and the plants were transplanted into the vineyard on June 21. The treatments were 1) injection of EB92-1 into the scion only, 2) injection of EB92-1 into the rootstock only, 3) injection of EB92-1 into both the rootstock and scion, and 4) nontreated. Five treatments were applied to the cultivar Chardonnay CL96/3309 on June 13 for the greenhouse treatments and on July 26 for the vineyard treatment. The plants were transplanted into the vineyard on July 3. The treatments were 1) injection of EB92-1 into the scion only in the greenhouse, 2) injection of EB92-1 into the rootstock only in the greenhouse, 3) injection of EB92-1 into both the rootstock and scion in the greenhouse, 4) nontreated, and 5) injection of EB92-1 into the scion only in the vineyard. In a third experiment, Chardonnay cuttings from the MREC vineyard were grafted onto Salt Creek rootstock rooted cutting from the vineyard. The grafted plants were transplanted into the vineyard on August 14. The treatments included 1) Chardonnay cuttings from mature vines that had been treated three years ago with EB92-1 on Salt Creek, 2) Chardonnay cuttings from mature nontreated vines on Salt Creek, and 3) Chardonnay cuttings from mature nontreated vines on Salt Creek, with the scion injected with EB92-1 in the vineyard on August 29.

CONCLUSIONS
The project was initiated in July. There are no conclusions to report.

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Funding for this project was provided by the CDFA Pierce's Disease and Glassy-winged Sharpshooter Board.