



# Department of Pesticide Regulation



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## MEMORANDUM

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DATE: March 1, 2012

SUBJECT: MONITORING RESULTS OF IMIDACLOPRID APPLICATIONS FOR GLASSY WINGED SHARPSHOOTER CONTROL IN A RESIDENTIAL AREA OF SAN LUIS OBISPO COUNTY

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### Summary

On March 17, 2011, the San Luis Obispo County Department of Agriculture's contract applicator applied imidacloprid to control the glassy-winged sharpshooter (*Homalodisca vitripennis* [GWSS]) in San Luis Obispo, California. Foliar and soil treatments of imidacloprid were applied. The Department of Pesticide Regulation (DPR) and the California Department of Food and Agriculture (CDFA) staff took air, leaf, deposition, and tank samples at two sites in the treatment area. Air samples were taken before, during, and after the application. All air samples contained no detectable amount of imidacloprid, and the detection limits ranged from 0.015 to 0.062  $\mu\text{g}/\text{m}^3$ . Post application dislodgeable foliar residue from leaf samples had concentrations of 0.015  $\mu\text{g}/\text{cm}^2$  and 0.017  $\mu\text{g}/\text{cm}^2$  for the two sites. The average mass deposition sample concentrations were 0.032  $\mu\text{g}/\text{cm}^2$  under the canopy and 0.0028  $\mu\text{g}/\text{cm}^2$  one-half meter outside the canopy of the treated shrubs. The imidacloprid concentrations for the tank mixes used for the soil injection and foliar treatments were 0.15% and 0.0027% respectively, 82% and 93% of the target concentrations of 0.18% and 0.0029%.

### Introduction

GWSS is a serious agricultural pest in California. It is a very efficient vector of the bacterium *Xylella fastidiosa* and the associated diseases to grapevines (Pierce's Disease), almond trees, alfalfa, citrus, and oleander. First found in the state in 1990, GWSS has spread throughout Southern California and into areas of the San Joaquin Valley. Treatments have included soil applications of imidacloprid and foliar applications of imidacloprid, carbaryl or cyfluthrin. The San Luis Obispo County Department of Agriculture currently uses soil injection and foliar applications of imidacloprid to control infestations of the GWSS.



The Environmental Monitoring Branch of DPR has been monitoring selected treatments made in residential areas to provide information on the concentrations of the applied pesticides in air, surface water, and on leaf surfaces. Additionally, tank samples are taken at each location where air samples are collected to verify application rates. In 2011, staff from CDFA Pierce's Disease Control Program and DPR Environmental Monitoring Branch monitored treatments. Results reported in this memo are from imidacloprid applications made at two sites on March 17, 2011, in San Luis Obispo, California. Sampling results from other GWSS monitoring studies are available at DPR's Web site <<http://www.cdpr.ca.gov/docs/emon/epests/gwss/reports.htm>>.

### **Materials and Methods**

**Pesticide Application** - The imidacloprid treatments were in a residential area consisting of single family detached homes in the city of San Luis Obispo, California. Monitoring was conducted at two residences that were treated on March 17, 2011. Samples were collected at these residences from March 16 to March 18, 2011. Foliar applications of Merit® 75 WP (Bayer®), containing 75% active ingredient (a.i.) of imidacloprid were made at a dilution of one half ounce (14.7 grams) Merit® 75 WP per 100 gallons (379 liters) of water. Pesticide was delivered through a HD Hudson JD9® High Pressure Spray Gun with a 2 gpm nozzle attached to a truck mounted PBM Spray and Manufacturing, Inc. spray rig, consisting of a tank, motor, pump and hose. In addition to the foliar application, a soil injection of Merit® 75 WSP (Bayer®), consisting of 75% a.i. of imidacloprid, was made to noncitrus trees at a dilution of 32 ounces (907 grams) per 100 gallons (379 liters) of water. Pesticide was delivered through a HD Hudson JD9® High Pressure Spray Gun with an injection nozzle and Flowmaster™ electronic flow meter also attached to a truck mounted PBM Spray and Manufacturing, Inc. 100 gallon spray rig. CoreTect® tablets (2.5 gram 20% a.i. imidacloprid) were applied to citrus at 2-3 tablets per inch of trunk diameter. Soil injection and tablet applications were not monitored. Applications to monitoring sites began at 10:40 a.m. and ended at 11:40 a.m. for the two sites.

**Air Sampling** - Ambient air samples were collected in the front yard of both sites. A background air sample was taken prior to treatment on March 16, 2011. Air samples were taken during, and for one day following treatment.

Samples were collected using XAD - 2 resin tubes (SKC#226-30-02) and SKC air samplers (SKC# 224-PCXR8) calibrated at a rate of approximately 3 liters-per-minute, using the standard operation procedure (SOP) EQAI001.00 (Wofford, 2001). The samplers were located outdoors near the front door of the house and away from the direct spray of the treatment, with an air intake height of ~ 1.1 meter. After collection samples were stored on dry ice until delivery to the CDFA's Center for Analytical Chemistry for laboratory analyses. Imidacloprid on the XAD-2 resin was extracted with methanol and analyzed using High Performance Liquid

Chromatography (HPLC) with an ultra violet (UV) detector with a reporting limit of 0.05 µg per sample (analytical method EM 12.3).

**Leaf Sampling** - Leaf samples were collected from host plants at the monitoring sites for dislodgeable residue analysis, SOP FSOT006.00 (Gurusinghe, 2006). Foliage was treated with the same application tank from which the tank sample was collected. Samples consisted of approximately 30 grams of whole leaves collected into 1 quart glass Mason jars and sealed with an aluminum foil lined lid. Two samples at each site were collected: one before application to the foliage (background) and the other after the spray had dried, which was one hour after the application ended. Before - and after - treatment leaf samples were collected from the same plants. Samples were stored on wet ice and delivered within 24 hours to the CDFA Center for Analytical Chemistry, and analyzed for dislodgeable foliar residue. Samples were washed with Surten® surfactant, extracted with ethyl acetate, and analyzed using HPLC with a fluorescence detector (analytical method EM 12.4). The limit of quantification (LOQ) was 0.5 µg/sample (~ 0.0035 ug/cm<sup>2</sup>).

**Deposition Sampling** - Deposition samples were collected to monitor the amount of imidacloprid reaching the ground under and around foliar treated host plants, SOP FSOT005.00 (Walters, 2003). Samples consisted of 800 cm<sup>2</sup> aluminum foil rectangles pinned on plastic covered cardboard rectangles. The deposition samples were placed in the front yards of the treated properties before treatment and collected approximately two hours after treatment. Eight samples were positioned under the canopy of the treated shrubs and eight were placed one-half meter outside the canopy. After collection samples were stored on dry ice until delivery to the CDFA's Center for Analytical Chemistry for laboratory analyses. (modified analytical method EM 19.4).

**Tank Sampling** - Tank samples were collected during the application, SOP FSOT007.00 (Sava, 2008). The samples were collected from the spray gun into a 500-mL nalgene® opaque container. Tank samples were stored separate from other samples on wet ice until delivery to the lab for analysis. The tank samples were diluted with methanol and analyzed using HPLC.

### **Weather**

The weather was clear and sunny on the application day. On March 17, 2011 temperatures ranged from 43°F to 65°F with a daily average wind speed of 4.9 miles-per-hour, measured at the California Irrigation Management Information System (CIMIS) station #160, San Luis Obispo.

### **Results and Discussion**

**Air** - A total of six air samples were analyzed for imidacloprid. All air samples had no detectable amount of imidacloprid at a reporting limit of 0.05 µg/sample, which corresponds to air

concentrations of 0.015  $\mu\text{g}/\text{m}^3$  to 0.062  $\mu\text{g}/\text{m}^3$ . The variation is due to the different volume of air sampled during the two air sampling collection periods (Table 1).

**Leaf Samples** - Leaf samples were collected from treated shrubs at the two monitoring sites. The post application samples had residues of 0.015 and 0.017  $\mu\text{g}/\text{cm}^2$  of imidacloprid. Monitoring results from three other GWSS treatments had average recoveries of 0.045, 0.052 and 0.098  $\mu\text{g}/\text{cm}^2$  of imidacloprid, adjusted by measured tank concentration (Kim 2007, Segawa 2004, Walters 2001). These results, while similar are not directly comparable due to differences in host plants, application equipment, application rates, and sampling methods. The background samples had no detectable amount of imidacloprid at a reporting limit of 0.0035 and 0.0040  $\mu\text{g}/\text{cm}^2$ . The variation is due to differences in the surface area of the leaf samples collected (Table 2).

**Deposition Sampling** - Sixteen deposition samples were collected from the monitoring sites. The 8 samples positioned under the canopy of the treated shrubs had average residues of 0.032  $\mu\text{g}/\text{cm}^2$ , compared to 0.0028  $\mu\text{g}/\text{cm}^2$  for the 8 samples positioned one-half meter outside the canopy (Table 3).

**Tank Mix** - The tank samples had concentrations of 0.148% and 0.0027% a.i. of imidacloprid. The applicator mixing rate for Merit® 75 WSP (75% a.i. of imidacloprid) was 32 ounces of product per 100 gallons of water for soil injection around trees. Theoretical calculation of percent a.i. was 0.18%. The applicator mixing rate for Merit® 75 WP (75% a.i. of imidacloprid) was one-half ounces of product per 100 gallons of water for foliar use on trees and ornamentals. Theoretical calculation of percent a.i. was 0.0029% (Table 4).

Table 1. Imidacloprid Air Concentrations and Minimum Detection Limits.

Sample Description	Amount detected	Air Volume Collected	Detection Limit
#1 Background	<0.05 $\mu\text{g}$ *	2.93 $\text{m}^3$	0.017 $\mu\text{g}/\text{m}^3$
#2 Background	< 0.05 $\mu\text{g}$ *	2.96 $\text{m}^3$	0.017 $\mu\text{g}/\text{m}^3$
#1 Application	< 0.05 $\mu\text{g}$ *	0.81 $\text{m}^3$	0.062 $\mu\text{g}/\text{m}^3$
#2 Application	< 0.05 $\mu\text{g}$ *	0.81 $\text{m}^3$	0.061 $\mu\text{g}/\text{m}^3$
#1 Post Application	< 0.05 $\mu\text{g}$ *	3.27 $\text{m}^3$	0.015 $\mu\text{g}/\text{m}^3$
#2 Post Application	< 0.05 $\mu\text{g}$ *	3.23 $\text{m}^3$	0.015 $\mu\text{g}/\text{m}^3$

\* Below 0.05  $\mu\text{g}/\text{sample}$  Reporting Limit

Table 2. Imidacloprid Leaf Deposition Sample Concentrations and Minimum Detection Limits.

Sample	Amount detected	Concentration	Detection Limit
#1 Background	< 0.5 µg *	none detected	0.0035 µg/cm <sup>2</sup>
#2 Background	< 0.5 µg *	none detected	0.0040 µg/cm <sup>2</sup>
#1 Post Application	2.78 µg	0.017 µg/cm <sup>2</sup>	0.0031 µg/cm <sup>2</sup>
#2 Post Application	2.15 µg	0.015 µg/cm <sup>2</sup>	0.0035 µg/cm <sup>2</sup>

\* Below 0.5 µg/sample Reporting Limit

Table 3. Imidacloprid Ground Deposition from Foliar Applications.

Sample# & Location	Concentration	
1 Outside	0.00675 µg/cm <sup>2</sup>	Samples placed 1.5 meters Outside Treated Host Plant Canopy Average 0.0028 µg/cm <sup>2</sup> Standard deviation 0.0040 µg/cm <sup>2</sup>
2 Outside	0.00006 µg/cm <sup>2</sup>	
6 Outside	0.00042 µg/cm <sup>2</sup>	
7 Outside	0.00011 µg/cm <sup>2</sup>	
9 Outside	0.01100 µg/cm <sup>2</sup>	
11 Outside	0.00168 µg/cm <sup>2</sup>	
14 Outside	0.00021 µg/cm <sup>2</sup>	
16 Outside	0.00194 µg/cm <sup>2</sup>	
3 Canopy	0.02188 µg/cm <sup>2</sup>	Samples Placed Under Treated Host Plant Canopy Average 0.0324 µg/cm <sup>2</sup> Standard deviation 0.0188 µg/cm <sup>2</sup>
4 Canopy	0.02400 µg/cm <sup>2</sup>	
5 Canopy	0.02363 µg/cm <sup>2</sup>	
8 Canopy	0.01113 µg/cm <sup>2</sup>	
10 Canopy	0.04750 µg/cm <sup>2</sup>	
12 Canopy	0.04525 µg/cm <sup>2</sup>	
13 Canopy	0.01900 µg/cm <sup>2</sup>	
15 Canopy	0.06700 µg/cm <sup>2</sup>	
17 Field Blank	< 0.000025µg/cm <sup>2</sup> *	Detection Limit 0.000025µg/cm <sup>2</sup>

\* Below 0.02 µg/sample Reporting Limit

Table 4. Imidacloprid Tank Mixture Sample Concentrations and Theoretical Concentrations.

Sample	Amount detected	Theoretical Amount	% of Theoretical Mixture Amount
Foliar Spray - Merit® 75 WP	0.0027%	0.0029%	93%
Soil Injection - Merit® 75 WSP	0.148%	0.18%	82%

## References

Gurusinghe, P.: 2006, *Procedure for Sampling Foliage for Pesticide Residue*. Standard operating procedure FSOT006.00. Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<<http://www.cdpr.ca.gov/docs/emon/pubs/sops/fsot006.pdf>>.

Kim, D.: 2007, *Monitoring Results of Imidacloprid Applications for Glassy Winged Sharpshooter Control in a Residential Area of Santa Calara County*. Memorandum to Randy Segawa, Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at: <[http://www.cdpr.ca.gov/docs/emon/epests/gwss/imid\\_gwss\\_07.pdf](http://www.cdpr.ca.gov/docs/emon/epests/gwss/imid_gwss_07.pdf)>.

Sava, R.: 2008, *Procedure for Sampling Pesticide Application Equipment*. Standard operating procedure FSOT007.00. Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<<http://www.cdpr.ca.gov/docs/emon/pubs/sops/fsot007.pdf>>.

Segawa, R, J. Walters, S. Fan: 2004, *Preliminary Monitoring Results of Imidacloprid and Cyfluthrin Applications for Glassy-Winged Sharpshooter Control in a Residential Area of Solano County*. Memorandum to John S. Sanders, Ph.D. Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<<http://www.cdpr.ca.gov/docs/emon/epests/gwss/gwss091704.pdf>>.

Walters, J, H. Casjens, and K. Goh: 2001, *Preliminary Monitoring Results of Imidacloprid and Cyfluthrin Applications for Glassy-Winged Sharpshooter Control in Commercial Areas of Butte County*. Memorandum to John S. Sanders, Ph.D., Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<[http://www.cdpr.ca.gov/docs/emon/epests/gwss/r1018\\_01.pdf](http://www.cdpr.ca.gov/docs/emon/epests/gwss/r1018_01.pdf)>.

Walters, J.: 2003, *Mass Deposition Sampling Using Mass Deposition Sheets*. Standard operating procedure FSOT005.00. Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<<http://www.cdpr.ca.gov/docs/emon/pubs/sops/fsot005.pdf>>.

Wofford, P.: 2001, *Instructions for Calibration and Use of SKC Inc. Personal Sample Pumps*. Standard operating procedure EQAI001.00. Environmental Monitoring Branch, Department of Pesticide Regulation, Sacramento, California. Available at:

<<http://www.cdpr.ca.gov/docs/emon/pubs/sops/eqai001.pdf>>.

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### **Analytical Methods**

EM 12.3, 2000, *Determination of Carbaryl and Imidacloprid Desorbed from XAD-2 Resin Tubes*. Center for Analytical Chemistry, Environmental Monitoring Section, Department of Food and Agriculture, Sacramento, California. Available at:  
<[http://www.cdpr.ca.gov/docs/emon/pubs/anl\\_methds/imeth\\_169.pdf](http://www.cdpr.ca.gov/docs/emon/pubs/anl_methds/imeth_169.pdf)>.

EM 12.4, 2000, *Determination of Carbaryl and Imidacloprid on Dislodgeable Leaf Punch Samples*. Center for Analytical Chemistry, Environmental Monitoring Section, Department of Food and Agriculture, Sacramento, California. Available at:  
<[http://www.cdpr.ca.gov/docs/emon/pubs/anl\\_methds/imeth\\_170.pdf](http://www.cdpr.ca.gov/docs/emon/pubs/anl_methds/imeth_170.pdf)>.

EM 19.4, 1995, *Diazinon, Chlopyrifos, and Methidathion on Mass Deposition Samples*. Center for Analytical Chemistry, Environmental Monitoring Section, Department of Food and Agriculture, Sacramento, California.