California Environmental Protection Agency
Department of Pesticide Regulation
Environmental Monitoring and Pest Management
830 K Street
Sacramento, California 95814-3510

ENVIRONMENTAL MONITORING OF GROUND APPLICATIONS OF INSECTICIDE(S) IN GLASSY-WINGED SHARPSHOOTER TREATMENT AREAS

June 12, 2000

I. INTRODUCTION

The California Department of Food and Agriculture (CDFA) proposes to use ground applications of carbaryl and maybe other insecticides to manage glassy-winged sharpshooter (GWSS) infestations in California. The glassy-winged sharpshooter (*Homalodisca coagulata*) is a serious new pest in Central California. It can feed on over 70 species of crop and ornamental plants. It poses a serious threat to the vineyards due to its ability to spread *Xylella fastidiosa*, the bacterium that causes incurable Pierce's disease in grapes. The sharpshooter can also vector diseases to almond, alfalfa, oleander and citrus (UC 1999).

The Environmental Hazards Assessment Program (EHAP) of the Department of Pesticide Regulation (DPR) will conduct monitoring of selected treatments to provide information on the concentrations of the chemical in various environmental media that may include surface, irrigation runoff, and storm runoff water, turf, soil and air. Additionally, representative backyard vegetables and fruits will be sampled. In the event that ecologically sensitive areas are present toxicity to aquatic organisms will also be determined in surface water. This proposed monitoring plan follows the general models in previous studies of carbaryl and other insecticides applied in gypsy moth eradication projects (Neher et al. 1982; Weaver et al. 1983) and in Japanese beetle eradication projects (Segawa 1988).

This proposed monitoring plan will be followed for each application event. More than one application event may be monitored; the total number of events to be monitored will be decided when the extent of the treatment program is known. The final matrices and total numbers of samples collected will be determined once this information is available. The monitoring data will be used by CDFA to assess proper application rate and coverage and to estimate public exposure to the application.

II. OBJECTIVE

The objectives of this study are to

1) Measure the amount of carbaryl (or other GWSS insecticides) in air, selective backyard vegetable and fruit, surface, irrigation runoff and storm runoff waters. Turf or soil may also be monitored.
2) Measure dissipation half-live of carbaryl in soil and turf, if turf or soil is sprayed.

III. PERSONNEL

This study will be conducted by EHAP under the general direction of Kean S. Goh, Agriculture Program Supervisor IV. Key personnel include:

Project Leader: Roger Sava
Field Coordinator: Nina Bacey and Johanna Walters
Statistician: Terri Barry
Laboratory Liaison: Carissa Ganapathy
Analyzing Laboratory: California Department of Food and Agriculture, Center for Analytical Chemistry
Agency and Public Contact: Kean S. Goh at (916) 324-4072, kgoh@cdpr.ca.gov

IV. STUDY DESIGN

The current GWSS infestations in Northern California are mainly in the Tulare and Fresno County. Proposed application sites cover nine square miles including residential areas. Multiple applications of 2-3 sprays at 7-14 day interval have been proposed. The following sampling plan represents one application event. Some matrices may be sampled at the end of the multiple treatments to provide data on worst-case scenario. Surface water sampling may occur outside treatment areas if they receive runoff water from within the treatment area. Vegetation and air monitoring will occur at the application sites.

Tank Samples will be taken at the ten sites selected for monitoring of environmental matrices. This is to ensure that correct rate of chemical has been applied.

A leafy vegetable and a fruit will be sampled at 10 sites after the elapsed of designated preharvest interval for each crop. Samples will be analyzed for total residues. Prespray samples will be taken.

Turf and/or surface soil. In the event that turf or soil are treated or heavily impacted from the sprays than samples will be collected from 10 application sites. Collection will occur after spray has dried to determine the maximum concentrations in treated areas. Turf samples will be analyzed for dislodgeable residue only. At five of the 10 sites, samples will be collected for up to eight additional sampling dates to determine dissipation rates of insecticide in turf and soil. Dissipation sampling for turf and/or soil may be performed offsite in a controlled setting due to complications with mowing, cultivating and irrigation practices. Half-lives will be estimated using standard statistical methods.

Air samples will be collected. Samples will be collected at fives sites in the highest use area to measure ambient insecticide concentrations. The samples will be collected for a 24-hour period before application (background). From the start of application a 24-hour sample will be taken at each of the five sites follow by another 24-post-application sampling. Sampling will be time for peak application period.
Surface waterways containing residential and agricultural irrigation runoff will be monitored, both prior to and following applications to determine insecticide concentrations. Additionally,

accessible storm runoff sites will be monitored during rain runoff events to determine concentrations due to wash off from exposed surfaces. During the first rain event after the initial application, samples will be collected at points of discharge and/or at areas of concern for aquatic organisms. The number and frequency of samples collected will depend on availability and sensitivity of water bodies and on the intensity and duration of the runoff event.

Aquatic toxicity. If the application areas have ecologically sensitive site, surface water samples will be tested for aquatic toxicity. DFG will assist in the selection of aquatic species for toxicity testing. The species selected will depend upon the origin of the water samples. Toxicity testing will use U. S. Environmental Protection Agency (1993) and American Society for Testing of Materials (1992) methods. Water quality parameters (alkalinity, hardness, electrical conductivity, ammonia, pH, dissolved oxygen, and water temperature) will also be measured.

V. SAMPLING METHODS

Tank Sample. Distinct well-mixed tank sample will be taken from each of the ten sites. Sample in 1-L amber bottle will be kept on wet ice until analysis.

10 sites x 1 sample/site=10 samples

Fruit & Vegetable. A leafy vegetable and a fruit will be sampled after their respective preharvest interval has elapsed. Two one-pound sample of each will be taken from 10 sites and placed in paper bag and stored on dry ice until extraction.

10 sites x 2 samples x 2 plant parts = 40 samples

Turf. In the event that turf is sprayed, a single turf-thatch sample composited from turf-thatch plugs collected from at least four randomly selected subsites within an application site will be taken. Two turf samples will be collected at each application site. Samples will be collected using a rubber mallet to drive a 6.3-cm i.d., stainless steel cylinder approximately 10 cm into the soil/turf. The cylinder containing the soil/turf plug is removed from the earth, and then the core is removed (pushed) from the cylinder. The turf-thatch will be cut off and placed in wide-mouth, glass jars, and sealed with an aluminum foil lined lid. The number of turf-thatch cores collected and the corresponding turf-thatch weight will be recorded on each sample's COC. In the field, samples will be stored on dry ice or refrigerated at -20°C until extraction.

10 sites x 2 samples/site = 20 residue samples
5 sites x 8 periods =40 dissipation samples

Soil. In the event that soil is sprayed or heavily impacted, four soil cores will be collected at four randomly selected subsites within an application site. Two soil samples will be collected at each application site. Soil cores will be collected by inserting a 6.3-cm internal diameter (i.d.), stainless steel cylinder into the soil to a depth of 2.5 cm. The soil cores will be placed into a glass jar and sealed with an aluminum foil lined lid. The number of soil cores collected and corresponding soil weight will be recorded on each sample's chain of custody (COC). In the field, samples will be stored on dry ice or refrigerated at -20°C until extraction.

10 sites x 2 samples/site = 20 samples
5 sites x 8 periods =40 dissipation samples

Air. Five sites, centrally located in the treatment area, will be sampled to measure outdoor ambient air concentrations of insecticide. These sites will be located within a circular area measuring one-half mile in diameter. Sites must also be accessible at all hours, protected from any direct spray, and have electrical power to run the samplers. Anderson model SE-114 sampling pumps, calibrated to 15 liters/min, mounted with XAD-4 resin tubes as the trapping medium will be used at each site. The samples will be collected for a 24-hour period before application (background), 24 hours starting at application, and 24 hours post-spray.

5 sites x 3 sample periods x 1 sample/site = 20 samples

Surface water. Surface water samples will be collected using a depth-integrated sampler (D-77) with a 3-liter Teflon® bottle and nozzle. Five to twenty vertical depth integrated samples will be composited at each site. At sites where the D-77 sampler cannot be used, due to insufficient water depth or access, a grab sample will be collected. Grab samples will be collected as close to center channel as possible using a 10-liter stainless steel bucket or a grab pole consisting of a glass bottle at the end of a 5-foot pole. Samples will be split into amber glass bottles using a Geotech® 10-port splitter then sealed with Teflon®-lined lids. Samples to be analyzed for pesticides will be preserved (if needed) by acidification with 3N hydrochloric acid to a pH between 3.0 to 3.5, and then samples will be stored on wet ice or refrigerated at 5°C until extraction. Toxicity samples will be delivered on wet ice to the CDFG Aquatic Toxicity Laboratory within 30 hours.

Est. 5 sites x 5 periods x 1 sample/site/period=25 samples

VI. CHEMICAL ANALYSIS / TOXICITY TESTING

Chemical analysis will be performed by the CDFA's Center for Analytical Chemistry. Analytical methods are being validated and quality control measures are described in Segawa (1995). In the event that toxicity testing is deemed necessary, DFG's Aquatic Toxicology Laboratory will perform aquatic toxicity tests on surface water samples and measure totals of alkalinity, hardness and ammonia.

VII. DATA ANALYSIS

Concentrations for dislodgeable residues of insecticide in turf/thatch will be reported as milligrams per square meter (mg/m^2) and parts per million (ppm) wet weight and dry weight; soil concentrations will be reported as ppm and mg/m^2 on a wet weight and dry weight basis. Concentrations of total residues in fruit and leafy vegetable will be reported as ug/g or ppm wet weight basis. Concentrations of insecticide in air will be reported as both micrograms per cubic meter ($\mu g/m^3$) and parts per trillion (ppt), and water concentrations will be reported as both micrograms per liter ($\mu g/L$) and parts per billion (ppb). When sample size permits, means, percentiles and frequency histograms will be presented. Toxicity data will be presented as percent survival. Water concentrations will be compared with toxicity data to aid in the interpretation of toxicity test results.

REFERENCES

American Society for Testing of Materials. 1992. Standard guide for conducting static and flow-through acute toxicity tests with mysids from the West Coast of the United States, Designation E 1463-92. In: 1998 Annual Book of ASTM Standards, Volume 11.05, ASTM, West Conshohocken, PA.

Neher, L., R. Segawa, and R. Oshima. 1982. Monitoring of the Gypsy Moth eradication ground spray program in Santa Barbara County. California Dept. of Food and Agriculture. Environmental Hazards Assessment Program. EH 82-02.

Segawa, R. 1988. Monitoring the pesticide treatments of the Japanese Beetle Eradication Project, Sacramento County, California, 1983-1986, Volume I: Carbaryl. California Dept. of Food and Agriculture. Environmental Hazards Assessment Program. EH 88-13.

Segawa, R. 1995. Chemistry Laboratory Quality Control. California-EPA/Dept. of Pesticide Regulation. Environmental Hazards Assessment Program. SOP QAQC001.00.

U.S. Environmental Protection Agency. 1993. Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms. Fourth Edition, EPA/600/4-90/027. Washington, D.C.

Weaver, D. et al. 1983. Monitoring of the 1993 Gypsy moth eradication ground spray program in six California Counties. California Dept. of Food and Agriculture. Environmental Hazards Assessment Program. EH 83-03.