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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

WASHINGTON, D.C. 20460

OFFICE OF PREVENTION, PESTICIDES AND TOXIC SUBSTANCES

OFF OFFICIAL RECORD HEALTH EFFECTS DIVISION SCIENTIFIC DATA REVIEWS - EPA SERIES 061

MEMORANDUM

DATE: March 7, 2007

SUBJECT: Secondary Review of "Determination of Transferable Turf Residue Dissipation from Turf Treated with Granular and Water Dispersible Granular Formulations of Thiamethoxam"; MRID# 46402915; D321327

FROM: Margarita Collantes, Biologist  
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TO: Venus Eagle, PM01  
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HED performed a secondary review of this TTR study for Thiamethoxam and concurs with Versar's primary review and conclusions. A summary of the study and conclusions is provided below.

MAR 15 REC'D

## EXECUTIVE SUMMARY:

This study was designed to characterize dissipation of thiamethoxam transferable turf residues when applied to turf at three test sites in California, Pennsylvania and North Carolina. Meridian™ 25WG Insecticide, formulated as a water dispersible granule containing 25% thiamethoxam as the active ingredient and Meridian™ 0.33G Insecticide, formulated as a dry granule containing 0.33% ai thiamethoxam, were applied once to separate plots at each site. The applications were made using turf handgun equipment and a drop spreader, typical of residential lawn applications. The effect of watering-in versus not watering-in was also examined at each site. Watering-in was conducted by applying 0.25 inches of water following application using overhead sprinkler irrigation. Each Meridian™ 25WG application was made at the maximum target application rate of 0.265 lbs ai per acre. Each Meridian™ 0.33G application was made at the maximum target application rate of 0.265 lbs ai per acre. Transferable turf residues (TTR) were collected using the modified California Roller Technique. The application method, rate, and frequency (number and timing) were relevant to the use pattern proposed by the product label. All untreated control samples were collected at each site prior to application of the test product. Each field site consisted of four treated plots: (1) Meridian™ 25WG - non-irrigated; (2) Meridian™ 25WG - irrigated; (3) Meridian™ 0.33G - non-irrigated and (4) Meridian™ 0.33G - irrigated. Each treated plot was divided into subplots from which four replicate samples were collected randomly at each sampling interval. Targeted sampling intervals were: pre-application, immediately post-application (non-irrigated plots only), 4, 8, and 24 hours after treatment, and 2, 4, 7, 10, 14, and 21 days after treatment. Not all samples from these intervals were analyzed.

Only one irrigated Meridian™ 25WG test plot (North Carolina) had measurable transferable residues; these residues were detected at 4 hours and 2 days after treatment (DAT2) and were just slightly above the MQL ( $0.000359 \mu\text{g}/\text{cm}^2$ ). At all other locations, the plots sprayed with the Meridian™ 25WG formulation and then irrigated yielded no detectable residues of thiamethoxam. All transferable residues in the plots treated with the granular formulation (Meridian™ 0.33G), irrigated and non-irrigated, were below the level of detection, except at the North Carolina site. At this site, residues from the Meridian™ 0.33G non-irrigated plot were detected in 2 of the 4 post-application (0 hr) samples at a level slightly above the MQL and in all 4 of the DAT2 samples at a much higher level (average of  $0.001742 \mu\text{g}/\text{cm}^2$ ). At the Meridian™ 0.33G irrigated plot, a single sample collected from the 4 hour after application sampling event was slightly above the MQL. According to the Study Report, the samples from the irrigated Meridian™ 25WG test plot and the non-irrigated Meridian™ 0.33G test plot in North Carolina were collected during light rainfall and when turf was reported to be noticeably damp. The study author speculates that the transferable residues detected on DAT2 at these plots were artificially high for this reason.

Measurable transferable residues were detected at all non-irrigated Meridian™ 25WG plots and are summarized in **Table 1** below. At the California test site, the maximum average TTR values for the non-irrigated Meridian™ 25WG application occurred immediately after the application of the test substance ( $0.0122 \mu\text{g}/\text{cm}^2$ ). At the Pennsylvania test site, the maximum average TTR values for the non-irrigated Meridian™ 25WG application occurred immediately after the application of the test substance ( $0.0096 \mu\text{g}/\text{cm}^2$ ). At the North Carolina non-irrigated Meridian™ 25WG test site, the average TTR value was  $0.007445 \mu\text{g}/\text{cm}^2$  immediately after application of the test substance.

The raw TTR values did not require correction for field fortification recoveries, as the appropriate corresponding overall recoveries were >90%.

Table 1. Meridian™ 25WG Non-irrigated Trial Summary

| Field Site     | Registrant's Regression Coefficient (R <sup>2</sup> ) | Registrant's Half-life (hours) | Versar's Regression Coefficient (R <sup>2</sup> ) | Versar's Half-life (days) | Zero Hour Avg Residue (µg/cm <sup>2</sup> ) | Percent of Average Application Rate |
|----------------|---|--------------------------------|---|---------------------------|---|-------------------------------------|
| California     | 0.9792  | 1.17                           | 0.9798  | 1.19                      | 0.0122                                      | 0.40                                |
| Pennsylvania   | 0.9671  | 0.361                          | 0.9723  | 0.356                     | 0.0096                                      | 0.31                                |
| North Carolina | 0.9486  | 1.34                           | 0.6767  | 1.37                      | 0.0074                                      | 0.24                                |

Note: Average actual application rate was 3.060 µg/cm<sup>2</sup>

Dissipation rates were modeled by the study author, assuming first-order kinetics, to estimate thiamethoxam half-lives of 1.17 hours (R<sup>2</sup>=0.9792) for non-irrigated Meridian™ 25WG applied at the California site, 0.361 hours (R<sup>2</sup>=0.9671) at the Pennsylvania site, and 1.34 hour (R<sup>2</sup>=0.9486) at the North Carolina site. The Registrant reported the half-life values in hours. However, the regression equation they provided and the graphical representations of the data curves used time in days. Versar's estimated half-life values were 1.19 days (R<sup>2</sup>=0.9798) for non-irrigated Meridian™ 25WG applied at the California site, 0.356 days (R<sup>2</sup>=0.9723) at the Pennsylvania site, and 1.37 days (R<sup>2</sup>=0.6767) at the North Carolina site. It appears that the Registrant's and Versar's R<sup>2</sup> values for the North Carolina site are different because the Registrant used the incorrect DAT2 average in the regression analysis.

**SYNONYMS:** The chemical name for thiamethoxam is 4H-1,3,5-oxadiazin-4-imine, 3[(2-chloro-5-thiazolyl)methyl]tetrahydro-5-methyl-N-nitro. The CAS number for thiamethoxam is 153719-23-4.

**CITATION:**

Authors: Leah A. Rosenheck  
William Itterly

Title: *Determination of Transferable Turf Residues on Turf Treated with the Granular and Water-Dispersible Granule Formulations of Thiamethoxam (CGA-293343)*

Report Date: September 2, 2004

Performing Laboratory: Central California Research Laboratories, Inc.  
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Identifying Codes: CCRL Study Number 990079; Syngenta Number 1201-00; MRID 464029-15; Unpublished

**SPONSOR:** Syngenta Crop Protection, Inc.  
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**COMPLIANCE:** Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. The study sponsor waived claims of confidentiality within the scope of FIFRA Section 10 (d)(1)(A), (B), or (C). The Study Report indicated that the study was conducted under EPA Good Laboratory Practice Standards (40 CFR Part 160), with the following exceptions: Pennsylvania: (1) historical weather data; and (2) the percent relative humidity data were not collected in strict adherence to GLP standards. North Carolina: (1) field pesticide history information and (2) weather data were not collected in strict adherence to GLP standards. The site and soil information such as slope, depth to groundwater and USDA soil classification data were not collected at either site in strict adherence to GLP standards. According to the study author, these GLP deviations did not compromise the scientific integrity of the study.

**CONCURRENT EXPOSURE STUDY?:** No

**GUIDELINE OR PROTOCOL FOLLOWED:** This study was conducted according to an approved protocol number 1201-00. Series 875, Occupational and Residential Exposure Test Guidelines Group B: Postapplication Exposure Monitoring Test Guidelines, 875.2100, Transferable Residue Dissipation, Lawn and Turf was followed for the compliance review of this study

## I. MATERIALS AND METHODS

### A. MATERIALS

#### 1. Test Material:

|                             |   |
|-----------------------------|---|
| Formulation:                | Meridian™ 25WG - a water dispersible granular formulation containing 25% thiamethoxam as the active ingredient.<br>Meridian™ 0.33G - a dry granular formulation containing 0.33% thiamethoxam as the active ingredient. |
| Lot #:                      | Meridian™ 25WG - KW910081 (formulated product)<br>Meridian™ 0.33G - GP-000206 (formulated product)  |
| Formulation guarantee:      | The certificates of GLP analyses for the test products stated that the formulations contained 25.6% ai (Meridian™ 25WG) and 0.29% ai (Meridian™ 0.33G). The expiration date for both analyses was 1/31/2002.            |
| Purity:                     | 98.9% (technical standard)  |
| CAS #(s):                   | 153719-23-4   |
| Other Relevant information: | Meridian™ 25WG EPA Reg. No. 100-943; EPA Est. 67545-AZ-1<br>Meridian™ 0.33G EPA Reg. No. 100-961; EPA Est. 5905-GA-1  |

#### 2. Relevance of Test Material to Proposed Formulation(s):

According to the Study Report, the test products sent to the field sites were Meridian™ 25WG containing 25% ai thiamethoxam and Meridian™ 0.33G containing 0.33% ai thiamethoxam. The labels provided with the Study Report had the same names and the same percent active ingredients. Thus, they appear to be the same products.

### B. STUDY DESIGN

There were 15 amendments to and zero reported deviations from the study protocol. The amendments specified the following: (1) department and personnel title changes resulting from the merger between Novartis and Zeneca; (2) changing site 1 from Florida to California due to poor turf quality; (3) the purity analysis of 0.29% for Meridian™ 0.33G should be used to calculate the amount of test substance applied to the test plot due to the significant difference in between the nominal percent ai and the assayed amount; (4) correcting typographical errors in Part A Biological Phase of the protocol; (5) replacing the Virginia site with the North Carolina field site because the samples collected at the Virginia site could not be verified and the results were highly variable; (6) reducing the number of samples to be collected for plots 2 (25WG - irrigated), 3 (0.33G-non-irrigated) and 4 (0.33G-irrigated) at the North Carolina site; (7) changing the turf height to 1.5 to 2.5 inches at the North Carolina test site; (8) changing the 8-hour sampling interval at the North Carolina site to a 6-hour sampling interval; (9) increasing the handgun application swath at the North Carolina site from 10 ft to 12 ft; (10) although the North Carolina site received a trace of rain after the DAT1 sampling interval and prior to the DAT2 sampling interval, it was decided that the study would not be aborted at this test site; (11) providing more accurate information concerning the turf variety, age, and source of the turf at the North Carolina site; (12) adding DAT23 and DAT28 sampling intervals to the North Carolina 25WG-non-irrigated plot (plot 1) which was later dropped; (13) sampling interval DAT21 at the California site was to only be conducted for the 25WG-non-irrigated plot; (14) changing the analytical principal investigator; and (15) correcting typographical errors in Part B Analytical Phase of the protocol.

#### 1. Site Description

Test locations: The field portion of the study was conducted at three geographically distinct locations for each formulation. The three locations were in Madera County, California, Lehigh County, Pennsylvania, and Granville County, North Carolina. A test site was also originally located in Ivor, Virginia, but this site was dropped from the study because the analysis of the samples collected at the 4 hour and 8 hour post-application sampling intervals contained a large number of non-detects and the sampling

information for all of the samples collected at this site could not be accurately verified. The North Carolina test site replaced the Virginia test site.

Areas sprayed and sampled: Each field site consisted of the following four treated plots:

- Plot 1: Meridian™ 25WG- non-irrigated;
- Plot 2: Meridian™ 25WG - irrigated;
- Plot 3: Meridian™ 0.33G - non-irrigated; and
- Plot 4: Meridian™ 0.33G - irrigated.

All untreated control samples were collected at each site prior to application of the test product.

California - All treated plots were separated by a distance of at least 200 ft. Plots 1 and 2 measured 100 ft by 10 ft (0.023 acres); plots 3 and 4 measured 100 ft by 8.67 ft (0.020 acres). The treated plots were divided into two rows of 25 subplots. The subplots for plots 1 and 2 measured 5 ft by 4 ft and subplots for plots 3 and 4 measured 52 inches by 4 ft.

Pennsylvania - All treated plots were separated by a distance of 35 ft. Plots 1 and 2 measured 43 ft by 25 ft (0.025 acres); plots 3 and 4 measured 43 ft by 29.5 ft (0.029 acres). Plots 1 and 2 were set up in two strips 39 ft in length and 10 ft wide, with 26 subplots per strip. Each subplot measured 3 ft by 5 ft. Plots 3 and 4 were divided into 5 strips per plot, with each strip measuring 3.5 ft by 40 ft. and containing 10 subplots per strip.

North Carolina - The distance between the treated plots ranged from 21 to 46 ft. Plot 1 measured 75 ft by 12 ft (0.021 acres) and consisted of two strips of 25 subplots per strip, with each subplot measuring 4 ft by 3 ft. Plot 2 measured 45 ft by 12 ft (0.012 acres) and consisted of two strips of 15 subplots per strip, with each subplot measuring 4 ft by 3 ft. Plots 3 and 4 measured 50 ft by 12.5 ft (0.014 acres) and consisted of 3 parallel strips, each strip measuring 41 inches by 50 ft and were separated from each other by 1 ft. There were 10 subplots in each strip. Each subplot measured 42 inches by 4 ft.

Meteorological Data: The protocol stated that daily maximum and minimum air temperatures, wind speed and direction, and relative humidity data were to be collected from automated sensors near or at the field sites. These environmental conditions were to be monitored from the date of plot establishment through final sampling. Table 1 provides a summary of the meteorological conditions which existed at the time when the applications were made. Additionally, the air temperature range, the relative humidity range, and rainfall during the study period at each site is provided below. Historical weather data were not provided for any of the sites.

California Meteorological data were measured using the Excel Weather Station that was located about 400 to 800 feet from the test plots. According to the Study Report, air temperatures ranged from 47 to 99°F and relative humidity ranged from 9 to 93%. There was no rainfall during the period of the trial. However, turf irrigation with overhead sprinklers was used (a total of 5.27 to 5.60 inches).

Pennsylvania Meteorological data were monitored using NOAA station #0106, approximately 16 miles from the test plot. On-site rainfall was

measured using an automated weather station approximately 200 yards from the test plots. According to the Study Report, the air temperatures ranged from 47 to 97°F. Relative humidity ranged from 11 to 100%. The first rain event occurred on Day 1 (0.32 inches), prior to collecting the 24-hour sample. There was an overall total of 2.43 inches of rainfall prior to the DAT3 collection.

North Carolina Meteorological data were monitored using a Campbell weather station, located at the Grayson Facility approximately 103 feet south of treatment plot 2. On-site rainfall was measured using a rain-gauge placed at the northeast corner of plot 2. According to the Study Report, the air temperatures ranged from 58.4 to 90.0°F. Relative humidity ranged from 52 to 100%. The first rain event occurred on DAT2 (trace prior to sampling and 0.1 inches after sampling).

Table 1. Meteorological Data from All Three Test Sites on Day of Application

| Site | Application Scenario | Application Date | Air Temperature (°F) | Wind (mph) | Relative Humidity (%) |
|------|----------------------|------------------|----------------------|------------|-----------------------|
| CA   | Plot 1               | 5/4/2001         | 70.0                 | 2 to 4     | 34.0                  |
|      | Plot 2               | 5/4/2001         | 70.0                 | 2 to 4     | 34.0                  |
|      | Plot 3               | 5/4/2001         | 74.0                 | 2 to 3     | 30.0                  |
|      | Plot 4               | 5/4/2001         | 74.0                 | 2 to 3     | 30.0                  |
| PA   | Plot 1               | 6/19/2001        | 76.4                 | 0 to 1.8   | 70.0                  |
|      | Plot 2               | 6/19/2001        | 76.4                 | 0 to 1.8   | 70.0                  |
|      | Plot 3               | 6/19/2001        | 87.5                 | 0          | 49.0                  |
|      | Plot 4               | 6/19/2001        | 87.5                 | 0          | 49.0                  |
| NC   | Plot 1               | 8/16/2001        | 86.0                 | 0          | 73.0                  |
|      | Plot 2               | 8/16/2001        | 86.0                 | 0          | 73.0                  |
|      | Plot 3               | 8/16/2001        | 90.0                 | 0          | 74.0                  |
|      | Plot 4               | 8/16/2001        | 90.0                 | 0          | 74.0                  |

For each field site: Plot 1 represented the Meridian™ 25WG application which was not watered in.  
 Plot 2 represented the Meridian™ 25WG application which was watered in.  
 Plot 3 represented the Meridian™ 0.33G application which was not watered in.  
 Plot 4 represented the Meridian™ 0.33G application which was watered in.

## 2. Surface Monitored:

California

Turf Species: Tall Fescue  
 Residential or Public Area: Excel Research Services facility.  
 Other relevant Characteristics: The turf in plots 1 and 2 was slightly over four years old and the turf in plots 3 and 4 was approximately 2 years old. The turf was mowed to a height of 2 inches on May 2, 2001, two days before the application and on May 21, 2001 which was 17 days after the application. The clippings were raked off the plots.

Other products used on turf (treated plots): No pesticides or fertilizers were applied to the test plots in 2001.

#### Pennsylvania

Turf Species: Triple Mix Fescue  
 Residential or Public Area: Crop Management Strategies field facility.  
 Other relevant Characteristics: The turf used in all four plots was approximately 10 years old. The turf was mowed to a height of 2.5 inches with a rotary mower on June 11, 13, and 18, 2001. The application took place on June 19, 2001. The clippings were bagged and removed.

Other products used on turf (treated plots): No maintenance pesticides were applied to the turf during 2001. On April 6, 2001, 20-9-9 fertilizer was applied at 346 lb/A.

#### North Carolina

Turf Species: Tifway 419 Bermuda grass  
 Residential or Public Area: Grayson Research facility  
 Other relevant Characteristics: The turf in all four plots was approximately 5.5 years old. The test plots were mowed to a height of 2.25 inches on August 14, two days before the application.

Other products used on turf (treated plots): On July 31, 2001, the turf was fertilized with 16-8-8 at a rate of 116 lb nitrogen per 1,000 ft<sup>2</sup>. Weeds were pulled by hand on August 14.

### **3. Physical State of Formulation as Applied**

The physical states of the formulations as applied were a liquid spray for the Meridian™ 25WG test product and dry granule for the Meridian™ 0.33G test product.

### **4. Application Rates and Regimes**

Residential or Commercial Applicator: The products were applied by a researcher and the turf was cultured and maintained according to accepted local commercial practices.

Application rate: The target application rate was 0.265 lbs ai per acre for both Meridian™ 25WG (17 oz/A) and Meridian™ 0.33G (91.4 lb product/A), the maximum labeled application rates. Though the Meridian™ 0.33G label indicates a maximum rate of 80 lb product/A, the product was applied at a rate of 91.4 lb product/A to account for the difference in the nominal percent active ingredient (0.33%) and the assayed percent active ingredient (0.29% ai). The applications for test plots 1 and 2 were mixed/loaded and sprayed in succession from the same spray mix. The applications for test plots 3 and 4 were loaded and spread in succession from the same calibration.

#### California

The actual application rate for the Meridian™ 25WG applications (plots 1 and 2) was 0.265 lb ai/A and the actual application rate for the Meridian™ 0.33G applications (plots 3 and 4) was 0.266 lbs ai/A.



|                                   |                       |   |
|-----------------------------------|-----------------------|---|
|                                   | <u>Pennsylvania</u>   | The actual application rates for the Meridian™ 25WG applications for plots 1 and 2 were 0.277 lb ai/A and 0.265 lb ai/A, respectively. The actual application rates for the Meridian™ 0.33G applications for plots 3 and 4 were 0.296 lbs ai/A and 0.346 lb ai/A, respectively.   |
|                                   | <u>North Carolina</u> | The actual application rates for the Meridian™ 25WG applications for plots 1 and 2 were 0.270 lb ai/A and 0.273 lb ai/A, respectively. The actual application rates for the Meridian™ 0.33G applications for plots 3 and 4 were 0.299 lbs ai/A and 0.295 lb ai/A, respectively.   |
| Application Regime:               | <u>California</u>     | Each plot was treated once on May 4, 2001.  |
|                                   | <u>Pennsylvania</u>   | Each plot was treated once on June 19, 2001.  |
|                                   | <u>North Carolina</u> | Each plot was treated once on August 16, 2001.  |
| Application Equipment:            |                       | The liquid spray application was made with a turf handgun attached by a long hose connected to a spray tank. The handgun was powered by a tractor-driven PTO pump with continuous hydraulic (bypass) agitation. The applicator swath was 10 ft for the California site and 12 ft for the Pennsylvania and North Carolina sites. The granular application was made with a tractor-drawn Gandy drop spreader. The applicator swath was 52 inches for the California site and 42 inches for the Pennsylvania and North Carolina sites. |
| Spray Volume:                     | <u>California</u>     | The targeted spray volume for Meridian™ 25WG was 80 gallons/A. The actual spray volume for plots 1 and 2 was 80 gallons/A.  |
|                                   | <u>Pennsylvania</u>   | The targeted spray volume for Meridian™ 25WG was 81.3 gallons/A. The actual spray volumes for plots 1 and 2 were 84.9 gallons/A and 81.1 gallons/A.   |
|                                   | <u>North Carolina</u> | The targeted spray volume for Meridian™ 25WG was 81.3 gallons/A. The actual spray volumes for plots 1 and 2 were 84.5 gallons/A and 85.5 gallons/A.   |
| Equipment Calibration Procedures: |                       | The liquid sprayer was calibrated by the time:volume method on the day of the application or the day before the application. The granular spreader was calibrated by measuring the spreader output over time by catching and weighing the granules dispensed during a specified time interval.  |
| Was application "watered in"?     |                       | Plot 1 was not watered-in (Meridian™ 25WG)<br>Plot 2 was watered-in (Meridian™ 25WG)<br>Plot 3 was not watered-in (Meridian™ 0.33G)<br>Plot 4 was watered-in (Meridian™ 0.33G)  |
|                                   |                       | The water-in procedure, for plots 2 and 4, began within 30 minutes following application. The target amount of water to be applied to each plot was 0.25 inches. Irrigation was accomplished by using an overhead sprinkler system to simulate a homeowner sprinkler or rainfall.   |
| Was total deposition measured?    |                       | No  |

##### 5. Dislodgeable Residue Sampling Procedures

**Method and Equipment:** Samples were collected using the modified California Roller Technique, which was approved by the Outdoor Residential Exposure Task Force (ORETF). This technique involves the use of a 27" x 39" cloth (27.5" x 39.5" cloths for PA site) attached to a rectangular metal frame with clamps and a 32 ± 1 pound roller. After the cloth was secured, a rectangular plastic sheet of similar dimensions was placed behind the cloth on the frame. The frame was secured to the turf using nails at all four corners. The cloth media used in the study was 100% cotton sheeting (200 thread count).

**Sampling Procedure:** The cloth dosimeters were covered by a plastic layer and secured to the sampling media frame. The frame was placed randomly in the subplots. The roller was placed on top of the plastic sheet and rolled back and forth five times without pushing down. The cloth dosimeter was then carefully removed from the surface, any visible debris on the cloth was removed and the cloth was folded with the treated side inward. The cloth samples were wrapped in foil and then placed in a pre-labeled plastic ziplock style bag. Control samples were collected prior from each of the plots prior to the application. The labeled bags were frozen and shipped to the analytical laboratory. The frame was decontaminated between samples using a solvent and a new plastic covering sheet was used for each sample.

**Surface area(s) sampled:** Each cloth dosimeter at the CA and NC sites measured 27" x 39". The cloth dosimeters used at the PA site were 27.5" x 39.5". However, the surface area of the cloth exposed to the turf was 2 ft x 3 ft, or 6 ft<sup>2</sup> which is equivalent to 5,574 cm<sup>2</sup>.

**Replicates per surface:**

- Replicates per sampling time: Cotton cloth samples were collected in quadruplicate from the treated plots (i.e., one sample collected randomly from each of four subplots). The control cloth samples were collected prior to the application.
- Number of sampling times: After the application, there were a total of 9 sampling events at the non-irrigated plots and 10 sampling events at the irrigated plots

**Times of sampling after application:** Treated samples were collected after the application (non-irrigated applications only), 4 and 8 hours, then on 1, 2, 4, 7, 10, 14, and 21 days after the final application. Therefore, the first sampling interval after applications at plots 2 and 4 (watered-in applications) was the 4 hour sampling event. At the Pennsylvania site, the day 4 sample was moved to day 3 due to the rain forecast.

## **6. Sample Handling**

Cotton samples were folded (with the exposed part of the cloth inward) and wrapped in foil. The foil wrapped samples were placed in ziplock bags into coolers with blue or dry ice for transport to freezers prior to being shipped frozen to the analytical laboratory. The California samples were transported by Excel personnel via truck to the analytical laboratory using insulated containers with dry ice on May 7 and 31, 2001. The Pennsylvania samples were shipped by Federal Express overnight air service to the analytical laboratory using insulated containers with dry ice on June 25 and July 16, 2001. The North Carolina samples were shipped by Federal Express overnight air service to the analytical laboratory using insulated containers with dry ice on August 20 and September 24, 2001. The fortification samples were handled, stored and shipped in the same manner as the residue samples. Upon receipt at the laboratory, the samples were inventoried and then placed into frozen storage until analysis. Samples were stored for 4 to 49 days prior to analysis.

## **7. Analytical Methodology:**

**Extraction method:** The method used to quantitatively determine the amount of thiamethoxam residues on cotton cloth was CCRL-MTH-036 entitled "Analytical Method for the Determination of

Thiamethoxam on 100% Cotton Cloth Sampling Media Used in Transferable Turf Residue Studies. The extraction process of thiamethoxam involved placing the cotton cloth samples in ½ gallon glass jars. A one liter solution of 50:50 acetone:deionized water was added to all of the samples. Each sample was capped and inverted/shaken by hand for approximately 30 seconds. Each sample was placed on a platform shaker set at approximately 200 rpm for 20 minutes. After the shaking period, the samples were removed from the shaker and allowed to settle. A 200 mL aliquot was removed from each sample and transferred to a 500 mL separatory funnel. Approximately 20 grams of sodium chloride were added to the sample in the separatory funnel and the sample mixed thoroughly. A 50 mL aliquot of methylene chloride was added to the separatory funnel, the funnel was capped, shaken with venting for approximately 1 minute. After phase separation, the lower aqueous layer was collected into a clean 250 mL container and retained. The organic layer was drained through pre-rinsed sodium sulfate. The aqueous layer was returned to the separatory funnel and partitioned a second time with 50 mL of methylene chloride. The organic layer was drained through sodium sulfate into the same 500 mL flask. The combined sample extracts were evaporated to dryness using a rotary evaporator equipped with a water bath set at approximately 35°C. Ten mLs of deionized water were added to the dried extracts in the sample flasks and transferred to a prepared florisil solid phase extraction (SPE) cartridge. The samples were eluted through the SPE cartridges and the eluates discarded. The sample flask was rinsed with approximately 10 mL of deionized water and the rinse was transferred to the C18 SPE column. The eluate was discarded a second time. The column was not allowed to go completely dry leaving a small amount of water remaining on the column. Thiamethoxam was eluted from the column into a clean evaporation flask using two column volumes of 30% acetone:70% hexane (v:v). The sample eluants were evaporated to dryness using rotary evaporation equipped with a water bath at approximately 35°C. The sample residue was dissolved in mobile phase (20% ACN:80% 0.2M acetic acid) and quantitatively transferred to a pre-calibrated test tube with a teflon lined cap to a final volume of 4 mL. The final sample extracts were transferred to an HPLC vial and submitted for analysis by HPLC UV-VIS. (see Table 2).

Detection method: See Table 2.

Table 2. Summary of HPLC/UV Operating Conditions

|                    |  |            |            |
|--------------------|--|------------|------------|
| HPLC Column        | Phenomenex Luna 5 µ C18 (2)<br>(250 mm x 4.60 mm id) |            |            |
| Guard Column       | Phenomenex Security C18 ODS<br>(4 mm x 3.0 mm id)    |            |            |
| Detection          | UV at 255  |            |            |
| Column Temperature | 35°C   |            |            |
| Mobile Phase       | <u>Time</u>  | <u>A.%</u> | <u>B.%</u> |
|                    | 0.0  | 20 (18)    | 80 (82)    |
|                    | 12.0   | 20 (18)    | 80 (82)    |
|                    | 12.1   | 60         | 40         |
|                    | 16.0   | 60         | 40         |
|                    | 16.1   | 20 (18)    | 80 (82)    |
|                    | 25.0   | 20 (18)    | 80 (82)    |
| Flow Rate          | 1.0 mL/minute  |            |            |
| Run Time           | 25 minutes   |            |            |
| Injection Volume   | 100 µL   |            |            |

|                |                            |
|----------------|----------------------------|
| Retention Time | Thiamethoxam: -9.7 minutes |
|----------------|----------------------------|

**Method validation:** Validation of the analytical method on cloth samples exposed to untreated turf from California, Pennsylvania and Virginia test sites for thiamethoxam followed CCRL method CCRL-MTH-036 (the Virginia test site was later dropped from the study). The North Carolina site was added after the method validation and therefore, there were no validation samples from this site. The method was validated using three fortification concentrations with a minimum quantifiable limit (MQL) of 2.00 µg/sample (0.000359 µg/cm<sup>2</sup>) for thiamethoxam. The method was validated over a 2.0 to 1,000 µg/sample fortification range. Thiamethoxam recoveries ranged from 81.6% to 102% with an overall average recovery of 91.9% ± 5.60% for all three sites.

**Instrument performance and calibration:** Calibration standards ranged from 0.05 µg/mL to 1.0 µg/mL. Five calibration standards were used to generate the calibration curve. According to the Study Report, all of the correlation coefficients calculated from the calibration curves associated with this study were greater than 0.995.

**Quantification:** Thiamethoxam concentrations were determined from the standard calibration curve which was generated by linear regression.

### 8. Quality Control:

**Lab Recovery:** Laboratory recovery samples were analyzed with each analytical sequence of cloth samples. The laboratory control and laboratory fortified samples were clean cloth samples obtained from the Pennsylvania field facility. The results of all control samples extracted and analyzed concurrently with the laboratory fortification samples were less than MQL (0.000359 µg/cm<sup>2</sup>). Laboratory fortification concentrations ranged from 2.00 to 100 µg/sample. Fortification recoveries ranged from 75.0 to 129% with an overall mean recovery of 94.6 ± 10.5% (n=52). Table 3 provides a summary of the laboratory fortification average recoveries.

Table 3. Summary of Laboratory Fortification Recoveries<sup>a</sup>

| Fortification Level (µg) | n  | Average % Recovery per Level | Overall Average % Recovery |
|--------------------------|----|------------------------------|----------------------------|
| 2                        | 26 | 95.9 ± 13.0                  | 94.6 ± 10.5                |
| 40                       | 1  | 82.0                         |                            |
| 50                       | 3  | 97.2 ± 4.52                  |                            |
| 100                      | 15 | 92.0 ± 8.05                  |                            |
| 1,000                    | 7  | 95.7 ± 3.68                  |                            |

<sup>a</sup> Recoveries calculated by Versar using data from Table 2 of the Study Report.

**Field blanks:** Four pre-application samples were collected from each plot at each site. All cloth control blanks collected prior to the applications had residues less than the MQL (0.000359 µg/cm<sup>2</sup>).

**Field recovery:** Field fortification samples were prepared in triplicate at two fortification levels (5.00 and 100 µg/cloth) for each field site. The cotton cloth media was fortified on the day of application for all three sites and on 10 days after application at the California site and on 14 days after application at the Pennsylvania site. The samples used for field fortification were subjected to the same rolling

technique required for the field samples. Tables 4 through 6 provide a summary of the mean field fortification recoveries and standard deviations for each field site. The overall average field fortification recoveries for the California, Pennsylvania and North Carolina sites were  $94.2\% \pm 4.88\%$ ,  $91.7\% \pm 2.78\%$  and  $97.4\% \pm 3.90\%$ , respectively.

Table 4. Summary of Field Fortification Recoveries For California<sup>a</sup>

| Fortification Level<br>( $\mu\text{g}$ ) | Amount Detected<br>( $\mu\text{g}$ ) | Percent Recovery | Daily Average<br>Percent Recovery |
|--|--------------------------------------|------------------|-----------------------------------|
| 5  | 4.90                                 | 98.0             | $92.3 \pm 5.47$                   |
| 5  | 4.57                                 | 91.4             |                                   |
| 5  | 4.89                                 | 97.8             |                                   |
| 5  | 4.53                                 | 90.6             |                                   |
| 5  | 4.16                                 | 83.2             |                                   |
| 5  | 4.63                                 | 92.6             |                                   |
| 100                                      | 97.2                                 | 97.2             | $96.1 \pm 3.72$                   |
| 100                                      | 95.8                                 | 95.8             |                                   |
| 100                                      | 92.7                                 | 92.7             |                                   |
| 100                                      | 91.6                                 | 91.6             |                                   |
| 100                                      | 102                                  | 102              |                                   |
| 100                                      | 97.2                                 | 97.2             |                                   |
| Overall Average Percent Recovery         |                                      |                  | $94.2 \pm 4.88$                   |

Recoveries calculated by Versar using data from Table 3 of the Study Report.

Table 5. Summary of Field Fortification Recoveries For Pennsylvania<sup>a</sup>

| Fortification Level<br>( $\mu\text{g}$ ) | Amount Detected<br>( $\mu\text{g}$ ) | Percent Recovery | Daily Average<br>Percent Recovery |
|--|--------------------------------------|------------------|-----------------------------------|
| 5  | 4.68                                 | 93.6             | $91.8 \pm 3.57$                   |
| 5  | 4.68                                 | 93.6             |                                   |
| 5  | 4.66                                 | 93.2             |                                   |
| 5  | 4.23                                 | 84.6             |                                   |
| 5  | 4.68                                 | 93.6             |                                   |
| 5  | 4.61                                 | 92.2             |                                   |
| 100                                      | 90.8                                 | 90.8             | $91.6 \pm 2.06$                   |
| 100                                      | 90.6                                 | 90.6             |                                   |
| 100                                      | 90.8                                 | 90.8             |                                   |
| 100                                      | 89.9                                 | 89.9             |                                   |
| 100                                      | 95.6                                 | 95.6             |                                   |
| 100                                      | 91.6                                 | 91.6             |                                   |

| Fortification Level<br>( $\mu\text{g}$ ) | Amount Detected<br>( $\mu\text{g}$ ) | Percent Recovery | Daily Average<br>Percent Recovery |
|--|--------------------------------------|------------------|-----------------------------------|
| Overall Average Percent Recovery         |                                      |                  | 91.7 $\pm$ 2.78                   |

a Recoveries calculated by Versar using data from Table 4 of the Study Report.

Table 6. Summary of Field Fortification Recoveries For North Carolina<sup>a</sup>

| Fortification Level<br>( $\mu\text{g}$ ) | Amount Detected<br>( $\mu\text{g}$ ) | Percent Recovery | Daily Average<br>Percent Recovery |
|--|--------------------------------------|------------------|-----------------------------------|
| 5  | 4.99                                 | 99.8             | 99.5 $\pm$ 0.945                  |
| 5  | 5.01                                 | 100              |                                   |
| 5  | 4.92                                 | 98.4             |                                   |
| 100                                      | 92.1                                 | 92.1             | 95.3 $\pm$ 4.92                   |
| 100                                      | 92.9                                 | 92.9             |                                   |
| 100                                      | 101                                  | 101              |                                   |
| Overall Average Percent Recovery         |                                      |                  | 97.4 $\pm$ 3.90                   |

a Recoveries calculated by Versar using data from Table 5 of the Study Report.

Formulation: The Certificate of G.P. Analysis for the test substances stated that the percent active ingredient in the Meridian™ 25WG test substance was 25.6% and the percent active ingredient in the Meridian™ 0.33G test substance was 0.29%. The purity of the technical standard was 98.9%.

Tank mix: Tank mix samples were not discussed in this Study Report.

Travel Recovery: Travel recovery was not discussed in the Study Report.

Storage Stability: Freezer storage stability of thiamethoxam was evaluated prior to the initiation of this study. Cloth control samples were exposed to untreated turf from the California, Pennsylvania and Virginia field sites (the Virginia site was later dropped from the study). One control and three replicate samples fortified at 100  $\mu\text{g}/\text{sample}$  (50X MQL) were prepared. After the samples were fortified they were stored frozen and analyzed at 0, 31 and 90 days. Concurrent laboratory fortification samples were analyzed with the storage stability samples. The residues measured in the freezer storage stability samples were corrected for average concurrent laboratory fortification recoveries which were below 100%. The results from the storage stability study indicated that there was no loss of thiamethoxam over the 90 day storage period. The overall recovery of thiamethoxam in the storage stability samples was 100%  $\pm$  8.13% (n=9). The 90 day storage interval represented a period that exceeded the longest storage period for all of the field samples which was 49 days.

## II. RESULTS AND CALCULATIONS:

The Registrant provided individual and average residue data in  $\mu\text{g}/\text{cm}^2$  for each of the applications at each test site. Samples were only analyzed up to DAT10 for the California and North Carolina Meridian™ 25WG non-irrigated plots, up to DAT3 for the Pennsylvania Meridian™ 25WG non-irrigated plot, up to 24 hours after treatment for the Pennsylvania Meridian™ 25WG irrigated and the Meridian™ 0.33G irrigated plots, up to 8 hours after treatment at the Pennsylvania Meridian™ 0.33G non-irrigated plot, and up to DAT2 at the remaining plots.

Only one irrigated Meridian™ 25WG test plot (North Carolina) had measurable transferable residues; these residues were detected at 4 hours and 2 days after treatment (DAT2) and were just slightly above the MQL ( $0.000359 \mu\text{g}/\text{cm}^2$ ). At all other locations, the plots sprayed with the Meridian™ 25WG formulation and then irrigated yielded no detectable residues of thiamethoxam. All transferable residues in the plots treated with the granular formulation (Meridian™ 0.33G), irrigated and non-irrigated, were below the level of detection, except at the North Carolina site. At this site, residues from the Meridian™ 0.33G non-irrigated plot were detected in 2 of the 4 post-application (0 hr) samples at a level slightly above the MQL and in all 4 of the DAT2 samples at a much higher level (average of  $0.001742 \mu\text{g}/\text{cm}^2$ ). At the Meridian™ 0.33G irrigated plot, a single sample collected from the 4 hour after application sampling event was slightly above the MQL. According to the Study Report, the samples from the irrigated Meridian™ 25WG test plot and the non-irrigated Meridian™ 0.33G test plot in North Carolina were collected during light rainfall and when turf was reported to be noticeably damp. The study author speculates that the transferable residues detected on DAT2 at these plots were artificially high for this reason.

Measurable transferable residues were detected at all non-irrigated Meridian™ 25WG plots. The regression analysis provided as Appendix B, summarizes the TTR values in  $\mu\text{g}/\text{cm}^2$ , with corresponding statistical summaries for the non-irrigated Meridian™ 25WG application. The raw TTR values did not require correction for field fortification recoveries, as the appropriate corresponding overall recoveries were >90%.

At the California test site, the maximum average TTR values for the non-irrigated Meridian™ 25WG application occurred immediately after the application of the test substance ( $0.0122 \mu\text{g}/\text{cm}^2$ ). The average TTR values dropped below the MQL ( $0.000359 \mu\text{g}/\text{cm}^2$ ) by DAT7. At the Pennsylvania test site, the maximum average TTR values for the non-irrigated Meridian™ 25WG application occurred immediately after the application of the test substance ( $0.0096 \mu\text{g}/\text{cm}^2$ ). The average TTR values dropped below the MQL by DAT2. At the North Carolina non-irrigated Meridian™ 25WG test site, the average TTR value was  $0.007445 \mu\text{g}/\text{cm}^2$  immediately after application of the test substance and declined to  $0.002482$  24 hours after application of the test substance. The average TTR value then increased to a maximum of  $0.0160 \mu\text{g}/\text{cm}^2$  on DAT2 and then dropped below the MQL ( $0.000359 \mu\text{g}/\text{cm}^2$ ) by DAT7. The Study Author reported the DAT2 average as  $0.0016 \mu\text{g}/\text{cm}^2$ , however, this appears to be an error based on the individual TTR values provided in the Study Report.

According to the Study Author, there was a total of 0.32 inches of rainfall at the Pennsylvania site between the 8 hr and 24 hr sampling events and an overall of 2.43 inches of rainfall prior to the DAT3 sampling event. The rainfall could have reduced the amount of TTRs.

First-order dissipation kinetics were assumed by the Registrant and Versar in generating dissipation curves. Versar used individual residue data collected immediately after the final application to the sampling event with all residues below the minimum quantifiable limit (DAT7 for the California samples, DAT2 for the Pennsylvania samples, and DAT7 for the North Carolina samples). It appears that the Registrant used the average residue data for the same sampling intervals. For values <MQL, the Registrant and Versar used a value of  $\frac{1}{2}$  the MQL. Both the Registrant and Versar conducted a linear regression analysis using the natural logarithm of the individual TTR values.

Dissipation rates were modeled by the study author, assuming first-order kinetics, to estimate thiamethoxam half-lives of 1.17 hours ( $R^2=0.9792$ ) for non-irrigated Meridian™ 25WG applied at the California site, 0.361 hours ( $R^2=0.9671$ ) at the Pennsylvania site, and 1.34 hour ( $R^2=0.9486$ ) at the North Carolina site. The Registrant reported the half-life values in hours. However, the regression equation they provided and the graphical representations of the data curves used time in days. Versar's estimated half-life values were 1.19 days ( $R^2=0.9798$ ) for non-irrigated Meridian™ 25WG applied at the California site, 0.356 days ( $R^2=0.9723$ ) at the Pennsylvania site, and 1.37 days ( $R^2=0.6767$ ) at the North Carolina site. It appears that the Registrant's and Versar's  $R^2$  values for the North Carolina site are different because of Registrant used the incorrect DAT2 average in the regression analysis.

### III DISCUSSION

**A. LIMITATIONS OF THE STUDY:**

This study met most of the Series 875.2100 Guidelines (See Appendix A). The issues of concern are:

- (1) daily meteorological data were not reported for the for any of the test sites, except for daily rainfall and range of temperature and relative humidity over the study duration;
- (2) half-life values were reported in hours, but the same values appeared to be calculated and graphed as days;
- (3) the Study Author reported the TTR average for DAT2 at the non-irrigated Meridian™ 25WG North Carolina site as 0.0016  $\mu\text{g}/\text{cm}^2$ ; the correct value based on the average of the individual values is 0.016  $\mu\text{g}/\text{cm}^2$ ;
- (4) control plots were not established at any of the field sites, however, control samples were collected the day prior to application ;
- (5) only one set of field fortification samples were prepared at the North Carolina test site (day of application); and
- (6) the production of metabolites, breakdown products, or the presence of contaminants of potential toxicological concern were not discussed in the study.

**B. CONCLUSIONS:**

Versar's half-life estimates were very similar to those calculated by the Registrant except that Versar's half-life values were reported in days and the Registrant's half-life values are reported in hours. Upon closer evaluation, it appears that the Registrant's half-life values reported in hours may be a typographical error and that the values were intended to be reported as days. Versar also examined data variability as part of the linear regression analyses. The coefficients of variation for the sampling days on which residues were detected ranged from 11.3% to 26.0% at the California site, from 4.49% to 14.5% at the Pennsylvania site, and from 7.95% to 65.9% at the North Carolina site. Table 7 provides a comparison of the Registrant's and Versar's half-life values, regression coefficients, as well as a summary of the zero hour average residues' percent of application at each field site.

Table 7. Meridian™ 25WG Non-irrigated Trial Summary

| Field Site     | Registrant's Regression Coefficient ( $R^2$ ) | Registrant's Half-life (hours) | Versar's Regression Coefficient ( $R^2$ ) | Versar's Half-life (days) | Zero Hour Avg Residue ( $\mu\text{g}/\text{cm}^2$ ) | Percent of Average Application Rate |
|----------------|---|--------------------------------|---|---------------------------|---|-------------------------------------|
| California     | 0.9792  | 1.17                           | 0.9798                                    | 1.19                      | 0.0122  | 0.40                                |
| Pennsylvania   | 0.9671  | 0.361                          | 0.9723                                    | 0.356                     | 0.0096  | 0.31                                |
| North Carolina | 0.9486  | 1.34                           | 0.6767                                    | 1.37                      | 0.0074  | 0.24                                |

Note: Average actual application rate was 3.060  $\mu\text{g}/\text{cm}^2$



**APPENDIX A**

**Compliance Checklist for "Determination of TTRs on  
Turf Treated with Meridian™ 25WG and Meridian™ 0.33G"**

## Compliance Checklist

Compliance with OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Post application Exposure Monitoring Test Guidelines, 875.2100, Transferable Residue Dissipation, Lawn and Turf, is critical. The itemized checklist below describes compliance with the major technical aspects of OPPTS 875.2100.

- *The test substance must be the typical end use product of the active ingredient.* This criterion was met.
- *The production of metabolites, breakdown products, or the presence of contaminants of potential toxicologic concern, should be considered on a case-by-case basis.* It is not certain if this criterion was met. Metabolites, breakdown products, or the presence of contaminants of potential toxicological concern for thiamethoxam were not discussed in the Study Report.
- *Applications should occur at the time of season that the end-use product is normally applied to achieve intended pest control.* This criterion was met.
- *Initiating testing immediately before a precipitation event should be avoided. Applications should be made after mowing and watering.* This criterion was partially met. Rainfall did not occur within 24 hours at the California and North Carolina sites. Additionally, a rainfall event occurred just before the 24-hr sampling interval at the Pennsylvania field site and during a light rainfall at the North Carolina site on DATE.
- *The end use product should be applied by the application method recommended. Formulations which can be applied in a minimal amount of water and do not require "watering in" should be used. Information that verifies that the application equipment (e.g., sprayer) was properly calibrated should be included.* This criterion was met. The end use product was applied by the application method recommended and calibration data were provided for the application equipment. Tests were conducted with and without watering in.
- *The application rate used in the study should be provided and should be the maximum rate specified on the label. However, monitoring following application at a typical application rate is more appropriate in certain cases.* This criterion was met for both test products.
- *If multiple applications are made, the minimum allowable interval between applications should be used.* This criterion is not applicable to this study. Only one application was made at each site.
- *Transferable turf residue (TTR) data should be collected from at least three geographically distinct locations for each formulation. The sites should be representative of the regions (and turf types) where the chemical is used.* This criterion was met. Transferable turf residue data were collected from sites in California, Pennsylvania and North Carolina.
- *The site(s) treated should be representative of reasonable worst-case climatic conditions expected in intended use areas. Meteorological conditions including temperature, wind speed, daily rainfall, and humidity should be provided for the duration of the study.* This criterion was mostly met. The Study Report provided the temperature and relative humidity range for the study duration and daily rainfall for the study duration. Wind speed and humidity data were only provided for the day of application.
- *Sampling should be sufficient to characterize the dissipation mechanisms of the compound (e.g., three half-lives or 72 hours after application, unless the compound has been found to fully dissipate in less time; for more persistent pesticides, longer sampling periods may be necessary). Sampling intervals may be relatively short in the beginning and lengthen as the study progresses. Background samples should be collected before application of the test substance occurs.* These criteria were met.
- *Triplicate, randomly collected samples should be collected at each sampling interval.* This criterion was met. Quadruplicate turf sample replicates were collected at each sampling interval.

- *Samples should be collected using a suitable methodology (e.g., California Cloth Roller, Polyurethane Roller, Drag Sled, etc.) for turf. This criterion was met. Turf residue samples were collected using the modified California Cloth Roller methodology.*
- *Control plots should be established from which sufficient control samples can be collected. Control sites should be upwind and a reasonable distance from the treatment site. These criteria were not met. Control plots were not established for this study. Control (untreated) samples were collected from each of the plots the prior to the application of the test products. A sufficient number of control samples were collected from each test site.*
- *Residues should be dislodged from turf within a reasonable time period (i.e., EPA recommends that dislodging occur within 4 hours). Other transferable method samples should be handled in a manner that is appropriate to the method used. This criterion was met. The modified California cloth roller was used to collect HR samples. Extraction of the residues from the cloth sample occurred just prior to analysis of the samples.*
- *Samples should be stored in a manner that will minimize deterioration and loss of analytes between collection and analysis. Information on storage stability should be provided. These criteria were met. The samples were stored frozen shortly after collection and remained frozen until analysis. A storage stability study was performed and the results were provided in the Study Report.*
- *Validated analytical methods of sufficient sensitivity are needed. Information on method efficiency (residue recovery), and limit of quantitation (LOQ) should be provided. This criterion was met. However, a minimum quantitation limit (MQL) was provided instead of an LOQ.*
- *Information on recovery samples must be included in the study report. A complete set of field recoveries should consist of at least one blank control sample and three or more each of a low-level and high-level fortification. These fortifications should be in the range of anticipated residue levels in the field study. This criterion was met.*
- *Raw residue data must be corrected if appropriate recovery values are less than 90 percent. Distributional data should be reported, to the extent possible. This criterion was met. Raw residue data were not corrected because the corresponding average field fortification values were greater than 90%.*
- *Foliar residue data expressed as  $\mu\text{g}/\text{cm}^2$  turf leaf surface area. This criterion was met. All residue data were provided in  $\mu\text{g}/\text{cm}^2$ .*

**Appendix B**

**Versar's Regression Analysis for Meridian™ 25WG  
Turf Transfer Residue Data  
(non-irrigated plots)**

**Regression Analysis: Summary Output for North Carolina**

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.822628 |
| R Square                     | 0.676717 |
| Adjusted R <sup>2</sup>      | 0.664283 |
| Standard Error               | 0.870842 |
| Observations                 | 28       |

## ANOVA

|            | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i>  | <i>Signif. F</i> |
|------------|-----------|-----------|-----------|-----------|------------------|
| Regression | 1         | 41.27396  | 41.27396  | 54.424822 | 7.80762E-08      |
| Residual   | 26        | 19.71753  | 0.758366  |           |                  |
| Total      | 27        | 60.99149  |           |           |                  |

|           | <i>Coeff.</i> | <i>Std. Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> |
|-----------|---------------|-------------------|---------------|----------------|------------------|------------------|
| Intercept | -4.995911     | 0.216777          | -23.04636     | 7.89E-19       | -5.441501818     | -4.550320122     |
| Slope     | -0.505395     | 0.068507          | -7.377318     | 7.808E-08      | -0.646211882     | -0.36457726      |

Half Life = 1.371497 Days

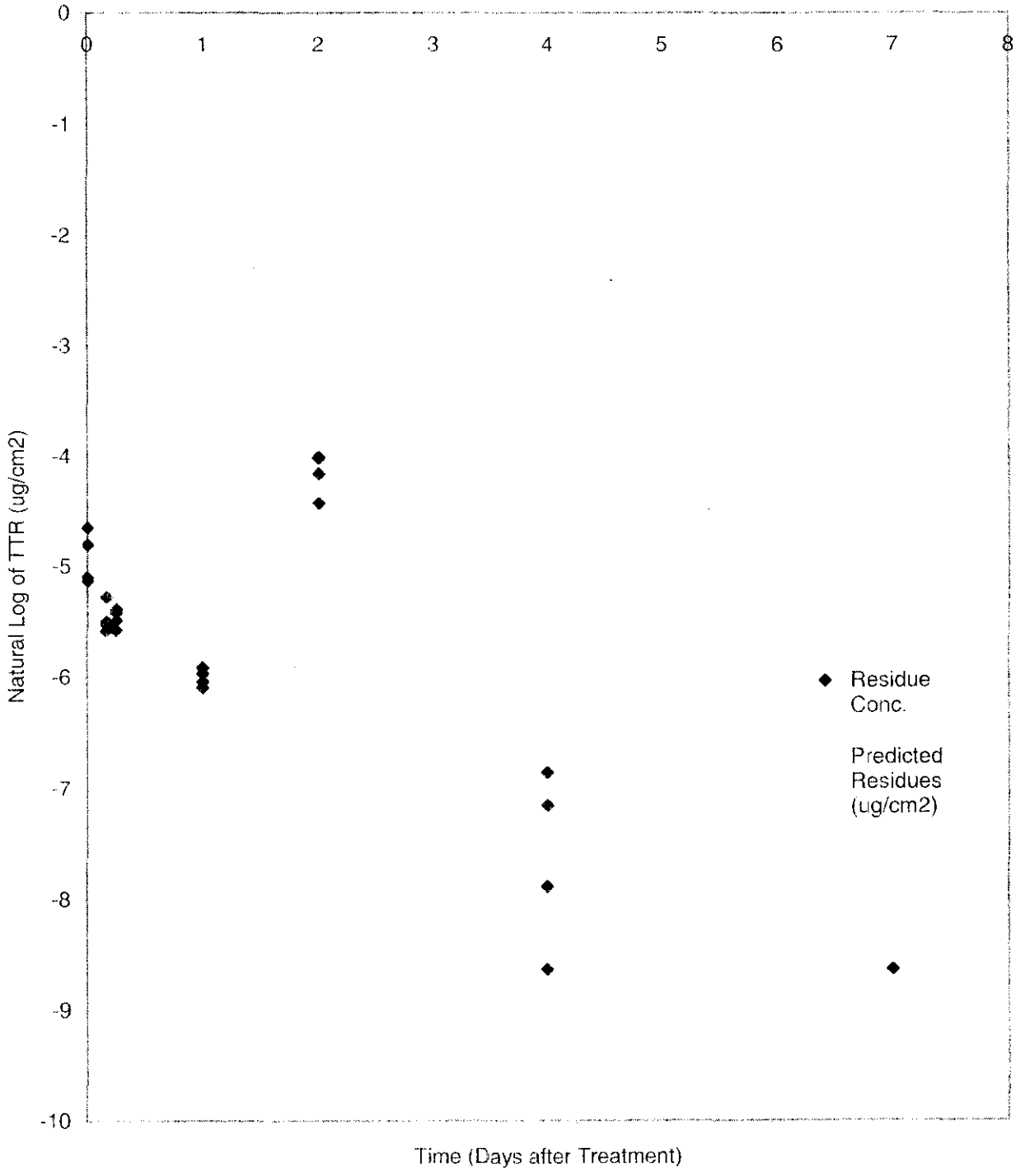
**Predicted TTR Levels**

| Time (Days) | Residue (ug/cm <sup>2</sup> ) | Time (Days) | Residue (ug/cm <sup>2</sup> ) |
|-------------|-------------------------------|-------------|-------------------------------|
| 0           | 0.006766                      | 21          | 1.663E-07                     |
| 1           | 0.004081                      | 22          | 1.004E-07                     |
| 2           | 0.002462                      | 23          | 6.054E-08                     |
| 3           | 0.001485                      | 24          | 3.652E-08                     |
| 4           | 0.000896                      | 25          | 2.203E-08                     |
| 5           | 0.000541                      | 26          | 1.329E-08                     |
| 6           | 0.000326                      | 27          | 8.018E-09                     |
| 7           | 0.000197                      | 28          | 4.837E-09                     |
| 8           | 0.000119                      | 29          | 2.918E-09                     |
| 9           | 7.16E-05                      | 30          | 1.76E-09                      |
| 10          | 4.32E-05                      | 31          | 1.062E-09                     |
| 11          | 2.61E-05                      | 32          | 6.407E-10                     |
| 12          | 1.57E-05                      | 33          | 3.865E-10                     |
| 13          | 9.48E-06                      | 34          | 2.332E-10                     |
| 14          | 5.72E-06                      | 35          | 1.407E-10                     |
| 15          | 3.45E-06                      |             |                               |
| 16          | 2.08E-06                      |             |                               |
| 17          | 1.26E-06                      |             |                               |
| 18          | 7.58E-07                      |             |                               |
| 19          | 4.57E-07                      |             |                               |
| 20          | 2.76E-07                      |             |                               |

**Regression Analysis: Means and CVs for North Carolina**

| Days after Last Treatment | Residues (ug/cm2) | Mean (ug/cm2) | Standard Deviation (ug/cm2) | Coefficient of Variation (%) |
|---------------------------|-------------------|---------------|-----------------------------|------------------------------|
| 0                         | 0.0082            | 0.00745       | 0.00175                     | 23.5                         |
|                           | 0.0061            |               |                             |                              |
|                           | 0.0096            |               |                             |                              |
|                           | 0.0059            |               |                             |                              |
| 0.167                     | 0.0041            | 0.00423       | 0.000601                    | 14.2                         |
|                           | 0.0040            |               |                             |                              |
|                           | 0.0051            |               |                             |                              |
|                           | 0.0038            |               |                             |                              |
| 0.250                     | 0.0038            | 0.00423       | 0.000354                    | 8.36                         |
|                           | 0.0044            |               |                             |                              |
|                           | 0.0041            |               |                             |                              |
|                           | 0.0046            |               |                             |                              |
| 1                         | 0.0027            | 0.00248       | 0.000197                    | 7.95                         |
|                           | 0.0023            |               |                             |                              |
|                           | 0.0024            |               |                             |                              |
|                           | 0.0026            |               |                             |                              |
| 2                         | 0.0183            | 0.016         | 0.00293                     | 18.3                         |
|                           | 0.0181            |               |                             |                              |
|                           | 0.0157            |               |                             |                              |
|                           | 0.0120            |               |                             |                              |
| 4                         | 0.0002            | 0.000602      | 0.000397                    | 65.9                         |
|                           | 0.0011            |               |                             |                              |
|                           | 0.0004            |               |                             |                              |
|                           | 0.0008            |               |                             |                              |
| 7                         | 0.0002            | 0.00018       | 0                           | 0                            |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |

### Regression Analysis: Log of Transferable Turf Residue vs. Time for North Carolina



23 -7.017489 -0.856963

24 -7.017489 -0.12905

25 -8.533673 -0.091662

26 -8.533673 -0.091662

27 -8.533673 -0.091662

28 -8.533673 -0.091662



**Regression Analysis: Summary Output for Pennsylvania**

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.986064 |
| R Square                     | 0.972323 |
| Adjusted R <sup>2</sup>      | 0.970785 |
| Standard Error               | 0.254013 |
| Observations                 | 20       |

**ANOVA**

|            | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i>  | <i>Signif. F</i> |
|------------|-----------|-----------|-----------|-----------|------------------|
| Regression | 1         | 40.801    | 40.801    | 632.35359 | 1.79003E-15      |
| Residual   | 18        | 1.161404  | 0.064522  |           |                  |
| Total      | 19        | 41.9624   |           |           |                  |

|           | <i>Coeff.</i> | <i>Std. Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> |
|-----------|---------------|-------------------|---------------|----------------|------------------|------------------|
| Intercept | -4.528146     | 0.078522          | -57.66703     | 7.063E-22      | -4.693115367     | -4.363176775     |
| Slope     | -1.947726     | 0.077455          | -25.14664     | 1.79E-15       | -2.110452704     | -1.78499977      |

Half Life = 0.355875 Days

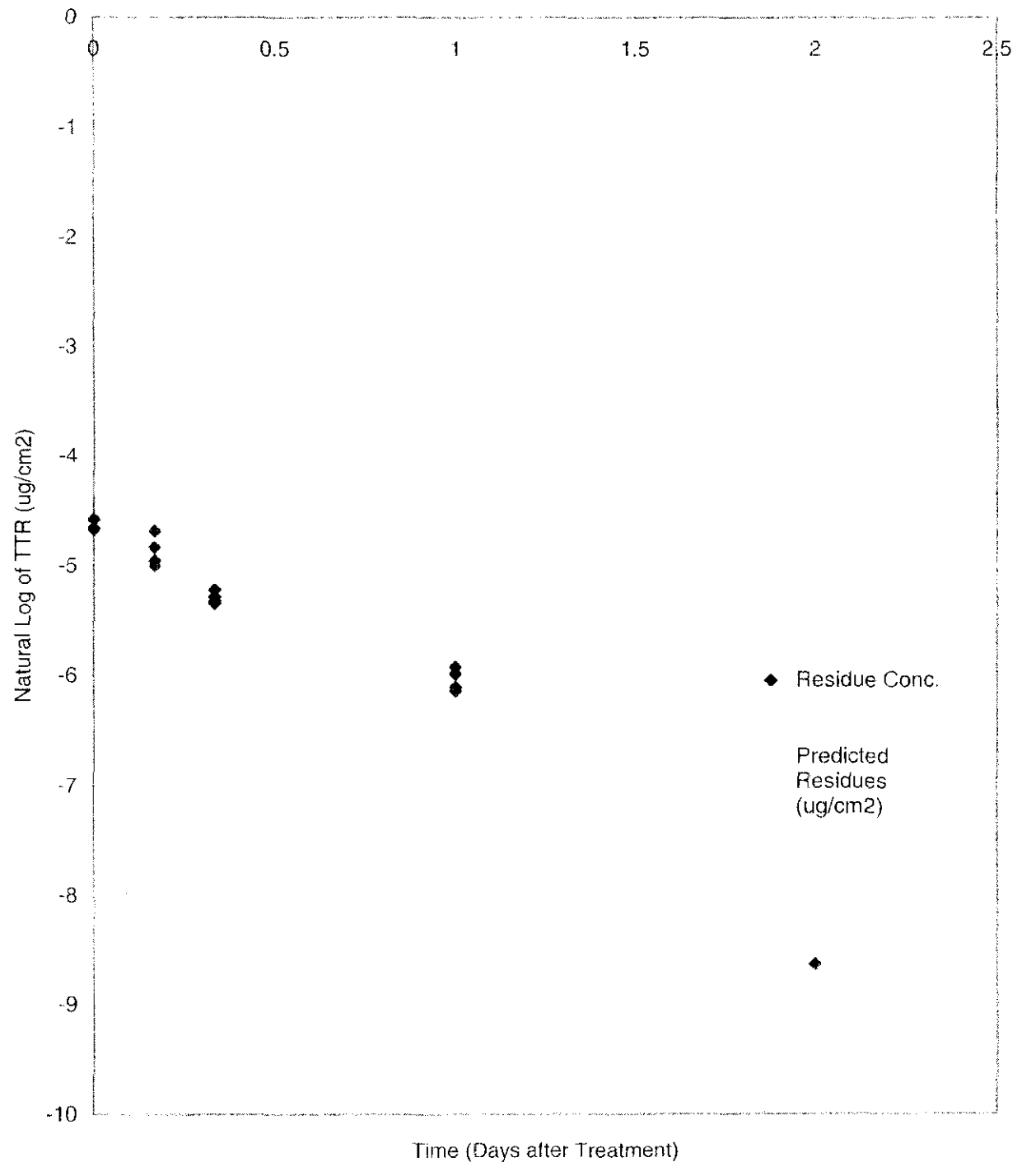
**Predicted TTR Levels**

| Time (Days) | Residue (ug/cm <sup>2</sup> ) | Time (Days) | Residue (ug/cm <sup>2</sup> ) |
|-------------|-------------------------------|-------------|-------------------------------|
| 0           | 0.010801                      | 21          | 1.861E-20                     |
| 1           | 0.00154                       | 22          | 2.654E-21                     |
| 2           | 0.00022                       | 23          | 3.785E-22                     |
| 3           | 3.13E-05                      | 24          | 5.397E-23                     |
| 4           | 4.47E-06                      | 25          | 7.696E-24                     |
| 5           | 6.37E-07                      | 26          | 1.097E-24                     |
| 6           | 9.08E-08                      | 27          | 1.565E-25                     |
| 7           | 1.29E-08                      | 28          | 2.232E-26                     |
| 8           | 1.85E-09                      | 29          | 3.182E-27                     |
| 9           | 2.63E-10                      | 30          | 4.538E-28                     |
| 10          | 3.75E-11                      | 31          | 6.471E-29                     |
| 11          | 5.35E-12                      | 32          | 9.227E-30                     |
| 12          | 7.64E-13                      | 33          | 1.316E-30                     |
| 13          | 1.09E-13                      | 34          | 1.876E-31                     |
| 14          | 1.55E-14                      | 35          | 2.676E-32                     |
| 15          | 2.21E-15                      |             |                               |
| 16          | 3.16E-16                      |             |                               |
| 17          | 4.5E-17                       |             |                               |
| 18          | 6.42E-18                      |             |                               |
| 19          | 9.15E-19                      |             |                               |
| 20          | 1.31E-19                      |             |                               |

**Regression Analysis: Means and CVs for Pennsylvania**

| Days after Last Treatment | Residues (ug/cm2) | Mean (ug/cm2) | Standard Deviation (ug/cm2) | Coefficient of Variation (%) |
|---------------------------|-------------------|---------------|-----------------------------|------------------------------|
| 0                         | 0.0094            | 0.00962       | 0.000432                    | 4.49                         |
|                           | 0.0094            |               |                             |                              |
|                           | 0.0095            |               |                             |                              |
|                           | 0.0103            |               |                             |                              |
| 0.167                     | 0.0093            | 0.00778       | 0.00113                     | 14.5                         |
|                           | 0.0080            |               |                             |                              |
|                           | 0.0068            |               |                             |                              |
|                           | 0.0071            |               |                             |                              |
| 0.333                     | 0.0054            | 0.00504       | 0.000278                    | 5.52                         |
|                           | 0.0048            |               |                             |                              |
|                           | 0.0049            |               |                             |                              |
|                           | 0.0051            |               |                             |                              |
| 1                         | 0.0027            | 0.00241       | 0.000244                    | 10.1                         |
|                           | 0.0022            |               |                             |                              |
|                           | 0.0022            |               |                             |                              |
|                           | 0.0025            |               |                             |                              |
| 2                         | 0.0002            | 0.00018       | 0                           | 0                            |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |

### Regression Analysis: Log of Transferable Turf Residue vs. Time for Pennsylvania



**Regression Analysis: Summary Output for California**

| <i>Regression Statistics</i> |          |
|------------------------------|----------|
| Multiple R                   | 0.989873 |
| R Square                     | 0.979849 |
| Adjusted R <sup>2</sup>      | 0.979074 |
| Standard Error               | 0.208277 |
| Observations                 | 28       |

**ANOVA**

|            | <i>df</i> | <i>SS</i> | <i>MS</i> | <i>F</i>  | <i>Signif. F</i> |
|------------|-----------|-----------|-----------|-----------|------------------|
| Regression | 1         | 54.84171  | 54.84171  | 1264.2371 | 1.41361E-23      |
| Residual   | 26        | 1.127862  | 0.043379  |           |                  |
| Total      | 27        | 55.96957  |           |           |                  |

|           | <i>Coeff.</i> | <i>Std. Error</i> | <i>t Stat</i> | <i>P-value</i> | <i>Lower 95%</i> | <i>Upper 95%</i> |
|-----------|---------------|-------------------|---------------|----------------|------------------|------------------|
| Intercept | -4.570008     | 0.052054          | -87.79393     | 1.088E-33      | -4.677006683     | -4.463010262     |
| Slope     | -0.584705     | 0.016445          | -35.55611     | 1.414E-23      | -0.618507192     | -0.550902563     |

Half Life = 1.185465 Days

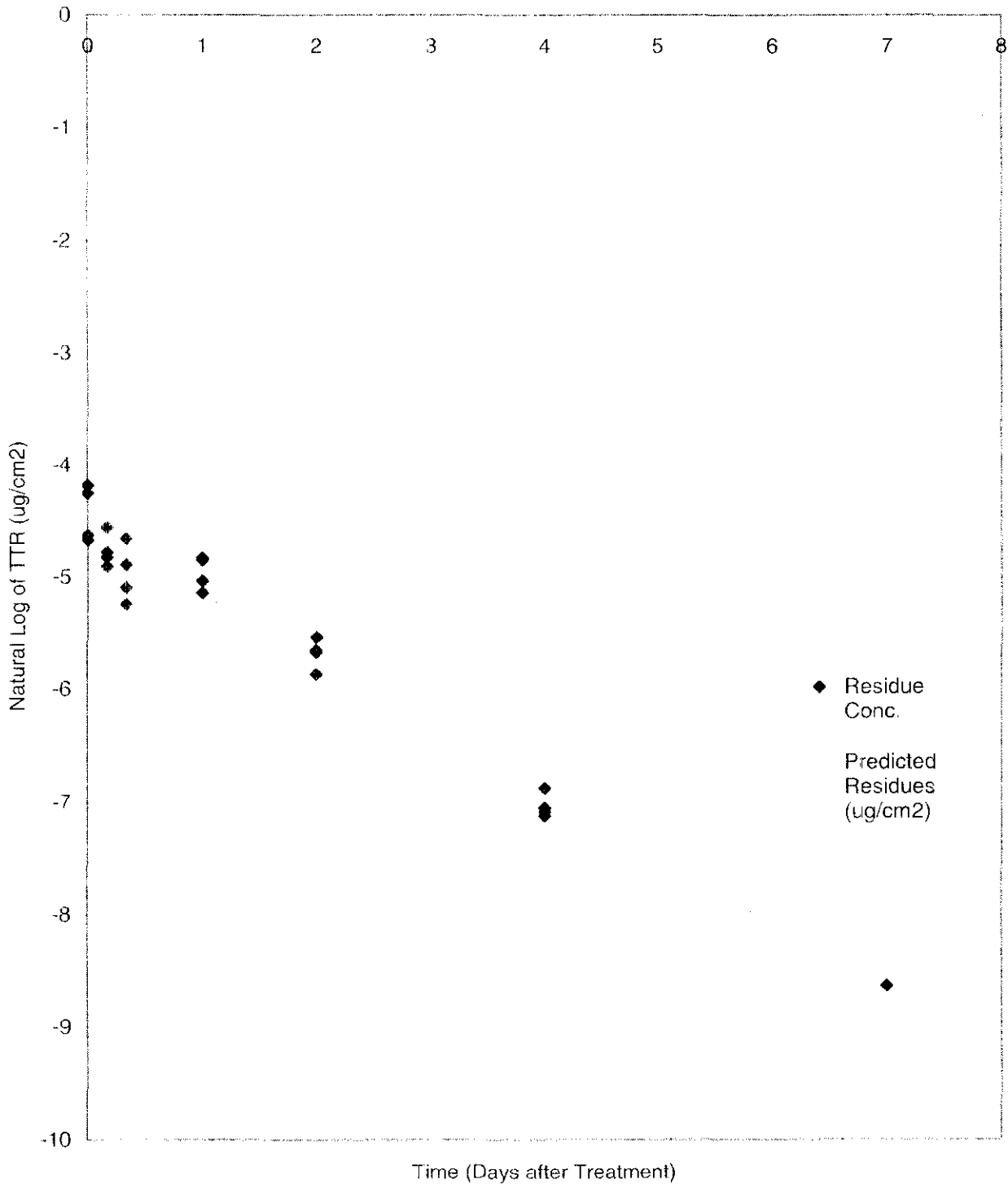
**Predicted TTR Levels**

| Time (Days) | Residue (ug/cm2) | Time (Days) | Residue (ug/cm2) |
|-------------|------------------|-------------|------------------|
| 0           | 0.010358         | 21          | 4.816E-08        |
| 1           | 0.005772         | 22          | 2.684E-08        |
| 2           | 0.003217         | 23          | 1.495E-08        |
| 3           | 0.001793         | 24          | 8.334E-09        |
| 4           | 0.000999         | 25          | 4.644E-09        |
| 5           | 0.000557         | 26          | 2.588E-09        |
| 6           | 0.00031          | 27          | 1.442E-09        |
| 7           | 0.000173         | 28          | 8.037E-10        |
| 8           | 9.63E-05         | 29          | 4.479E-10        |
| 9           | 5.37E-05         | 30          | 2.496E-10        |
| 10          | 2.99E-05         | 31          | 1.391E-10        |
| 11          | 1.67E-05         | 32          | 7.751E-11        |
| 12          | 9.29E-06         | 33          | 4.32E-11         |
| 13          | 5.18E-06         | 34          | 2.407E-11        |
| 14          | 2.89E-06         | 35          | 1.341E-11        |
| 15          | 1.61E-06         |             |                  |
| 16          | 8.96E-07         |             |                  |
| 17          | 4.99E-07         |             |                  |
| 18          | 2.78E-07         |             |                  |
| 19          | 1.55E-07         |             |                  |
| 20          | 8.64E-08         |             |                  |

**Regression Analysis: Means and CVs for California**

| Days after Last Treatment | Residues (ug/cm2) | Mean (ug/cm2) | Standard Deviation (ug/cm2) | Coefficient of Variation (%) |
|---------------------------|-------------------|---------------|-----------------------------|------------------------------|
| 0                         | 0.0153            | 0.0122        | 0.00304                     | 24.9                         |
|                           | 0.0094            |               |                             |                              |
|                           | 0.0098            |               |                             |                              |
|                           | 0.0143            |               |                             |                              |
| 0.167                     | 0.0080            | 0.00858       | 0.00135                     | 15.8                         |
|                           | 0.0074            |               |                             |                              |
|                           | 0.0084            |               |                             |                              |
|                           | 0.0105            |               |                             |                              |
| 0.333                     | 0.0061            | 0.00711       | 0.00185                     | 26                           |
|                           | 0.0075            |               |                             |                              |
|                           | 0.0053            |               |                             |                              |
|                           | 0.0095            |               |                             |                              |
| 1                         | 0.0058            | 0.00705       | 0.00104                     | 14.7                         |
|                           | 0.0078            |               |                             |                              |
|                           | 0.0065            |               |                             |                              |
|                           | 0.0080            |               |                             |                              |
| 2                         | 0.0034            | 0.00344       | 0.000458                    | 13.3                         |
|                           | 0.0028            |               |                             |                              |
|                           | 0.0039            |               |                             |                              |
|                           | 0.0035            |               |                             |                              |
| 4                         | 0.0010            | 0.000889      | 0.000101                    | 11.3                         |
|                           | 0.0008            |               |                             |                              |
|                           | 0.0008            |               |                             |                              |
|                           | 0.0009            |               |                             |                              |
| 7                         | 0.0002            | 0.00018       | 0                           | 0                            |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |
|                           | 0.0002            |               |                             |                              |

### Regression Analysis: Log of Transferable Turf Residue vs. Time for California



23 -6.908828 -0.210743

24 -6.908828 -0.138062

25 -8.662943 0.037607

26 -8.662943 0.037607

27 -8.662943 0.037607

28 -8.662943 0.037607

---

General Information

Trial 1

Trial 2

MQL (in DFR Units): 0.000359  
 DFR Units: ug/cm2

Name of Trial: California  
 Output Sheet Name: CA 25WG

Name of Trial:  
 Output Sheet Name:

Type of Regression: Standard ▼

DFR or TTR: TTR ▼

| Days after Application | Residue Conc. | Days after Application |
|------------------------|---------------|------------------------|
| 0                      | 0.0153        | 0                      |
| 0                      | 0.0094        | 0                      |
| 0                      | 0.0098        | 0                      |
| 0                      | 0.0143        | 0                      |
| 0.167                  | 0.0080        | 0.167                  |
| 0.167                  | 0.0074        | 0.167                  |
| 0.167                  | 0.0084        | 0.167                  |
| 0.167                  | 0.0105        | 0.167                  |
| 0.333                  | 0.0061        | 0.333                  |
| 0.333                  | 0.0075        | 0.333                  |
| 0.333                  | 0.0053        | 0.333                  |
| 0.333                  | 0.0095        | 0.333                  |
| 1                      | 0.0058        | 1                      |
| 1                      | 0.0078        | 1                      |
| 1                      | 0.0065        | 1                      |
| 1                      | 0.0080        | 1                      |
| 2                      | 0.0034        | 2                      |
| 2                      | 0.0028        | 2                      |
| 2                      | 0.0039        | 2                      |
| 2                      | 0.0035        | 2                      |
| 4                      | 0.0010        |                        |
| 4                      | 0.0008        |                        |
| 4                      | 0.0008        |                        |
| 4                      | 0.0009        |                        |
| 7                      | 0.0002        |                        |
| 7                      | 0.0002        |                        |
| 7                      | 0.0002        |                        |
| 7                      | 0.0002        |                        |



**Trial 3**

**Trial 4**

Pennsylvania  
PA 25WG

Name of Trial: North Carolina  
Output Sheet Name: NC 25WG

Name of Trial:  
Output Sheet Name:

| Residue Conc. | Days after Application | Residue Conc. | Days after Application |
|---------------|------------------------|---------------|------------------------|
| 0.0094        | 0                      | 0.0082        |                        |
| 0.0094        | 0                      | 0.0061        |                        |
| 0.0095        | 0                      | 0.0096        |                        |
| 0.0103        | 0                      | 0.0059        |                        |
| 0.0093        | 0.167                  | 0.0041        |                        |
| 0.0080        | 0.167                  | 0.0040        |                        |
| 0.0068        | 0.167                  | 0.0051        |                        |
| 0.0071        | 0.167                  | 0.0038        |                        |
| 0.0054        | 0.250                  | 0.0038        |                        |
| 0.0048        | 0.250                  | 0.0044        |                        |
| 0.0049        | 0.250                  | 0.0041        |                        |
| 0.0051        | 0.250                  | 0.0046        |                        |
| 0.0027        | 1                      | 0.0027        |                        |
| 0.0022        | 1                      | 0.0023        |                        |
| 0.0022        | 1                      | 0.0024        |                        |
| 0.0025        | 1                      | 0.0026        |                        |
| 0.0002        | 2                      | 0.0183        |                        |
| 0.0002        | 2                      | 0.0181        |                        |
| 0.0002        | 2                      | 0.0157        |                        |
| 0.0002        | 2                      | 0.0120        |                        |
|               | 4                      | 0.0002        |                        |
|               | 4                      | 0.0011        |                        |
|               | 4                      | 0.0004        |                        |
|               | 4                      | 0.0008        |                        |
|               | 7                      | 0.0002        |                        |
|               | 7                      | 0.0002        |                        |
|               | 7                      | 0.0002        |                        |
|               | 7                      | 0.0002        |                        |



**Trial 7**

Name of Trial:  
Output Sheet Name:

**Trial 8**

Name of Trial:  
Output Sheet Name:

| Residue Conc. | Days after Application | Residue Conc. | Days after Application |
|---------------|------------------------|---------------|------------------------|
|---------------|------------------------|---------------|------------------------|

**Trial 9**

Name of Trial:  
Output Sheet Name:

**Trial 10**

Name of Trial:  
Output Sheet Name:

Residue Conc.

Days after  
Application

Residue Conc.

Days after  
Application



13544

# R142146

**Chemical:** Thiamethoxam

**PC Code:**  
060109

**HED File Code:** 11000 Chemistry Reviews

**Memo Date:** 3/7/2007

**File ID:** DPD321327

**Accession #:** 000-00-0119

**HED Records Reference Center**  
4/24/2007