

ALTERNATIVES TO CONVENTIONAL CHEMICAL INSECTICIDES FOR CONTROL OF GLASSY-WINGED SHARPSHOOTER

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INTRODUCTION

Glassy-winged sharpshooter (GWSS) is a major pest of grape because it vectors a serious grape disease called Pierce's disease. Successful control of GWSS requires disinfestation of vineyards, citrus orchards, and plant nurseries in both agricultural and urban areas. Although there are conventional chemical insecticides that could be used to disinfest grape vineyards before harvest or treat urban areas for GWSS, there are concerns over public and environmental safety. Use of organically approved materials or insecticide chemistries safe to human health and the environment would be desirable, especially in GWSS control situations near urban areas. Currently, there are only a few organically approved insecticides (Surround WP, plant oils, and insecticidal soap) and information on how effective these materials are against GWSS is lacking.

ARS and industry partners have developed two new insecticidal chemistries that offer significant insect control properties with improved safety to human health and the environment. Particle film technology (Surround WP) is based on the inert mineral, kaolin. Surround WP is exempt from tolerance, can be applied up to the day of harvest, has a 4 hour re-entry period, virtually no mammalian toxicity, and is listed as an approved organic production material. Surround WP is unique among insecticides in that it has the ability to repel insects from plants and prevents insect oviposition and feeding which could prevent transmission of Pierce's disease. It has proven to be as effective as imidacloprid in controlling GWSS in citrus in recent small block tests in California. Sucrose octanoate is nearing EPA registration, made of food grade materials, is exempt from tolerance, and has also shown levels of control of GWSS that is as good or better than many of the soft pesticides currently available (M-Pede, Valero).

OBJECTIVES

1. Effect of alternative insecticide chemistries on all life stages on GWSS;
2. Efficacy of alternative insecticide chemistries for quick knock-down kill of GWSS in the field;
3. Prevention of GWSS infestations with season-long and timed spray applications of Surround WP.

What was accomplished the first year of this grant was the completion of objective 3 and the partial completion of objective 1.

RESULTS AND CONCLUSIONS

Prevention of GWSS Infestation with Season-long Applications of Surround WP

In the 2000 season, research was initiated at 3 vineyard sites north of Temecula, California. Treatments of Surround WP and an untreated control were applied to 1–2 acre blocks of wine grapes with three replications at Luttgens, (Cabernet Sauvignon) Mt. Palomar (Reisling) and Calloway (Chardonnay) vineyards. Treatments were applied about every 2 weeks

from April to September using a rate of 50 lb. Surround/100 gal of water applied at 50 to 100 gpa. GWSS and leafhopper adults were monitored biweekly using yellow sticky traps. Direct counts of GWSS adults and nymphs were also conducted on 16 ft of vine row in both treatments. In addition, the percentage of grape leaves damaged by leafhoppers was assessed in July, August, and September. All vines in these studies were rated for Pierce's disease (PD) symptoms in May and September, 2000 and again in September 2001 by Ed Civerolo's group to determine treatment effects.

Early Season Applications of Surround as a Barrier to GWSS Movement from Citrus into Grape

In March of 2001, research was initiated at 3 vineyard sites bordering citrus near Bakersfield, California. In these studies, we examined the effect of a 600 ft and 800 ft Surround WP barrier treatments on GWSS adult movement from citrus into grape. Treatments of Surround WP were compared to a conventional chemical control program at 3 vineyard test sites using 4–12 acre plots/ treatment with 3 replications. Surround treatments of 50 lb Surround WP/100 gal was applied at 50 to 70 gpa on March 13, March 30 and April 14 at three test sites. In Test Site 1 (12 acre treatment blocks), yellow sticky traps were placed in 2 transects per block and spaced every 100 feet that began where grape interfaced citrus and extended 1300 ft into the treatment blocks that went approximately 500 ft beyond the treated areas. In addition, the trap transects were extended into adjacent citrus groves for 100 ft. Test Sites 2 and 3 were similar to Test Site 1 except there were 4 replications and only 1 trap transect per treatment block. Data were only analyzed for Test Site 1 because GWSS control efforts in citrus adjacent to Test Sites 2 and 3 drove GWSS counts to levels too low to effectively sample.

Effect of Surround WP Applications on Nymphal Behavior

A series of studies were conducted on GWSS nymphs in free-choice and no-choice environments where they were offered Surround WP treated and untreated lemon foliage. The objectives of these studies were to determine if Surround treatments affected feeding preference and survival of GWSS nymphs. In a free-choice study, twenty GWSS nymphs were released at the base of a lemon seedling with one limb treated with Surround WP and one limb left untreated. Nymphs per limb were recorded 1 and 2 days after treatment. This experiment was replicated 6 times in field cages during July, 2001. In a no-choice study, twenty GWSS nymphs were released at the base of a lemon seedling that was treated with Surround or left untreated. Numbers of nymphs per seedling were recorded daily for 4 days after initiation of the study. This experiment was replicated 6 times in field cages during July, 2001.

Response of GWSS Adults to Different Colored Traps

A study was conducted to determine the response of GWSS adults to different colored sticky traps. Although it is known that GWSS adults are attracted to yellow, it is not known what other colors they are attracted to or if this attraction is temporal. Directly related to our Surround studies was the need to determine how GWSS adults respond to the color white because Surround turns plant foliage white. Round plastic colored targets 10 inches in diameter and coated with Tangle Foot sticky polymer were attached to bamboo poles 6 ft. above the ground. The colored traps were then placed within citrus groves at 3 sites beginning in April, 2001 and were sampled year-around. There were 9 colors with 4 replications per site.

Research on the different application strategies to control GWSS in grape and the studies on GWSS behavior have shown:

- 1) Bi-weekly Surround WP applications performed better than weekly applications of conventional insecticides in early spring.
- 2) Surround WP applied as an 800 ft barrier bi-weekly along heavily infested citrus performed better than weekly conventional insecticide treatments in preventing GWSS oviposition both within and beyond the barrier treatment.
- 3) Bioassays determined that GWSS nymphs will not move to Surround treated foliage and if forced to stay on treated foliage they will eventually die.
- 4) GWSS adults orient to yellow and to a lesser degree orange. They did not orient to white, indicating that white Surround WP treated plants could be difficult for GWSS to locate.

This research, plus other independent studies conducted by other researchers in California have shown that Surround WP is an effective alternative for the control of GWSS in both citrus and grapes.