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DATE: June 10, 2020

SUBJECT: SUMMARY OF JAPANESE BEETLE ERADICATION PROGRAM MONITORING FOR CHLORANTRANILIPROLE IN SACRAMENTO AND SANTA CLARA COUNTIES, 2016

INTRODUCTION

In 2014, the California Department of Food and Agriculture's (CDFA) Pest Detection/Emergency Projects Branch found Japanese beetles in traps in the Carmichael area of Sacramento County and initiated an eradication program. Japanese beetle adults feed on the foliage, fruit, and flowers of more than 300 plants; grubs feed mostly on grass roots, causing significant damage to lawns and pastures.

The Japanese beetle was first found in the United States in 1916 near Riverton, New Jersey. It has spread throughout most of the states east of the Mississippi River. Only partial infestations have been discovered west of the Mississippi River, most of which have been eradicated.

Prior to 2016, CDFA's eradication program relied on one application of the pesticide imidacloprid and multiple applications of the pesticides carbaryl and cyfluthrin to control Japanese beetle. In 2016, a single application of Acelepryn®, chlorantraniliprole a.i. (active ingredient) was used. At the request of CDFA, the Environmental Monitoring Branch of the Department of Pesticide Regulation (DPR) monitored the pesticide treatments with CDFA.

This document summarizes chlorantraniliprole monitoring results for Japanese beetle eradication program treatments in Sacramento and Santa Clara Counties in April and May 2016. Air, foliage, turf, and soil were monitored for pesticide residues.

Description of Application

In 2016, treatment for Japanese beetle in Sacramento and Santa Clara Counties consisted of the spray applications of Acelepryn® to turf, ground cover, soil around rose plants, and bare soil under other ornamental host plants. Treatments of monitored properties occurred on April 29, 2016 in Sacramento County, and May 3, 2016 in Santa Clara County.

The pesticide product used for Japanese beetle eradication treatments was Acelepryn® (EPA Reg. #100-1489), 18.4% chlorantraniliprole a.i.[1] The Acelepryn® was diluted with water (3 to 3200 ratio) to 0.017% chlorantraniliprole a.i. in a 200 gallon skid mounted spray rig. The mixed product was delivered through a chemical applicator spray gun (chemlawn gun, 3 gpm nozzle) attached to a hose connected to the application tank. The product was applied with a maximum application rate of 7.5 gallons per 1,000 ft^2 (0.5 lb a.i./acre), water was applied after the application.

Sampling Sites
Two treatment sites were established in the Carmichael area of Sacramento County, and two sites in Sunnyvale, Santa Clara County. Site selection was based on the following criteria: sites must be (1) located in the treatment area; (2) accessible the day before, during, and after the application; and (3) located in a secure area where any disturbance of the air sampling equipment would be unlikely. Residents authorized permission to DPR and CDFA staff to access the area.

MATERIALS AND METHODS

The materials and methods used to monitor for chlorantraniliprole residues in Sacramento and Santa Clara Counties during implementation of the Japanese beetle eradication program of 2016 are described in detail below. Air, foliage, turf, and soil were sampled at various pesticide application intervals: pre-treatment (background), treatment, and post-treatment. The pesticide application tank was also sampled to establish treatment concentrations of chlorantraniliprole.

All samples were analyzed by CDFA's Center for Analytical Chemistry laboratory. The laboratory did not have all the analysis methods ready at the time of sampling; these samples were kept frozen at the laboratory until they could be extracted and analyzed. The tank mixtures were refrigerated and analyzed within 2 weeks.

Air Sampling
A personal air sample pump (SKC# 224-PCXR) calibrated from 2.5 to 3 liters per minute mounted with XAD-2 resin tube trapping medium was used at each site. Air samples were collected at the following treatment intervals (sample intervals were run consecutively and did not overlap).

- **Pre-treatment (Background):** These samples were collected just prior to the pesticide application; the air sampler was run for a duration of about 20 hours.

[1] The mention of commercial products, their source, or use in connection with this eradication project is not to be construed as an actual or implied endorsement of such products.

- **Treatment:** The air sampler was run for a duration of about 8 hours as the pesticide was being applied in the area.
- **Post-treatment:** The air sampler was run for a duration of 18-22 hours after the pesticide application was completed.

All air samples were frozen (on dry ice or in a freezer) until delivered to the laboratory for analysis.

Turf Dislodgeable Residue
Turf dislodgeable residue samples were collected using the MCR (Modified California Roller) method. A weighted cylinder was rolled back and forth (5 times) over a cotton fabric held in place on the turf surface, transferring the chemical residues to the fabric. This method was used and described in a turf transferable residues (TTR) study conducted following imidacloprid application by DPR (Welsh, *et al.,* 2005). MCR samples were collected at each site and additional samples were collected in a controlled Sacramento test site (non-Japanese beetle site). On May 26, 2016 the controlled test application was applied with a backpack sprayer, mixed and filled from a treatment truck leftover from the Santa Clara treatments. Fabric samples were frozen (on dry ice or in a freezer) until delivered to the laboratory.

Foliage Sampling for Total Residue
Foliage samples were collected from ground cover plants from each site, if present. Background samples were collected prior to pesticide application; post-application samples were collected after application residue had dried. Total residue samples consisted of 20-40 grams of whole leaves placed in wide mouth Mason® jars. Samples were frozen (on dry ice or in a freezer) until delivered to the laboratory.

Turf and Soil Sampling
Each turf and soil sample consisted of three randomly selected cores taken to a depth of 1 inch, some turf cores had a substantial amount of soil. Cores were collected using a 2-1/2 inch (28.56 square centimeter [cm^2]) diameter stainless steel tube and composited into one wide mouth Mason® jar with an aluminum foil lined lid. Background samples were collected before treatment; post-treatment samples were collected after the pesticide application when the turf was dry. Samples were frozen (on dry ice or in a freezer) until delivered to the laboratory.

Tank Mixture Sampling/Product Concentration
Tank mixture samples were collected from treatment spray guns at the time of treatment to establish chlorantraniliprole pesticide concentrations in the spray material. Samples consisted of half-filled 500 milliliter Nalgene® wide mouth bottles. The exterior of each bottle was rinsed to remove spilled product; bottles were then triple bagged and refrigerated (on wet or blue ice) until

delivered to the laboratory. Tank sample results were compared to the amount/application rate specified on the product label to ensure the pesticide was mixed properly.

Quality Control
The CDFA Center for Analytical Chemistry analyzed all samples collected for this monitoring study. Standard operating procedures for continuing quality control (QC) measures are specified in QAQC001.01 (https://www.cdpr.ca.gov/docs/emon/pubs/sops/qaqc00101.pdf). Continuing QC samples were evaluated by laboratory chemists and adjustments were made to the analytical equipment on an as-needed basis to ensure analytical integrity.

RESULTS AND DISCUSSION

Air
No chlorantraniliprole residues were detected in any of the air samples collected. The highest detection limit of 0.038 µg/m^3 occurred during the treatment period. The detection limits for the other sample periods were below 0.02 µg/m^3. Detection limits for all samples are in Table 1.

Turf Dislodgeable Residue (MCR)
Turf dislodgeable residue samples were collected using MCR over a 5690 cm² sample area. The sample mean was 41.6 µg/sample with a maximum of 62.9 µg/sample for the 8 post-treatment samples. These results were similar to the 52.2 µg/sample mean with a maximum of 58.0 µg/sample for the controlled test in Sacramento. All background samples were ND (none detected, below detection limit). All MCR sample results are in Table 2.

Foliage Samples
The mean of the groundcover foliage samples was 3.80 ppm total residue of chlorantraniliprole in the post-application samples with a range of 1.44 to 5.83 ppm (Table 3). All background samples were ND. Samples were collected before and after the treatment. For the Sacramento sites, the species collected for the background samples were not treated and therefore do not appear in the table; a different species was treated and collected for post-treatment samples.

Turf and Soil Samples
The sample mean of the four turf/soil plugs was 0.50 ppm total residues of chlorantraniliprole with a range of 0.34 to 0.61 ppm (Table 4). All background samples were ND.

The sample mean of the three soil plugs was 1.58 ppm total residues of chlorantraniliprole. The two soil samples collected in Santa Clara were from around rose host plants with concentrations of 1.95 and 1.97 ppm total residues of chlorantraniliprole. The single Sacramento soil core was collected from under ornamental host plants, with a chlorantraniliprole concentration of 0.813 ppm (Table 5).

Tank Mix
Each site and the MCR controlled test were treated from a separately mixed tank mixture. The mean concentration was 0.01725% chlorantraniliprole, compared to the target concentration of 0.017% (Table 5). The controlled test tank mixture was mixed during the Santa Clara treatments 2 weeks before testing, this sample had a lower concentration of 0.014%.

CONCLUSION

Monitoring of the Japanese beetle eradication program pesticide treatments yielded the following results.

- All air samples were none detected (ND). Detection limits were below 0.016 $\mu g/m^3$ before and after treatment, and below 0.038 $\mu g/m^3$ during the treatment period.

- The MCR turf dislodgeable samples mean concentration was 41.6 µg/sample, or 0.0073 $\mu g/cm^2$. The maximum concentration was 62.9 µg/sample, or 0.011 $\mu g/cm^2$.

- The foliar total residue samples mean concentration was 3.8 ppm. The maximum concentration was 5.83 ppm.

- The turf/soil plugs samples mean concentration was 0.50 ppm. The maximum concentration was 0.61 ppm.

- The rose soil sample concentrations were 1.95 and 1.97 ppm. The bare soil sample concentration was 0.813 ppm.

- The tank mixture sample mean concentration was 0.01725%, all samples were within 6% of the target concentration.

TABLES

Table 1. Air Sampling Results. Detection limits are in µg/m^3 and represent the highest concentration which may have gone undetected.

Interval	Site	Amount Detected µg/m^3	Detection Limit µg/m^3	Detection Limit µg/sample
Background*	SC 1	ND	0.016	0.05
	SC 2	ND	0.015	0.05
Application	Sac 1	ND	0.036	0.05
	Sac 2	ND	0.034	0.05
	SC 1	ND	0.038	0.05
	SC 2	ND	0.037	0.05
Post-Application	Sac 1	ND	0.014	0.05
	Sac 2	ND	0.014	0.05
	SC 1	ND	0.016	0.05
	SC 2	ND	0.016	0.05

*Technical problems invalidated the Sacramento background samples

Table 2. Turf Dislodgeable Residue (MCR) Results. Results are reported in µg per sample. The sample area was 5690 cm^2. 1 Pass is rolling in one direction, the return is Pass 2.

Interval	Site	Amount Detected µg/sample	# of Passes	Detection Limit µg/sample
Background	Sac 1	ND	10	1.0
	Sac 2	ND	10	1.0
	SC 1	ND	10	1.0
	SC 2	ND	10	1.0
Post-Treatment Mean 41.6 SD 11.9	Sac 1	46.5	10	1.0
	Sac 1	44.8	10	1.0
	Sac 2	62.9	10	1.0
	Sac 2	36.5	10	1.0
	SC 1	50.4	10	1.0
	SC 1	25.8	10	1.0
	SC 2	30.7	10	1.0
	SC 2	35.4	10	1.0
Controlled Test 10_pass Mean 52.2 SD 7.7		32.5	5	1.0
		34.5	5	1.0
		43.5	10	1.0
		55.2	10	1.0
		58.0	10	1.0
		60.8	20	1.0
		55.5	20	1.0
		60.4	20	1.0
		67.7	20	1.0

Table 3. Ground Cover Foliar Treatment. Total residue results are reported in parts per million (ppm).

Interval	Site	Amount Detected ppm	Detection Limit ppm
Background	SC 1	ND	0.01
	SC 2	ND	0.01
Post-Treatment	Sac 1	3.62	0.01
	Sac 2	1.44	0.01
	SC 1	4.31	0.01
	SC 2	5.83	0.01

Table 4. Turf Plugs. Total residue results are reported in parts per million (ppm).

Interval	Site	Amount Detected ppm	Detection Limit ppm
Background	Sac 1	ND	0.01
	Sac 2	ND	0.01
	SC 1	ND	0.01
	SC 2	ND	0.01
Post-Treatment Mean 0.50ppm	Sac 1	0.611	0.01
	Sac 2	0.536	0.01
	SC 1	0.508	0.01
	SC 2	0.339	0.01

Table 5. Soil Cores. Total residue results are reported in parts per million (ppm).

Interval	Site	Amount Detected ppm	Detection Limit ppm
Background	SC 1	ND	0.01
	SC 2	ND	0.01
Post-Treatment Mean 1.58ppm	Sac 2	0.813	0.01
	SC 1	1.950	0.01
	SC 2	1.970	0.01

Table 6. Tank Mixture Samples. Total residue results reported in percent. The target mix concentration is 17%.

	Site	Amount Detected %	Detection Limit %
Treatment Sites Mean 17.25	Sac 1	0.016	0.0002
	Sac 2	0.017	0.0002
	SC 1	0.018	0.0002
	SC 2	0.018	0.0002
	Control*	0.014	0.0002

REFERENCES

Welsh A, Powell S, Spencer J, Schneider F, Hernandez B, Beauvais S, Fredrickson AS, Edmiston S, 2005. Transferable Turf Residue Following Imidacloprid Application. HS-1860. Worker Health and Safety Branch, Cal/EPA Department of Pesticide Regulation.