UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

OPP OFFICIAL RECORD
HEALTH EFFECTS DIVISION
SCIENTIFIC DATA REVIEWS
EPA SERIES 361

October 9, 2007

MEMORANDUM

SUBJECT: HED's Review of "Determination of Transferable Turf Residue Dissipation from Turf Treated with Mesotrione"; MRID # 471723-01. DP Barcode No. D342065.

FROM: Kelly M. Lowe, Environmental Scientist
Health Effects Division/Registration Action Branch 1 (7509P)

THRU: PV Shah, Acting Branch Chief
Health Effects Division/Registration Action Branch 1 (7509P)

TO: James Stone
Registration Division / Herbicide Branch (7505P)

Attached is a review of the turf transferable residue (TTR) study submitted by Syngenta (MRID 471723-01). The primary review was completed by Versar, Inc. on September 28, 2007, under supervision of HED. It has undergone secondary review in the branch and has been revised to reflect Agency policies.

Executive Summary

This study was designed to determine mesotrione turf transferable residues (TTR) when applied to turf at three test sites in New York, California, and Georgia. Two formulations of mesotrione were used in the study: (1) Mesotrione Turf Fertilizer, a dry granular containing 0.193% a.i. and (2) Outplay™ SC, a sprayable suspension concentrate containing 40.2% a.i. Each field site consisted of two treated plots, one for each formulation. All control (untreated) samples were collected prior to application of the test products. Both formulated test products were applied once to the turf at the maximum proposed label rate of 0.25 lbs a.i./A. The dry granular formulation was applied using a drop spreader and the liquid formulation was applied using a tractor mounted groundboom sprayer. For the suspension concentrate formulation, the target spray volume was 75 to 90 gallons per acre (GPA). Transferable residues were measured using the Modified California Roller technique for TTR. Triplicate TTR samples were collected before and immediately after the application, 4, 8, and 24 hours after the application, and 2, 3, 5, 7, 10, 14, and 21 days after the application.

DEC 11 REC'D, 2007

Residue data were corrected using the corresponding average low or high level field fortification recoveries when the recoveries were <90%. Average recoveries <90% included the low fortification level recovery at the California site (85.6%) and the low fortification level at the Georgia site (76.5%). Residues below the limit of quantitation (LOQ) of 0.00018 $\mu g/cm^2$ were assigned a value of ½ the LOQ.

For the granular applications, the maximum average mesotrione residue at the New York site occurred 8-hours following the application (0.0027 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) on the fifth day after treatment (5DAT). The maximum average mesotrione residue at the California site occurred immediately following the application (0.0045 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 14DAT. The maximum average mesotrione residue at the Georgia site occurred immediately following the application (0.0049 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 10DAT. In the samples taken immediately after the final application, approximately 0.077%, 0.179% and 0.185% of the application rate was available for transfer, respectively, at the New York, California, and Georgia test sites.

For the suspension concentrate applications, the maximum average mesotrione residue at the New York site occurred 8-hours following the application (0.0211 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 7DAT. The maximum average mesotrione residue at the California site occurred 6-hours following the application (0.0191 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 14DAT. The maximum average mesotrione residue at the Georgia site occurred immediately following the application (0.0050 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 10DAT. In the samples taken immediately after the final application, approximately 0.096%, 0.318% and 0.178% of the application rate was available for transfer, respectively, at the New York, California, and Georgia test sites.

The Registrant and Versar used natural log-transformation of individual measured residues to generate a log-linear graph and simple regression equation based on a one compartment model. The half-life was calculated assuming first order exponential decay. Individual mesotrione residues immediately following the application out to the first day where all residues dropped below the LOQ were used for the regression analysis for each test site. For the granular applications, the Registrant's calculated half-life values for New York, California, and Georgia were 1.04 days (R^2=0.743), 2.88 days (R^2=0.870) and 2.34 days (R^2=0.795), respectively. Versar's estimated half-life values for the granular applications were 1.04 days (R^2=0.743) for New York, 2.81 days (R^2=0.883) for California, and 2.30 days (R^2=0.794) for Georgia. For the suspension concentrate applications, the Registrant's calculated half-life values for New York, California, and Georgia were 1.16 days (R^2=0.751), 1.98 days (R^2=0.912) and 1.52 days (R^2=0.946), respectively. Versar's estimated half-life values for the suspension concentrate applications were 1.16 days (R^2=0.751) for New York, 1.98 days (R^2=0.927) for California, and 1.72 days (R^2=0.950) for Georgia.

Conclusions

The study is acceptable, since it has only minor deficiencies, and meets most of the guideline requirements. However, it should be noted that the TTR data provided in this study was

generated using the modified California roller. TTR data generated by this method appears to have a much lower transfer efficiency (percent of application rate) than the original version of this method. The TTR data provided here show percent transferabilities of less than 1% of the application rate for sprayable formulations on Day 0 and less than 0.5% of the application rate for granular formulations on Day 0. ORD has conducted a round robin test of TTR methods that included the ORETF roller (Fortune, 1997). While ORD concluded that the ORETF roller performed the best of all methods, transfer efficiency for three liquid herbicide formulations indicated a transfer efficiency of ~0.5%. The ORETF data should not be used with the revised transfer coefficients (TCs) identified in HED's Exposure Science Advisory Council Policy #12 (14,500 cm^2/hr for adults and 5,200 cm^2/hr for toddlers) since these revised TCs are based on TTR transfer efficiencies of ~1-5% (transfer efficiency = % of the application rate). The ORETF is generating task force specific transfer coefficients to be used with the ORETF member TTR data. ORETF postapplication exposure data has been submitted and is being reviewed.

EPA Reviewer: Kelly Lowe **Signature:** Kelly Lowe
[RAB1], Health Effects Division (7509C) **Date: 10/2/07**
Template version 02/06

DATA EVALUATION RECORD

STUDY TYPE: Determination of Transferable Turf Residue Dissipation from Turf Treated with Mesotrione.

TEST MATERIAL: Mesotrione Turf Fertilizer is a granular formulation containing 0.193% mesotrione as the active ingredient (a.i).

Outplay™ SC is a liquid suspension concentrate formulation containing 40.2% mesotrione as the active ingredient.

SYNONYMS: Mesotrione; 2-(4-methylsulfonyl)-2-nitrobenoyl)-1,3-cyclohexanedione; CAS # 104206-82-8.

CITATION:

Author:	Lange, Brian D. (Study Director)
Title:	*Mesotrione – Determination of Transferable Turf Residues on Turf Treated with Granular and Liquid Formulations* (219 pages)
Report Date:	July 2, 2007
Analytical Laboratory:	Morse Laboratories, Inc. 1525 Fulton Avenue Sacramento, CA 95825
Identifying Codes:	Laboratory Report Number: AR26073; Task Number: T003542-05; MRID 47172301; Unpublished

SPONSOR: Syngenta Crop Protection, Inc.
410 Swing Road
Post Office Box 18300
Greensboro, NC 27419-8300

This study met most of the Series 875, Group B:875.2100 Guidelines. The issues which were identified include:

- Separate control plots were not used in this study; however, all control samples were collected 1 to 12 days prior to the application at each site.
- Only overall minimum and maximum air temperatures, overall minimum and maximum relative humidity, and precipitation/irrigation data were provided for the duration of the study. Other meteorological recordings (wind speed, wind direction, and soil temperature) were only provided for each application day. According to the guideline, these meteorological measurements should also be provided for the duration of the study.

- The product labels recommend a maximum single application rate of 0.25 lb ai/A, with additional applications as needed for a maximum seasonal application rate of 0.50 lb ai/A. In this study, only one application was made at the maximum application rate of 0.25 lb ai/A.

- A limit of detection (LOD) was not provided in the Study Report.

- It is not certain if the production of metabolites, breakdown products, or the presence of contaminants of potential toxicologic concern were considered. The Study Report did not provide this information.

- The field fortification levels used in this study were 5 and 50 µg/sample. The raw uncorrected field residues ranged from <LOQ (1 µg/sample) to 124 µg/sample; therefore, the field fortification levels were not in the anticipated range of residues for some samples.

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: (1) weather data were collected from non-GLP weather stations for the New York and California test sites; (2) pesticide history was not maintained according to GLP for the New York and Georgia test sites; (3) soil information was retrieved from a non-GLP government source for the New York test site; (4) historical weather data were retrieved from a non-GLP government weather station for the California and Georgia test sites; and (5) maintenance activities were conducted using equipment which were not maintained according to GLP for the California and Georgia test sites. According to the Study Director, these exceptions to the GLP standards do not adversely impact the integrity of the study.

CONCURRENT EXPOSURE STUDY? No

GUIDELINE OR PROTOCOL FOLLOWED:

This study was conducted according to Syngenta Protocol Study Number T003542-05 and 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.

I. MATERIALS AND METHODS

A. MATERIALS

1. Test Material:

Formulation:	Mesotrione Turf Fertilizer is a granular formulation containing 0.193% mesotrione as the active ingredient. Outplay™ SC is a liquid suspension concentrate formulation containing 40.2% mesotrione as the active ingredient.
Lot/Batch #:	Lot No. GP-060618 and Batch No. 478154 (granular formulation) Lot No. MHASA10-35 and Batch No. 449543 (suspension concentrate formulation)

424811 (mesotrione analytical standard)

Formulation guarantee: The GLP analysis for the formulated test products stated that the granular formulated product contained 0.193% (w/w) of the active ingredient, mesotrione (expiration date of August 2009) and the suspension concentrate formulated product contained 40.2% (w/w) of the active ingredient, mesotrione (expiration date of August 2007).

Purity: The mesotrione reference standard was analyzed and found to have a purity of 96.2% (expiration date October, 2007).

CAS #(s): 104206-82-8

Other Relevant Information: EPA Registration Numbers for Mesotrione Turf Fertilizer and for Outplay™ SC are not available at this time.

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

The test products used in this study are the same formulations proposed in the labels provided in the Study Report.

B. STUDY DESIGN

The study protocol was provided in the Study Report. There were four amendments to the study protocol. The amendments involved: (1) clarifying the reference standard information, using Blue ice for transport, changing the Principal Analytical Investigator and preparing field fortification solutions before the LOQ was established; (2) changing the Protocol Number format from 3542-04 to T003542-05; (3) changing the Sponsor Representative; and (4) clarifying data recording of turf age, clarifying data recording of the turf source and providing additional information on expiration dates for the test products. There were no reported deviations to the study protocol.

1. Site Description

Test locations: The field trials were conducted in Wayne County, New York (Region 1), Fresno County, California (Region 10) and Tift Count Georgia (Region 4). The New York and California sites provided cool season grasses and the Georgia site provided warm season grass. Each field site consisted of two test plots, one for each formulation. The two plots at the New York, California and Georgia test sites were situated 40 ft, 112 ft, and 25 ft apart, respectively. A control plot was not established at any of the three test sites. According to the Study Report, the three geographic locations represent important use areas, climatic conditions and turf types.

Areas sprayed and sampled:

New York: Both plots measured 70 ft by 15 ft or 1,050 ft^2 (0.024 acre) and consisted of three strips of 14 subplots per strip. Each subplot measured 5 ft by 5 ft.

California: The granular application plot was 80 ft by 10 ft or 800 ft^2 (0.018 acre) and consisted of two strips of 20 subplots per strip. Two adjacent plots were used for the suspension concentrate application. Each measured 40 ft by 10 ft and consisted of two strips of 10 subplots per strip. The total area for the two adjacent plots was 800 ft^2 (0.018 acre). Each subplot for both formulations measured 4 ft by 5 ft.

Georgia: The granular application plot was 62 ft by 20 ft or 1,240 ft^2 (0.028 acre) and consisted of five strips, each strip separated by one foot, with eight subplots per strip; each subplot measured 7 ft by 3 ft. This subplot measurement was chosen because 3 ft was the size of the swath of the drop spreader used to make the application. The suspension concentrate application plot measured 90 ft by 12 ft or 1,080 ft^2 (0.025 acre) and consisted of two strips of 21 subplots per strip, with each subplot measuring 6 ft by 4 ft.

Meteorological Data: Air temperature, wind speed, wind direction, relative humidity, and soil temperature were recorded for the application event at all three test sites. A summary of the meteorological data recorded at each application event is provided in Table 1. The minimum and maximum air temperatures, relative humidity, total rainfall and total irrigation were also recorded for the in-life phase of the study for all three test sites. Historical data were not provided with the Study Report.

New York: Meteorological data were monitored using on-site weather monitoring equipment located approximately one-eighth of a mile from the test plots. Air temperatures ranged from 25.9 to 74.1°F and relative humidity ranged from 25.5 to 100%. The first rain event occurred in the early morning on Day 0, approximately eight hours prior to making the application. Following the application rain events occurred on days 7, 13, 14, 15, 18, 19, and 20 for an overall total of 3.77 inches. Sampling occurred on days 7 (0.37 inches of rain) and 14 (0.61 inches of rain); however, the turf was dry prior to sampling. Irrigation was not applied during the study.

California: Meteorological data were monitored using a local government weather station located approximately 20 miles from the test plots. Air temperatures ranged from 37 to 87°F and relative humidity ranged from 16 to 90%. There were no rainfall events during the field trial. Irrigation was applied using overhead sprinklers on 2 days prior to application and on Days 11 and 15 after the application (0.5 inch of water each time).

Georgia: Meteorological data were monitored using on-site weather monitoring equipment located approximately 1,200 ft from the test plots. Air temperatures ranged from 42 to 91°F. Relative humidity was not reported. Rainfall occurred on Days 12, 15, 19 and 20 after the application for a total of 0.15 inches of rain during the study period. Additionally, the turf was irrigated with overhead sprinklers on Day 8 after the application (0.6 inch of water).

Table 1. Meteorological Data for Each Application Event								
Test Site	App. Date	Formulation	Air Temperature (°F)	Wind Speed (mph)	Wind Direction	Relative Humidity (%)	Soil Temperature (°F)	Rainfall w/in 24-Hrs after application (inches)
New York	10/05/06	Granular	56	None	NA	45	48	None
		SC	54	None	NA	45	48	None
California	10/06/07	Granular	70.6	2 to 4	NW	49.5	70	None
		SC	66.7	1 to 3	NW	50.5	68	None
Georgia	09/27/06	Granular	83	<2	N	44	77	None
		SC	74	0 to 2	N	51	74	None

2. Surface Monitored:

Turf Species: New York: Turf (*Kentucky Bluegrass*); planted in 1997.

California: Turf (*Tall Fescue)*; planted in 2003.

Georgia: Turf (*Bermuda-Tif*); planted in 2004.

Residential or Public Area: The turfgrass varieties used in the study are grown in residential and commercial settings. The treated plots were located at research facilities. According to the labels provided with the Study Report, the test products used are intended for use on commercial and residential properties, recreational areas, sod farms and golf courses.

Other relevant characteristics: According to the Study Report, the test plots were maintained according to typical practice. The plots were mowed two days prior to the application to a height of 2.0 inches at the New York and Georgia test sites and to a height of 1.5 inches at the California test site. Following application, mowing did not occur until after Day 10 after the application.

Other products used on turf (treated plot): No pesticides or fertilizers were applied to the New York test plots in 2006. Maintenance fertilizers (20-10-10 and Ironite) were applied to the California plots on four occasions from May to July of 2006. The turf at the Georgia test site was fertilized during the 2006 growing season and treated with two herbicides (Weedar 64 with 2,4-D as the active ingredient at a rate of 0.95 lb ai/A and Envoke with trifloxysulfuron-sodium as the active ingredient at a rate of 0.023 lb ai/A). The treatments took place in June and July of 2006. No maintenance chemicals were applied during the study period at any site. Historical pesticide use data were not provided in the Study Report.

3. Physical State of Formulation as Applied:

Two formulations were used in this study. The physical states were described as dry granular (Mesotrione Turf Fertilizer) and liquid suspension concentrate (Outplay™ SC).

4. Application Rates and Regimes:

Residential or Commercial Applicator: Commercial application equipment was used for both test products.

Application rate: The target rate for the application was 0.25 lb a.i./A for both test products at all sites. The target application rate was the proposed label maximum recommended rate for a single application. According to the product label for Mesotrione Turf Fertilizer, no more than 3 applications can be made per year for a total seasonal application rate of 0.50 lb a.i./A. According to the product label for Outplay™ SC, additional applications can be made for a total seasonal application rate of 16 fl oz (0.50 lb a.i./A). Only one application was made at each test site plot.

New York: The actual granular application rate was 0.256 lb ai/A. The actual suspension concentrate application rate was 0.248 lb ai/A.

California: The actual granular application rate was 0.222 lb ai/A. The actual suspension concentrate application rate was 0.259 lb ai/A.

Georgia: The actual granular application rate was 0.235 lb ai/A. The actual suspension concentrate application rate was 0.251 lb ai/A.

Application Regime:

New York: A single application was made on October 5, 2006.

California: A single application was made on October 6, 2006.

Georgia: A single application was made on September 27, 2006.

Application Equipment:

New York: A Gandy 5' drop spreader pulled with a lawn tractor was used for the granular application. A tractor mounted boom spray rig equipped with a 30 gallon cone tank, and an 8005 flat fan with a 15 ft spray swath was used for the suspension concentrate application.

California: A Gandy 5' drop spreader pulled with a lawn tractor was used for the granular application. A tractor mounted boom spray rig equipped with a 50 gallon tank, and an 8008 flat fan with a 11.7 ft spray swath was used for the suspension concentrate application.

Georgia: A Lesco 36" drop spreader pulled with a lawn tractor was used for the granular application. A tractor mounted boom spray rig equipped with a cone tank and an 8004 flat fan with a 12 ft spray swath was used for the suspension concentrate application.

Spray Volume: The Outplay™ SC label recommended using a minimum of 40 gallons of water per acre. The Study Report stated that the target spray volume range for this study was 75 to 90 gallons per acre (GPA) for the suspension concentrate application since this range of spray volume is consistent with liquid

applications to turf.

New York: The actual spray volume was 75.03 GPA.

California: The actual spray volume was 90.2 GPA.

Georgia: The actual spray volume was 70.2 GPA.

Equipment Calibration Procedures: The drop spreaders at all three test sites were calibrated by measuring the output from the spreader over time by catching and weighing the granules dispensed during a specified time and distance. The tractor speed was checked several times over a specified distance in order to assure the correct application rate. The sprayers at all three sites were calibrated by the time:volume method on the day of the application.

Was application "watered in"? The applications were not watered in. The Mesotrione Turf Fertilizer product label states that for best results, the lawn is not to be watered for 24 hours after the application otherwise the effectiveness of the product would be reduced. The Outplay™ SC product label states that dry conditions following application may reduce the preemergence activity. Therefore, if rainfall (0.15 inches) does not occur within 10 days after the application, activate the product by applying 0.15 inches of water through irrigation. The first rain event after the application at the New York site occurred on Day 7 (0.37 inches). The California test site did not have any rainfall events during the course of the study, but the first irrigation of the test plots occurred on Day 11 (0.5 inches). The first rain event at the Georgia test site occurred on Day 12; however, the turf was irrigated with overhead sprinklers on Day 8 after the application (0.6 inches).

Was total deposition measured? Total deposition was not measured in this study.

5. Transferable Residue Sampling Procedures:

Method and Equipment: Cloth dosimeter samples were collected from the treated plot using the modified California Roller Technique, following the Outdoor Residential Exposure Task Force (ORETF) recommendations. Sampling equipment included the modified California roller (24 inches in length and 4 inches in width, weighing approximately 32 pounds), plastic sampling media frame with clamps, 27 inch by 39 inch sections of 100% cotton percale 200-thread cloth, and a rectangular plastic sheet of similar dimensions to the cotton percale cloth.

Sampling Procedure: Cloth samples cut into 27 inch x 39 inch pieces and a sheet of clear plastic were loaded onto each sampling frame. The frame was secured to the subplot with spikes or nails in each corner of the frame. The modified California roller was placed on the tip of the plastic sheet and rolled back and forth five times in each direction over the cloth dosimeters. After rolling, the plastic sheet was discarded and the cloth dosimeter was folded

with the exposed side inward, then wrapped in foil and placed in a plastic zip-lock bag. A randomization procedure was used for sampling the subplots in order to obtain a representative distribution. Outer plot edges and potential pray/deposition overlap area were avoided.

Surface area(s) sampled: The surface area of the cloth dosimeters which came in contact with the treated turf when placed in the sampling frame was 5,574 cm^2.

Replicates per surface:

- Replicates per sampling time: Triplicate cloth dosimeter samples were collected from the treated plots at each sampling interval.
- Number of sampling times: There were 12 cloth dosimeter sampling intervals (11 sampling intervals occurred after the last application).

Times of sampling after application: Cloth dosimeter samples were collected before and immediately after the application, 4, 8, and 24 hours after the application, and 2, 3, 5, 7, 10, 14, and 21 days after the application. The 8 hour sampling interval for the granular application at the Georgia test site was not collected due to dew formation and lack of light. According to the text within the Study Report, the California test site 8-hour sampling interval was performed at 6-hours in order to ensure that there was sufficient light and in order to avoid sampling after dew formation. It should be noted, however, that the tabulated data in the Study Report shows a 6-hour sampling interval for the granular application plot and an 8-hour sampling interval for the suspension concentrate application plot, and the analytical data shows an 8-hour sampling interval for both the granular and suspension concentrate plots.

6. Sample Handling:

After collection, each sample was carefully folded with the exposed sides together, then wrapped in foil and then placed into a pre-labeled plastic zip-lock style bag. The zip-lock bags containing the samples were placed into a cooler with blue ice for temporary storage. At the field facilities, the samples were transferred to freezers for storage until it was time to ship them to the analytical laboratory. The samples were shipped frozen to Morse Laboratories, Inc. for analytical analysis. The field portion of the study was conducted between September 27, 2006 and November 10, 2006. Field samples were extracted and analyzed at Morse Laboratories between November 13, 2006 and January 10, 2007.

7. Analytical Methodology:

Extraction method: Residues of mesotrione were extracted from cloth samples with acetonitrile:water (1:1, v/v). An aliquot of the extract was evaporated to the water phase and then acidified with acetic acid for C^{18}SPE cartridge cleanup. The analyte was eluted from the cartridge with 0.5% acetic acid in acetonitrile. The eluate was evaporated to dryness and the residue redissolved in 0.1% acetic acid in water.

Detection methods: All samples were analyzed using HPLC employing mass spectrometric (MS/MS) detection. Table 2 provides a summary of typical HPLC conditions for this type of analysis.

Table 2. Summary of Typical HPLC Conditions	
HPLC/MS System:	Applied Biosystems/MDS Sciex API 4000 LC/MS/MS system
HPCL Column:	50 mm x 4.6 mm i/d. PLRP-S 100Å, 5.0 µm particle size
HPLC Guard Column:	4.0 mm x 3.0 mm i.d. Phenomenex Polymerx RP-1
Mobile Phase:	Solvent A: 0.1% acetic acid in HPLC-grade water Solvent B: 100% acetonitrile
Gradient:	Time (min) / %A / %B / Flow Rate (mL/min) 0 – 0.5 / 98% / 2.0% / 0.5 7.0 – 10 5% / 95% / 0.5 10.10 / 98% / 2.0% / 0.5 10.11 – 14.99 / 98% / 2.0% / 0.8 15.0 / 98% / 2.0% / 0.5
Divert Valve:	Programmed to divert LC flow from column to waste from 0 to 5.0 minutes and again from 8.0 to 15 minutes. LC flow is directed to detector during the 5.0 to 8.0 minute window.
Interface:	TIS/ES (turbo ion spray/electrospray)
Ionization Mode:	Negative
Acquisition Mode:	MRM
Source Temperature:	500°C
Curtain Gas:	Nitrogen at 25
Collision Gas:	Nitrogen at setting of "4"
Transitions Monitored:	*m/z* 338.2 to 290.0 (quantitation) *m/z* 338.2 to 211.9 (confirmation), if necessary
Injection Volume:	10 µL
Column Temperature:	35°C
Retention Time:	Approximately 6.1 minutes

Method validation: The validated method for determining mesotrione on cloth dosimeters was Meth-182 entitled "Determination of Mesotrione in/on Transferable Turf Residue (TTR) Cloth Samples." The limit of quantitation (LOQ) for this method was 1.00 µg/cloth dosimeter (0.00018 µg/cm^2). This method was validated prior to analyzing any samples from this study. Method validation was validated using duplicate control samples fortified at 1, 50 and 500 µg/sample with mesotrione. The overall low, mid and high level fortifications yielded average recoveries of 99.4%, 102% and 95.1%, respectively. The overall average recovery was 99.0% ± 4.90 (n=6).

Instrument performance and calibration: The linearity was determined by analyzing at least five standards containing different concentrations of mesotrione ranging from 0.50 to 10.0 ng/mL. A curve check standard was injected every 4 to 5 sampling injections.

Quantification: Calculations for instrument analysis were conducted using a validated software application to create a standard curve based on linear regression. The regression

functions were used to calculate a best fit line and to determine concentrations of the analyte found during sample analysis from the calculated best fit line.

8. Quality Control:

Lab Recovery: Each analysis set consisted of one control dosimeter, two control dosimeters fortified at different levels, and actual study samples. The laboratory fortification levels ranged from 1.00 µg/cloth to 200 µg/cloth and were selected to bracket the anticipated residues detected in/on the field samples. There were no residues detected above the LOQ (1.0 µg/cloth or 0.00018 µg/cm^2) in the untreated laboratory control cloth dosimeters. The percent recoveries ranged from 70.1 to 106% and the overall mean recovery was 88.8% ± 8.48% (n=46).

Field blanks: Triplicate control samples were collected from each of the plots prior to the application of the test products. There were no residues detected above the LOQ (0.00018 µg/cm^2) in the untreated control cloth dosimeters.

Field recovery: Field fortification samples were prepared and analyzed for two sampling events (0DAT and 10DAT) at each test site. Prior to the application, 12 pieces of cotton cloth (27 x 39 inches) were rolled on the untreated turf according to the procedures used to collect the residue samples. After exposure to the turf, the cloths were wrapped in foil, placed into reclosable bags and stored frozen. Six pieces of cloth were removed from frozen storage on the day of each fortification event and allowed to thaw before spiking. Field fortifications were performed in triplicate at two rates (5 µg/cloth and 50 µg/cloth). Following fortification, the fortification solvent was allowed to dissipate before the cloths were folded, wrapped in foil and placed in a zip-lock type bag. The fortified samples where handled, stored and shipped in the same manner as the residue samples.

Field fortification recoveries from the New York site ranged from 88.6 to 105% with an overall average of 94.7% ± 5.70 (n=12).The low and high level average recoveries were 90.8% and 98.6%, respectively. Field fortification recoveries from the California site ranged from 81.4 to 104% with an overall average of 93.0% ± 8.33 (n=12).The low and high level average recoveries were 85.6% and 100%, respectively. Field fortification recoveries from the Georgia site ranged from 74.4 to 102% with an overall average of 83.3% ± 8.58 (n=12).The low and high level average recoveries were 76.5% and 90.2%, respectively. A summary of the field fortification recoveries is provided in Table 3.

Table 3. Summary of Field Fortification Recoveries

Site	Fortification Level (µg/sample)	Average % Recovery ± Std. Dev. per Level	Overall Average % Recovery	Std. Dev.	n
New York	5.0 (n=6)	90.8 ± 1.29	94.7	5.70	12
	50.0 (n=6)	98.6 ± 5.79			
California	5.0 (n=6)	85.6 ± 3.89	93.0	8.33	12
	50.0 (n=6)	100 ± 2.80			
Georgia	5.0 (n=6)	76.5 ± 2.48	83.3	5.58	12
	50.0 (n=6)	90.2 ± 6.60			

Formulation:	The GLP analysis for the formulated test products stated that the granular formulated product contained 0.193% (w/w) of the active ingredient, mesotrione (expiration date of August 2009) and the liquid suspension concentrate formulation contained 40.2% (w/w) of the active ingredient, mesotrione (expiration date of August 2007).
Tank mix:	Tank mix samples were not collected for this study.
Travel Recovery:	Travel recovery was not discussed in the Study Report.
Storage Stability:	A storage stability study was performed in order to verify the stability of mesotrione under frozen conditions similar to those for storage of the field samples. Duplicate fresh spike samples and triplicate aged spike samples were analyzed at three time points (Day 0, Day 32, and Day 94). The longest field sample storage interval was 93 days. The average mesotrione recoveries for the Day 94 fresh and aged spike samples were 87.2% and 102%, respectively. The overall average recovery of mesotrione for all of the fresh and aged samples was 96.1% and 104%, respectively. These results show that there was not any apparent loss of mesotrione during the time spent in frozen storage.

II. RESULTS AND CALCULATIONS:

The Registrant corrected raw field residue samples from the Georgia test site for an average field fortification recovery of 83.3%. There were no corrections applied by the Registrant to the raw field residue samples at the New York or California sites due to overall average field fortifications exceeding 90%. Versar corrected the raw field residue samples using the corresponding average low or high fortification level recovery for each test site when the recoveries were <90%. Average recoveries <90% included the low fortification level recovery at the California site (85.6%) and the low fortification level at the Georgia site (76.5%). Versar applied these recoveries to samples at the California and Georgia sites with raw residue values less than 27.5 µg/sample, which is the midpoint between the low and high field fortification levels. Residue values below the LOQ (0.00018 µg/cm^2) were not corrected. The Registrant and Versar used a residue value equal to half the LOQ in the statistical calculations for all residues less than the LOQ.

The mesotrione TTR levels from the granular applications and corresponding statistical summaries calculated by Versar are presented in Tables 4 through 6. The mesotrione TTR levels from the suspension concentrate applications and corresponding statistical summaries calculated by Versar are presented in Tables 7 through 9. Graphical presentations of the dissipation of mesotrione TTR are demonstrated in Figures 1 (granular applications) and 2 (suspension concentrate applications).

For the granular applications, the maximum average mesotrione residue at the New York site occurred 8-hours following the application (0.0027 µg/cm^2) and dropped below the LOQ (0.00018 µg/cm^2) on the fifth day after treatment (5DAT). The maximum average mesotrione residue at the California site occurred immediately following the application (0.0045 µg/cm^2) and dropped below the LOQ (0.00018 µg/cm^2) by 14DAT. The maximum average mesotrione residue at the Georgia site occurred immediately following the application (0.0049 µg/cm^2) and dropped below the LOQ (0.00018 µg/cm^2) by 10DAT. In the samples taken immediately after the final application, approximately 0.077%, 0.179% and 0.185% of the application rate was available for transfer, respectively, at the New York, California, and Georgia test sites.

For the suspension concentrate applications, the maximum average mesotrione residue at the New York site occurred 8-hours following the application (0.0211 µg/cm^2) and dropped below the LOQ (0.00018

$\mu g/cm^2$) by 7DAT. The maximum average mesotrione residue at the California site occurred 6-hours following the application (0.0191 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 14DAT. The maximum average mesotrione residue at the Georgia site occurred immediately following the application (0.0050 $\mu g/cm^2$) and dropped below the LOQ (0.00018 $\mu g/cm^2$) by 10DAT. In the samples taken immediately after the final application, approximately 0.096%, 0.318% and 0.178% of the application rate was available for transfer, respectively, at the New York, California, and Georgia test sites.

The Registrant and Versar used natural log-transformation of individual measured residues to generate a log-linear graph and simple regression equation based on a one compartment model. The half-life was calculated assuming first order exponential decay. Individual mesotrione residues immediately following the application out to the first day where all residues dropped below the LOQ were used for the regression analysis for each test site. For the granular applications, the Registrant's calculated half-life values for New York, California, and Georgia were 1.04 days (R^2=0.743), 2.88 days (R^2=0.870) and 2.34 days (R^2=0.795), respectively. For the suspension concentrate applications, the Registrant's calculated half-life values for New York, California, and Georgia were 1.16 days (R^2=0.751), 1.98 days (R^2=0.912) and 1.52 days (R^2=0.946), respectively. As shown in Appendices B through D, Versar's estimated half-life values for the granular applications were 1.04 days (R^2=0.743) for New York, 2.81 days (R^2=0.883) for California, and 2.30 days (R^2=0.794) for Georgia. Versar's estimated half-life values for the suspension concentrate applications were 1.16 days (R^2=0.751) for New York, 1.98 days (R^2=0.927) for California, and 1.72 days (R^2=0.950) for Georgia.

According to the Registrant, the slight increase on TTR seen at 8 hrs after treatment in some instances was attributed to dew which had formed on the grass on the evening. This had been seen in other studies and appears to be a direct effect of moisture re-solubilizing the pesticide.

III DISCUSSION

A. LIMITATIONS OF THE STUDY:

This study met most of the Series 875, Group B:875.2100 Guidelines. The issues which were identified include:

- Separate control plots were not used in this study; however, all control samples were collected 1 to 12 days prior to the application at each site.

- Only overall minimum and maximum air temperatures, overall minimum and maximum relative humidity, and precipitation/irrigation data were provided for the duration of the study. Other meteorological recordings (wind speed, wind direction, and soil temperature) were only provided for each application day. According to the guideline, these meteorological measurements should also be provided for the duration of the study.

- The product labels recommend a maximum single application rate of 0.25 lb ai/A, with additional applications as needed for a maximum seasonal application rate of 0.50 lb ai/A. In this study, only one application was made at the maximum application rate of 0.25 lb ai/A.

- A limit of detection (LOD) was not provided in the Study Report.

- It is not certain if the production of metabolites, breakdown products, or the presence of contaminants of potential toxicologic concern were considered. The Study Report did not provide this information.

- The field fortification levels used in this study were 5 and 50 µg/sample. The raw uncorrected field residues ranged from <LOQ (1 µg/sample) to 124 µg/sample; therefore, the field fortification levels were not in the anticipated range of residues for some samples.

B. CONCLUSIONS:

The half-life estimations by the Registrant were the same as those estimated by Versar for the New York test site and only slightly different from those estimated by Versar for the California and Georgia test sites. The differences are most likely due the different methods used by the Registrant and Versar to correct the raw residue data.

The Registrant stated that the residue data in this study demonstrate that the application of mesotrione (granular formulation and the suspension concentrate liquid formulation) on turf at the maximum labeled rate of 0.25 lb a.i./A resulted in very low transferable residues. The estimates of residue transferability are well supported in this study through the use of established test dosimetry, the use of validated analytical methodology, and calculations based on measurable residue in study samples. The integrity of the study samples is further supported by acceptable field fortification recoveries and storage stability data.

Table 4. Mesotrione TTR Residues for Granular Application in New York							
Sampling Interval	Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0021	0.0022	0.0008	37.7	-6.11	0.0021	0.077
	0.0031						
	0.0014						
0.167DAT	0.0020	0.0017	0.0004	21.2	-6.38	0.0017	0.059
	0.0013						
	0.0017						
0.333DAT	0.0024	0.0027	0.0006	22.5	-5.93	0.0026	0.093
	0.0022						
	0.0033						
1DAT	0.0006	0.00054	0.0001	17.7	-7.53	0.0005	0.019
	0.0004						
	0.0006						
2DAT	<LOQ (0.000090)	0.00014	0.0001	64.3	-8.85	0.0001	0.005
	<LOQ (0.000090)						
	0.0002						
3DAT	0.0005	0.00029	0.0002	62.2	-8.14	0.0003	0.010
	0.0002						
	0.0002						
5DAT	<LOQ (0.000090)	0.000090	0.000	0.000002	-9.32	0.0001	0.003
	<LOQ (0.000090)						
	<LOQ (0.000090)						
7DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
10DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
14DAT3	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
21DAT3	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes:
- Residue values did not require correction for field fortification recoveries <90%.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The actual application was 2.87 μg ai/ cm^2

Table 5. Mesotrione TTR Residues for Granular Application in California

Sampling Interval	Corrected Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0053	0.0045	0.0011	24.3	-5.41	0.0044	0.179
	0.0049						
	0.0032						
0.167DAT	0.0034	0.0030	0.0007	22.8	-5.81	0.0029	0.120
	0.0033						
	0.0022						
0.250DAT	0.0034	0.0038	0.0007	19.1	-5.57	0.0038	0.152
	0.0034						
	0.0046						
1DAT	0.0025	0.0019	0.0007	34.6	-6.27	0.0018	0.076
	0.0020						
	0.0012						
2DAT	0.0008	0.00082	0.0000	1.42	-7.10	0.0008	0.033
	0.0008						
	0.0008						
3DAT	0.0008	0.00069	0.0001	16.2	-7.27	0.0007	0.028
	0.0006						
	0.0008						
5DAT	0.0005	0.00071	0.0002	29.9	-7.25	0.0007	0.029
	0.0009						
	0.0008						
7DAT	0.0004	0.00051	0.0001	15.2	-7.58	0.0005	0.021
	0.0005						
	0.0006						
10DAT	0.0003	0.00026	0.00003	11.3	-8.26	0.0003	0.010
	0.0003						
	0.0002						
14DAT3	<LOQ (0.000090)	0.000090	0.0000	0.000002	-9.32	0.0001	0.004
	<LOQ (0.000090)						
	<LOQ (0.000090)						
21DAT3	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes: - The 8-hour sampling interval was performed at 6-hours to ensure that there was enough light and that dew did not occur on the leaf blades before collection.
- Residue values associated with the low level field fortification (residues <27.5 µg/sample) were corrected for an average low level field fortification recovery of 85.6%
- Residue values associated with the high level field fortification (residues >27.5 µg/sample) did not require correction.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The actual application rate was 2.49 μg ai/ cm^2

Table 6. Mesotrione TTR Residues for Granular Application in Georgia

Sampling Interval	Corrected Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0045	0.0049	0.0003	6.78	-5.32	0.0049	0.185
	0.0052						
	0.0049						
0.167DAT	0.0022	0.0021	0.0005	23.3	-6.15	0.0021	0.081
	0.0016						
	0.0026						
1DAT	0.0020	0.0014	0.0005	33.8	-6.56	0.0014	0.054
	0.0012						
	0.0011						
2DAT	0.0050	0.0027	0.0020	73.3	-5.91	0.0023	0.103
	0.0013						
	0.0018						
3DAT	0.0014	0.0013	0.0003	24.0	-6.67	0.0012	0.048
	0.0015						
	0.0009						
5DAT	0.0011	0.0012	0.0000	3.64	-6.74	0.0012	0.045
	0.0012						
	0.0012						
7DAT	0.0009	0.00070	0.0001	19.1	-7.26	0.0007	0.027
	0.0006						
	0.0006						
10DAT	<LOQ (0.000090)	0.000090	0.0000	0.000002	-9.32	0.0001	0.003
	<LOQ (0.000090)						
	<LOQ (0.000090)						
14DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
21DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes:
- The 8-hour sampling interval was not performed due to dew formation and lack of sun light.
- Residue values associated with the low level field fortification (residues <27.5 µg/sample) were corrected for an average low level field fortification recovery of 75.5%
- Residue values associated with the high level field fortification (residues >27.5 µg/sample) did not require correction.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The actual application was 2.63 μg ai/ cm^2

Table 1. Mesotrione TTR Residues for Suspension Concentrate Application in New York

Sampling Interval	Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0033	0.0027	0.0006	21.1	-5.93	0.0026	0.096
	0.0022						
	0.0025						
0.167DAT	0.0021	0.0024	0.0003	14.0	-6.05	0.0023	0.085
	0.0027						
	0.0022						
0.333DAT	0.0222	0.0211	0.0015	7.10	-3.86	0.0210	0.757
	0.0215						
	0.0194						
1DAT	0.0020	0.0015	0.0005	32.8	-6.53	0.0014	0.052
	0.0012						
	0.0012						
2DAT	0.0005	0.00052	0.0001	12.8	-7.55	0.0005	0.019
	0.0006						
	0.0005						
3DAT	0.0004	0.00043	0.0001	16.0	-7.76	0.0004	0.015
	0.0004						
	0.0005						
5DAT	0.0002	0.00017	0.0001	41.8	-8.67	0.0002	0.006
	0.0002						
	< LOQ (0.000090)						
7DAT	< LOQ (0.000090)	0.000090	0.0000	0.000002	-9.32	0.0001	0.003
	< LOQ (0.000090)						
	< LOQ (0.000090)						
10DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
14DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
21DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes:
- Residue values did not require correction for field fortification recoveries <90%.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The actual application was 2.78 μg ai/ cm^2

Table 8. Mesotrione TTR Residues for Suspension Concentrate Application in California							
Sampling Interval	Corrected Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0091	0.0092	0.0001	1.25	-4.68	0.0092	0.318
	0.0093						
	0.0093						
0.167DAT	0.0080	0.0073	0.0007	9.09	-4.92	0.0073	0.252
	0.0073						
	0.0067						
0.250DAT	0.0187	0.0191	0.0009	4.64	-3.96	0.0191	0.657
	0.0201						
	0.0185						
1DAT	0.0054	0.0049	0.0007	13.9	-5.33	0.0048	0.167
	0.0041						
	0.0051						
2DAT	0.0030	0.0026	0.0003	13.2	-5.94	0.0026	0.090
	0.0024						
	0.0025						
3DAT	0.0014	0.0017	0.0004	20.5	-6.35	0.0017	0.060
	0.0018						
	0.0021						
5DAT	0.0014	0.0015	0.0001	4.41	-6.53	0.0015	0.050
	0.0015						
	0.0014						
7DAT	0.0008	0.00071	0.0002	21.2	-7.25	0.0007	0.025
	0.0008						
	0.0005						
10DAT	0.0003	0.00019	0.0001	47.9	-8.56	0.0002	0.007
	0.0002						
	<LOQ (0.000090)						
14DAT	<LOQ (0.000090)	0.000090	0.0000	0.000002	-9.32	0.0001	0.003
	<LOQ (0.000090)						
	<LOQ (0.000090)						
21DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes:
- The 8-hour sampling interval was performed at 6-hours to ensure that there was enough light and that dew did not occur on the leaf blades before collection.
- Residue values associated with the low level field fortification (residues <27.5 µg/sample) were corrected for an average low level field fortification recovery of 85.6%
- Residue values associated with the high level field fortification (residues >27.5 µg/sample) did not require correction.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The actual application rate was 2.90 μg ai/ cm^2

Table 9. Mesotrione TTR Residues for Suspension Concentrate Application in Georgia

Sampling Interval	Corrected Residue ($\mu g/cm^2$)	Arithmetic Mean ($\mu g/cm^2$)	Standard Deviation ($\mu g/cm^2$)	Coefficient of Variance (%)	Natural Log of Mean ($\mu g/cm^2$)	Geomean ($\mu g/cm^2$)	% of app rate transferred
Pre-App	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
0DAT	0.0059	0.0050	0.0008	16.4	-5.30	0.0050	0.178
	0.0042						
	0.0049						
0.167DAT	0.0040	0.0038	0.0002	4.47	-5.58	0.0038	0.135
	0.0037						
	0.0037						
0.333DAT	0.0028	0.0034	0.0006	19.0	-5.68	0.0034	0.121
	0.0041						
	0.0033						
1DAT	0.0035	0.0025	0.0009	34.2	-5.99	0.0024	0.089
	0.0021						
	0.0019						
2DAT	0.0011	0.0013	0.0003	26.6	-6.64	0.0013	0.046
	0.0011						
	0.0017						
3DAT	0.0009	0.0011	0.0004	38.0	-6.83	0.0010	0.038
	0.0016						
	0.0008						
5DAT	0.0004	0.00039	0.00001	1.51	-7.85	0.0004	0.014
	0.0004						
	0.0004						
7DAT	<LOQ (0.000090)	0.00019	0.0001	46.5	-8.55	0.0002	0.007
	0.0003						
	0.0002						
10DAT	<LOQ (0.000090)	0.000090	0.0000	0.000002	-9.32	0.0001	0.003
	<LOQ (0.000090)						
	<LOQ (0.000090)						
14DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						
21DAT	<LOQ	<LOQ	NA	NA	NA	NA	NA
	<LOQ						
	<LOQ						

Notes:
- Residue values associated with the low level field fortification (residues <27.5 µg/sample) were corrected for an average low level field fortification recovery of 76.5%
-Residue values associated with the high level field fortification (residues >27.5 µg/sample) did not require correction.
- ½ LOQ (0.000090 $\mu g/cm^2$) was used for residue values <LOQ.
- The application at a rate of 2.81 μg ai/ cm^2

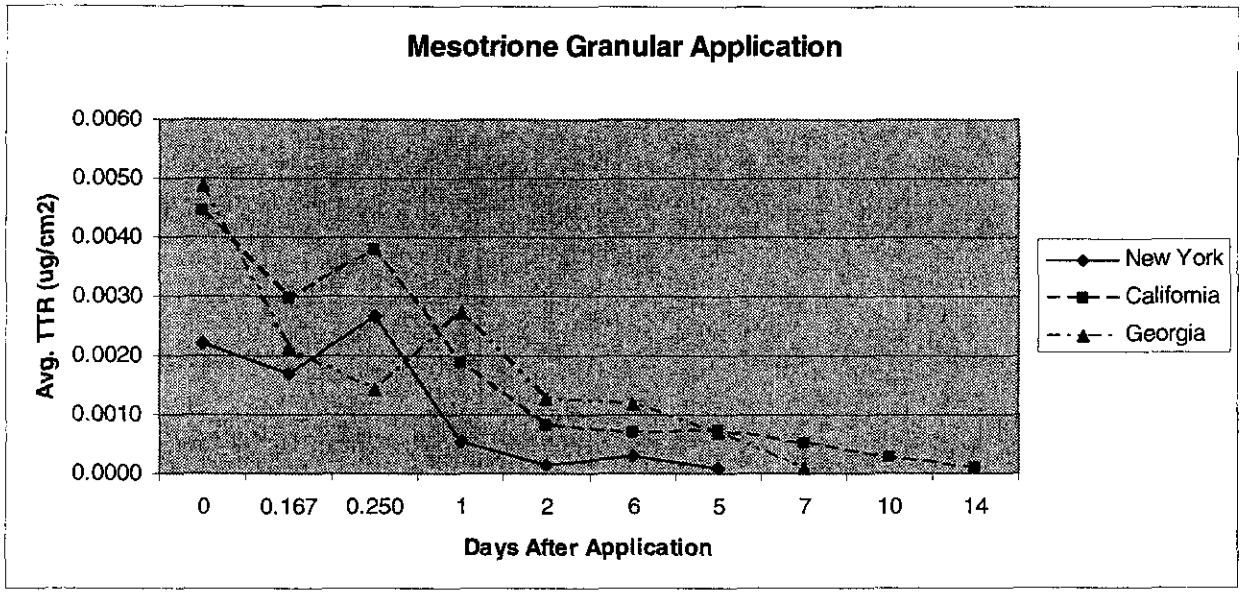


Figure 1. Mesotrione Residues on Cloth Dosimeters from Granular Applications in New York, California, and Georgia

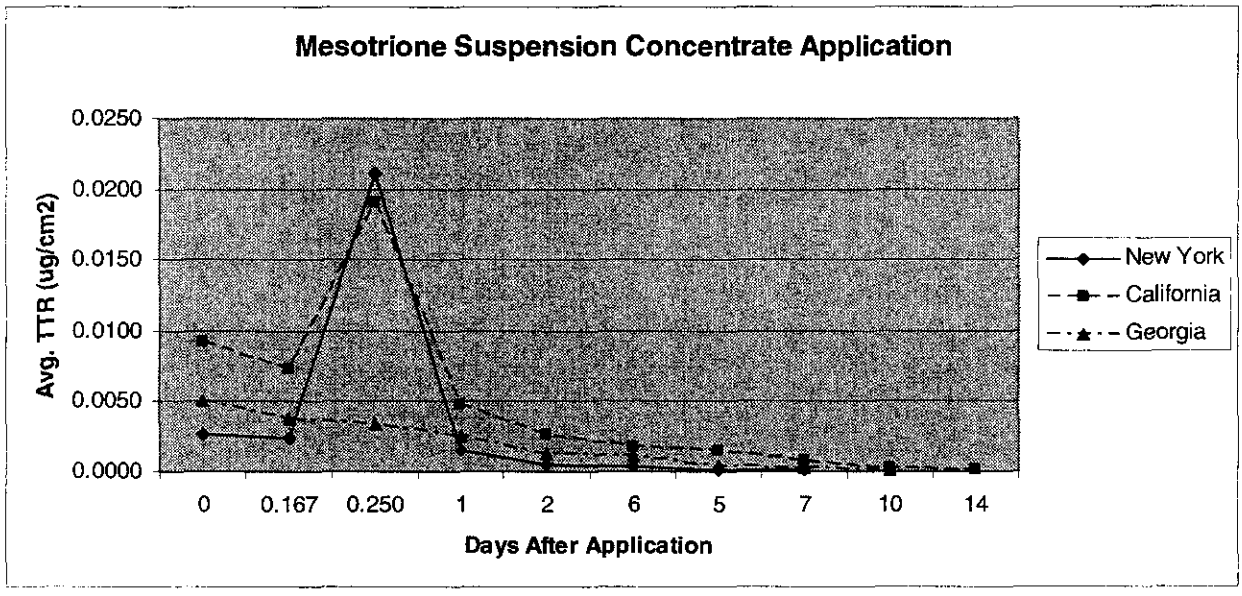


Figure 2. Mesotrione Residues on Cloth Dosimeters from Suspension Concentrate Applications in New York, California, and Georgia

APPENDIX A

Compliance Checklist for "Mesotrione – Determination of Transferable Turf Residues on Turf Treated with Granular and Liquid Formulations"

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 most of 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. Both test products were typical end use products.

- *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 or breakdown products for mesotrione 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.* These criteria were met. There were no rainfall events within 24 hours after any of the applications.

- *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.* These criteria were met. The test product applications were not "watered in" and the sprayer calibration data was provided in the Study Report.

- *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. Both test products were applied at the maximum rate specified on the labels (0.25 lb ai/A).

- *If multiple applications are made, the minimum allowable interval between applications should be used.* This criterion does not apply, only one application was made.

- *Turf transferable 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.

- *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.* These criteria were partially met. Air temperature, wind speed, wind direction, relative humidity, and rainfall were recorded for each application event at all three test sites. Only the minimum and maximum air temperature and relative humidity along with precipitation/irrigation data were provided for the duration of the study. Historical weather data were not provided for any of the test sites.

- *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. Samples were collected out to 21 days after the final application. All residues were below the LOQ by 14DAT at the latest.

- *Triplicate, randomly collected samples should be collected at each sampling interval.* This criterion was met.

- *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 Roller technique.

- *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 samples were collected from the treated plots prior to the application.

- *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 for the cloth dosimeters. 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.* This criterion was met.

- *Validated analytical methods of sufficient sensitivity are needed. Information on method efficiency (residue recovery), and limit of quantitation (LOQ) should be provided.* These criteria were met. The analytical method was validated prior to the start of the study and information on method efficiency was provided with the Study Report. The LOQ for mesotrione was 0.00018 $\mu g/cm^2$.

- *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.* These criteria were 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.

- *Residue data should be expressed as $\mu g/cm^2$.* This criterion was met.

APPENDIX B

Regression Data for Mesotrione TTR From New York Granular Application and Suspension Concentrate Application

Regression Analysis: Summary Output for NY turf Granular

Regression Statistics	
Multiple R	0.861689
R Square	0.742508
Adjusted R^2	0.728956
Standard Error	0.701248
Observations	21

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	26.94231	26.94231	54.788723	5.20993E-07
Residual	19	9.343236	0.491749		
Total	20	36.28555			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-6.41936	0.212763	-30.1714	1.628E-17	-6.864682919	-5.974044494
Slope	-0.66602	0.089979	-7.40194	5.21E-07	-0.854350042	-0.47769237

Half Life = 1.040728 Days

Predicted DFR Levels

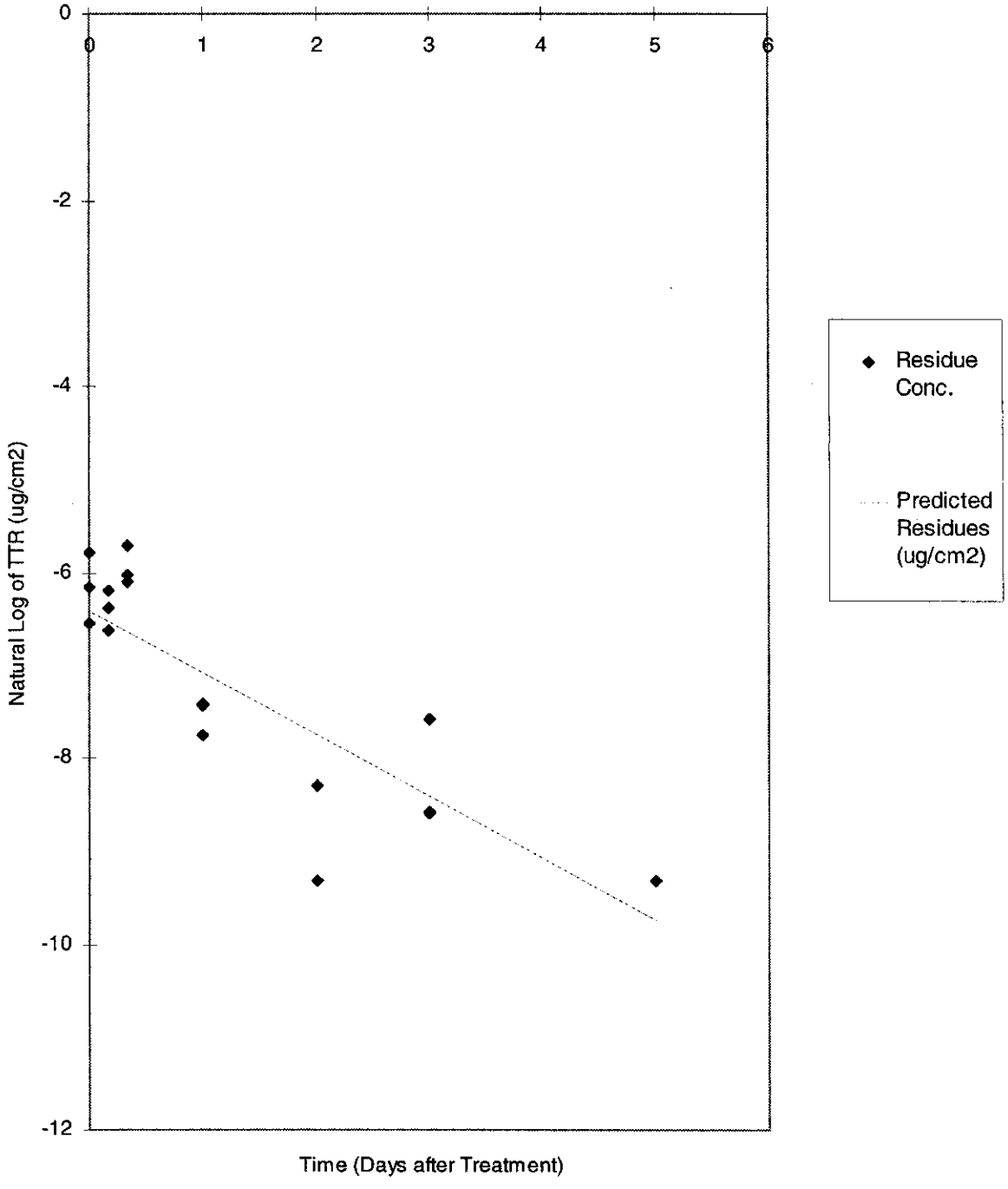
Time (Days)	Residue (ug/cm2)
0	0.00163
1	0.000837
2	0.00043
3	0.000221
4	0.000114
5	5.83E-05
6	3E-05
7	1.54E-05
8	7.91E-06
9	4.06E-06
10	2.09E-06
11	1.07E-06
12	5.51E-07
13	2.83E-07
14	1.45E-07
15	7.47E-08
16	3.84E-08
17	1.97E-08
18	1.01E-08
19	5.2E-09
20	2.67E-09

Time (Days)	Residue (ug/cm2)
21	1.374E-09
22	7.057E-10
23	3.626E-10
24	1.863E-10
25	9.569E-11
26	4.916E-11
27	2.526E-11
28	1.298E-11
29	6.666E-12
30	3.425E-12
31	1.759E-12
32	9.039E-13
33	4.644E-13
34	2.386E-13
35	1.226E-13

Regression Analysis: Means and CVs for NY turf Granular

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0021	0.00221	0.000833	37.7
	0.0031			
	0.0014			
0.167	0.0020	0.00169	0.000358	21.2
	0.0013			
	0.0017			
0.333	0.0024	0.00266	0.000597	22.5
	0.0022			
	0.0033			
1	0.0006	0.000539	9.54E-05	17.7
	0.0004			
	0.0006			
2	0.0001	0.000143	0.000092	64.3
	0.0001			
	0.0002			
3	0.0005	0.000291	0.000181	62.3
	0.0002			
	0.0002			
5	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for NY turf Granular



Regression Analysis: Summary Output for NY turf SC

Regression Statistics	
Multiple R	0.866314
R Square	0.7505
Adjusted R^2	0.739159
Standard Error	0.857721
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	48.68496	48.68496	66.176348	4.46745E-08
Residual	22	16.18507	0.735685		
Total	23	64.87003			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5.59309	0.244061	-22.9167	7.607E-17	-6.099242117	-5.086936036
Slope	-0.59815	0.073529	-8.13488	4.467E-08	-0.750643424	-0.445662043

Half Life = 1.158813 Days

Predicted DFR Levels

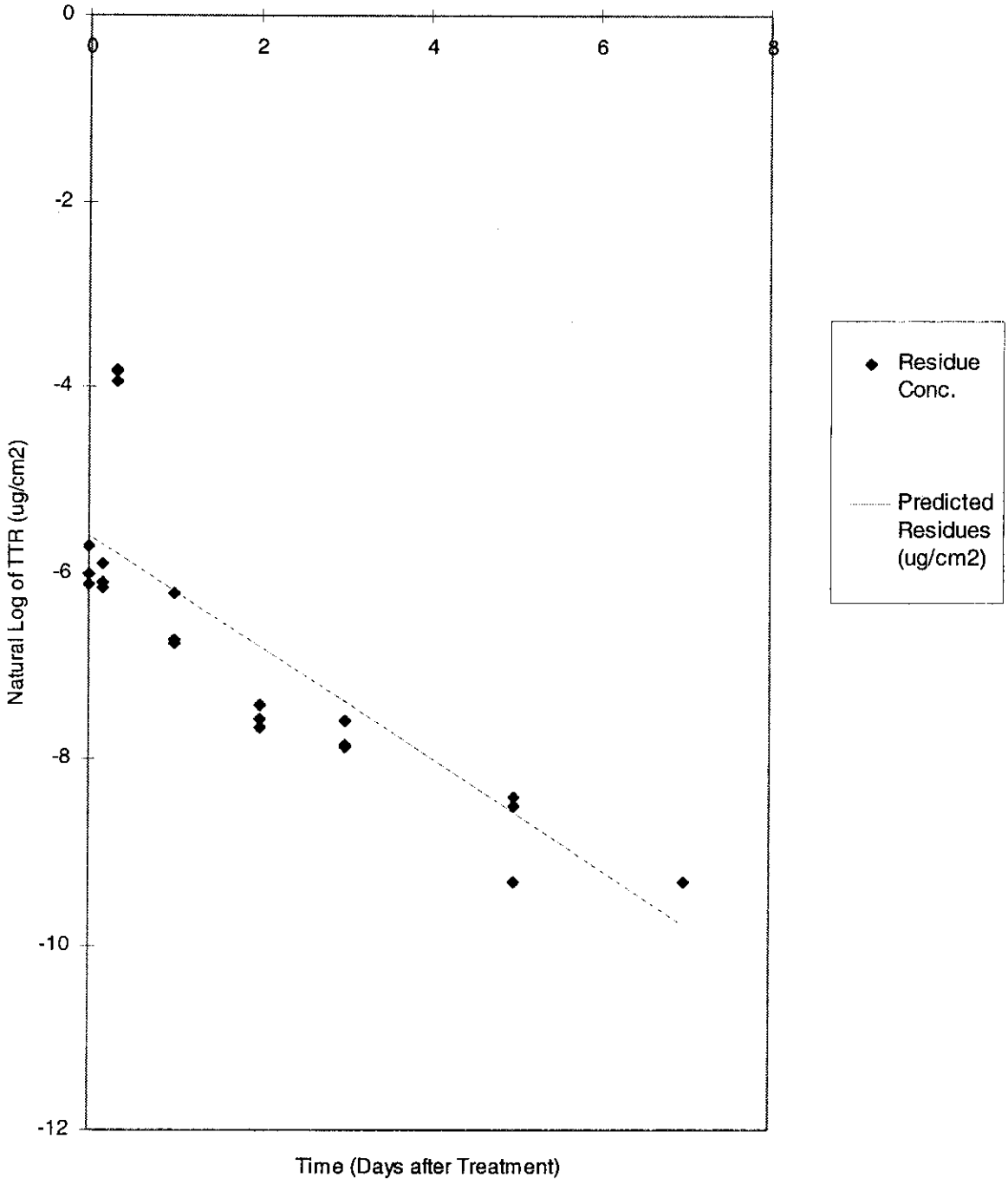
Time (Days)	Residue (ug/cm2)
0	0.003724
1	0.002047
2	0.001126
3	0.000619
4	0.00034
5	0.000187
6	0.000103
7	5.66E-05
8	3.11E-05
9	1.71E-05
10	9.4E-06
11	5.17E-06
12	2.84E-06
13	1.56E-06
14	8.59E-07
15	4.72E-07
16	2.6E-07
17	1.43E-07
18	7.85E-08
19	4.32E-08
20	2.37E-08

Time (Days)	Residue (ug/cm2)
21	1.305E-08
22	7.177E-09
23	3.946E-09
24	2.17E-09
25	1.193E-09
26	6.559E-10
27	3.606E-10
28	1.983E-10
29	1.09E-10
30	5.994E-11
31	3.296E-11
32	1.812E-11
33	9.963E-12
34	5.478E-12
35	3.012E-12

Regression Analysis: Means and CVs for NY turf SC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0033	0.00266	0.00056	21.1
	0.0022			
	0.0025			
0.167	0.0021	0.00236	0.000329	13.9
	0.0027			
	0.0022			
0.333	0.0222	0.0211	0.00149	7.08
	0.0215			
	0.0194			
1	0.0020	0.00146	0.000478	32.7
	0.0012			
	0.0012			
2	0.0005	0.000524	6.74E-05	12.9
	0.0006			
	0.0005			
3	0.0004	0.000427	6.85E-05	16
	0.0004			
	0.0005			
5	0.0002	0.000172	7.21E-05	41.9
	0.0002			
	0.0001			
7	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for NY turf SC



APPENDIX C

Regression Data for Mesotrione TTR from California Granular Application and Suspension Concentrate Application

Regression Analysis: Summary Output for CA turf Granular

Regression Statistics	
Multiple R	0.939742
R Square	0.883115
Adjusted R^2	0.878941
Standard Error	0.419979
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	37.31398	37.31398	211.55165	1.4067E-14
Residual	28	4.938706	0.176382		
Total	29	42.25269			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5.954	0.105169	-56.6136	2.003E-30	-6.169425657	-5.738567564
Slope	-0.24682	0.01697	-14.5448	1.407E-14	-0.281579843	-0.212058598

Half Life = 2.808319 Days

Predicted DFR Levels

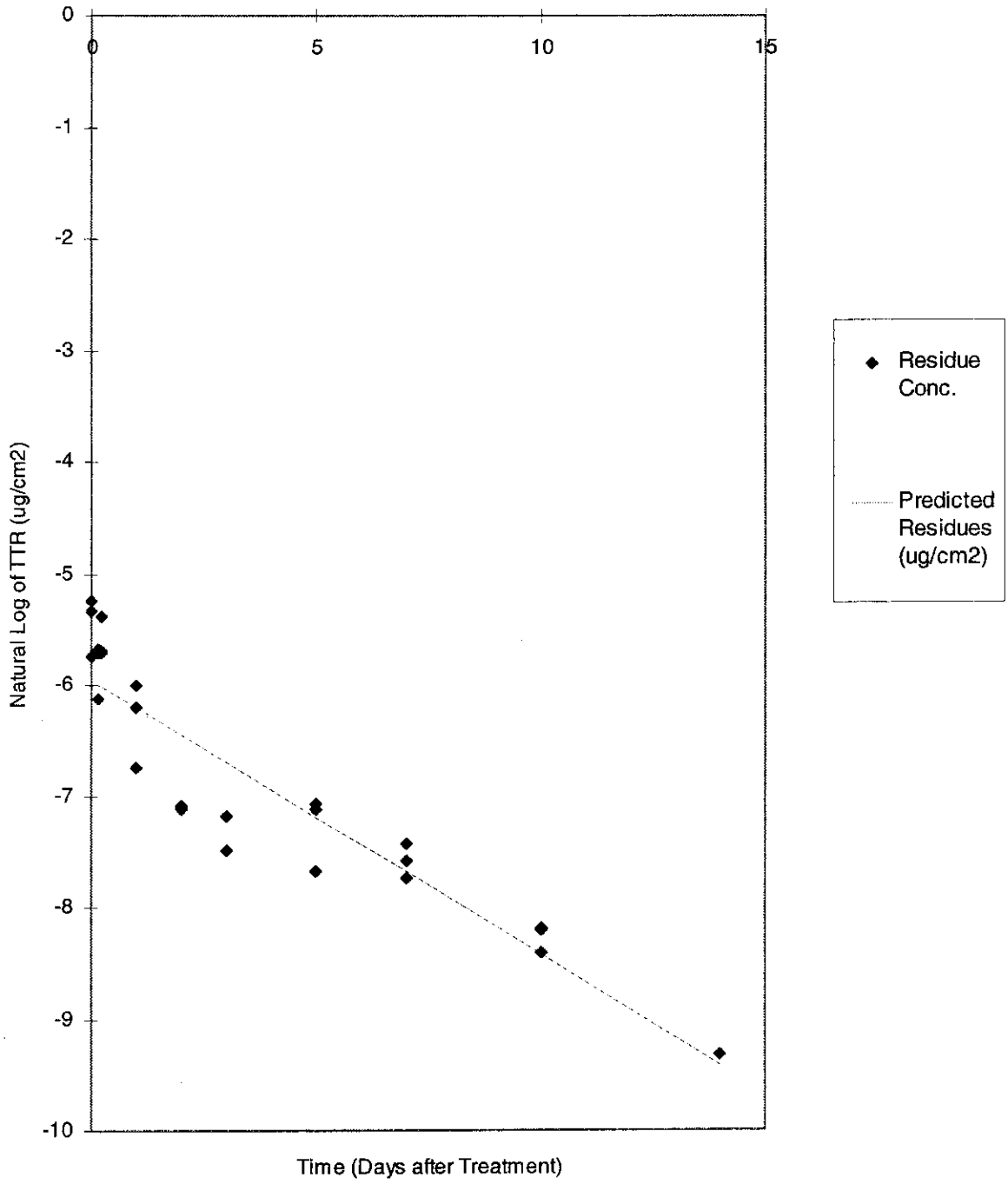
Time (Days)	Residue (ug/cm2)
0	0.002595
1	0.002028
2	0.001584
3	0.001238
4	0.000967
5	0.000756
6	0.00059
7	0.000461
8	0.00036
9	0.000282
10	0.00022
11	0.000172
12	0.000134
13	0.000105
14	8.19E-05
15	6.4E-05
16	5E-05
17	3.91E-05
18	3.05E-05
19	2.39E-05
20	1.86E-05

Time (Days)	Residue (ug/cm2)
21	1.456E-05
22	1.138E-05
23	8.888E-06
24	6.944E-06
25	5.425E-06
26	4.239E-06
27	3.311E-06
28	2.587E-06
29	2.021E-06
30	1.579E-06
31	1.234E-06
32	9.64E-07
33	7.531E-07
34	5.884E-07
35	4.597E-07

Regression Analysis: Means and CVs for CA turf Granular

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0053	0.00445	0.00108	24.3
	0.0049			
	0.0032			
0.167	0.0034	0.00298	0.000681	22.8
	0.0033			
	0.0022			
0.250	0.0034	0.00379	0.000726	19.2
	0.0034			
	0.0046			
1	0.0025	0.00189	0.000655	34.7
	0.0020			
	0.0012			
2	0.0008	0.000822	1.17E-05	1.42
	0.0008			
	0.0008			
3	0.0008	0.000694	0.000113	16.2
	0.0006			
	0.0008			
5	0.0005	0.000713	0.000213	29.9
	0.0009			
	0.0008			
7	0.0004	0.000511	7.76E-05	15.2
	0.0005			
	0.0006			
10	0.0003	0.000258	2.91E-05	11.3
	0.0003			
	0.0002			
14	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for CA turf Granular



Regression Analysis: Summary Output for CA turf SC

Regression Statistics	
Multiple R	0.962735
R Square	0.926859
Adjusted R^2	0.924247
Standard Error	0.459964
Observations	30

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	75.06819	75.06819	354.82062	1.94142E-17
Residual	28	5.923865	0.211567		
Total	29	80.99206			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-4.81299	0.115182	-41.7861	8.96E-27	-5.048934261	-4.577055703
Slope	-0.35008	0.018585	-18.8367	1.941E-17	-0.388153186	-0.312013072

Half Life = 1.97995 Days

Predicted DFR Levels

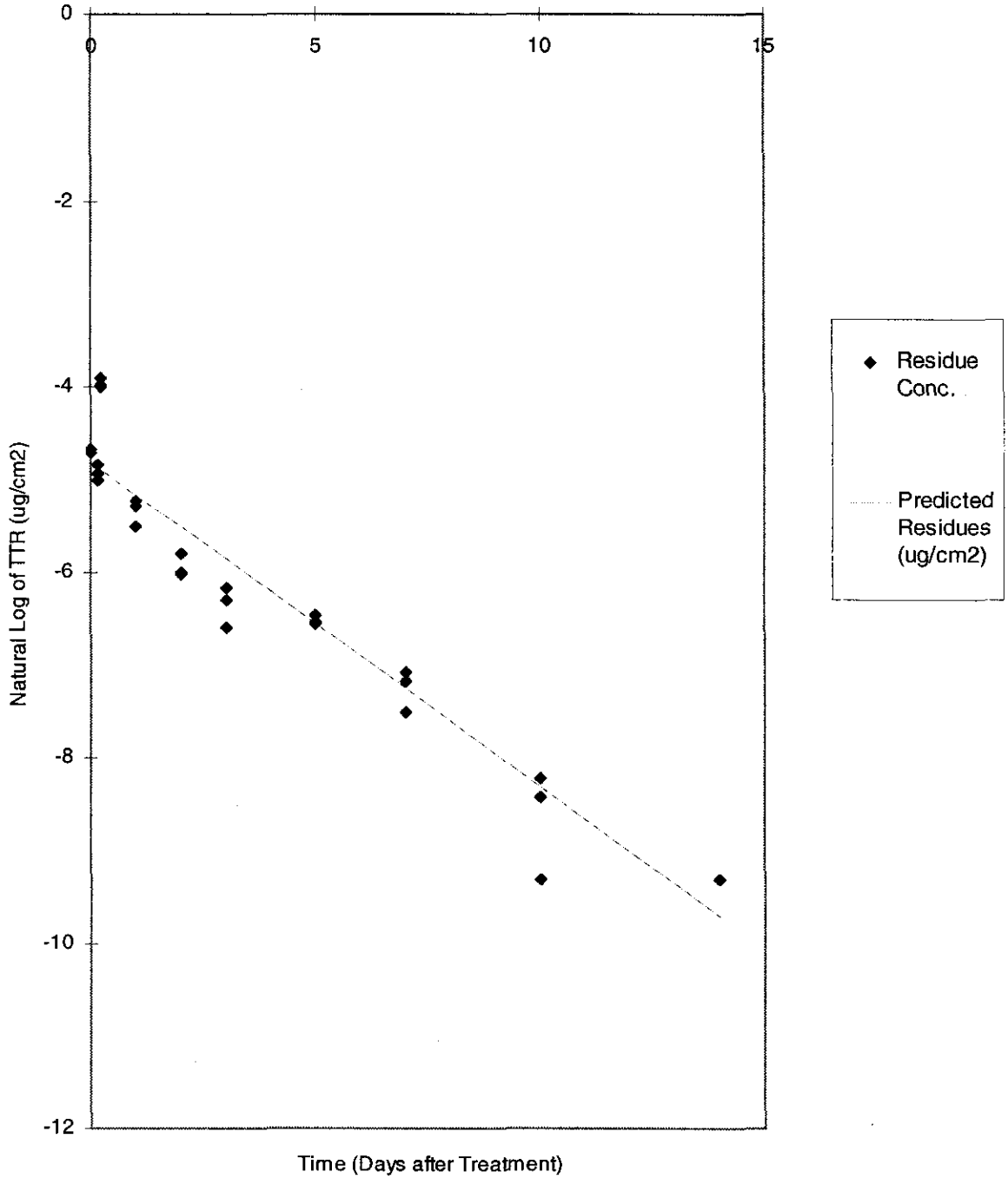
Time (Days)	Residue (ug/cm2)
0	0.008123
1	0.005724
2	0.004033
3	0.002842
4	0.002003
5	0.001411
6	0.000994
7	0.000701
8	0.000494
9	0.000348
10	0.000245
11	0.000173
12	0.000122
13	8.57E-05
14	6.04E-05
15	4.26E-05
16	3E-05
17	2.11E-05
18	1.49E-05
19	1.05E-05
20	7.4E-06

Time (Days)	Residue (ug/cm2)
21	5.211E-06
22	3.672E-06
23	2.587E-06
24	1.823E-06
25	1.285E-06
26	9.052E-07
27	6.378E-07
28	4.494E-07
29	3.167E-07
30	2.231E-07
31	1.572E-07
32	1.108E-07
33	7.806E-08
34	5.501E-08
35	3.876E-08

Regression Analysis: Means and CVs for CA turf SC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0091	0.00925	0.000115	1.25
	0.0093			
	0.0093			
0.167	0.0080	0.00731	0.000664	9.09
	0.0073			
	0.0067			
0.250	0.0187	0.0191	0.000885	4.63
	0.0201			
	0.0185			
1	0.0054	0.00486	0.000677	13.9
	0.0041			
	0.0051			
2	0.0030	0.00262	0.000346	13.2
	0.0024			
	0.0025			
3	0.0014	0.00175	0.000358	20.5
	0.0018			
	0.0021			
5	0.0014	0.00146	6.44E-05	4.41
	0.0015			
	0.0014			
7	0.0008	0.000713	0.000151	21.2
	0.0008			
	0.0005			
10	0.0003	0.000192	9.19E-05	47.9
	0.0002			
	0.0001			
14	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for CA turf SC



APPENDIX D

Regression Data for Mesotrione TTR from Georgia Granular Application and Suspension Concentrate Application

Regression Analysis: Summary Output for GA turf Granular

Regression Statistics	
Multiple R	0.891117
R Square	0.794089
Adjusted R^2	0.784729
Standard Error	0.535011
Observations	24

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	24.28498	24.28498	84.84228	5.26931E-09
Residual	22	6.29721	0.286237		
Total	23	30.58219			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5.71119	0.158864	-35.9501	4.895E-21	-6.040655674	-5.38172614
Slope	-0.30183	0.032769	-9.21099	5.269E-09	-0.369791104	-0.2338744

Half Life = 2.296461 Days

Predicted DFR Levels

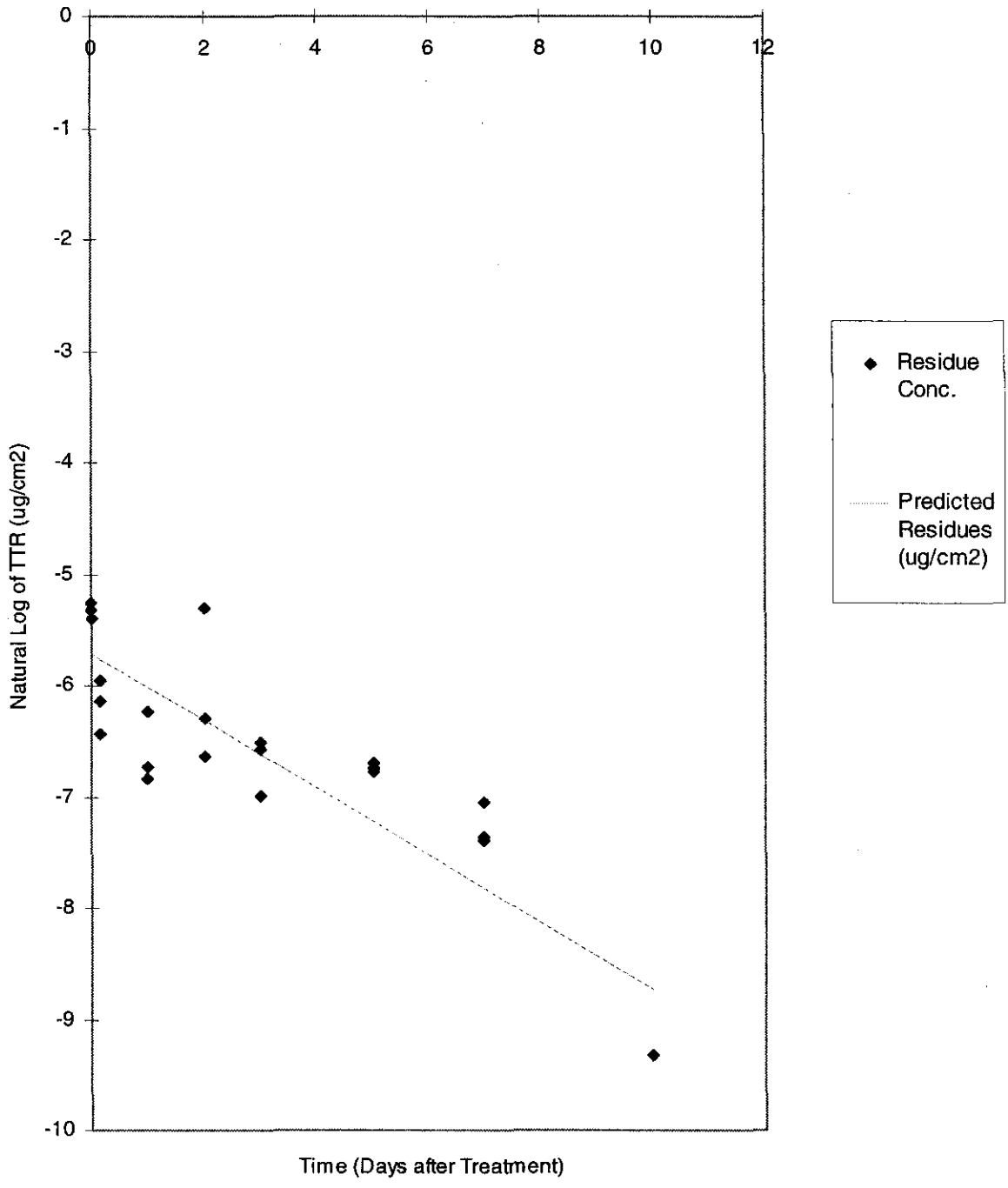
Time (Days)	Residue (ug/cm2)
0	0.003309
1	0.002447
2	0.001809
3	0.001338
4	0.000989
5	0.000732
6	0.000541
7	0.0004
8	0.000296
9	0.000219
10	0.000162
11	0.00012
12	8.84E-05
13	6.54E-05
14	4.84E-05
15	3.58E-05
16	2.64E-05
17	1.96E-05
18	1.45E-05
19	1.07E-05
20	7.91E-06

Time (Days)	Residue (ug/cm2)
21	5.846E-06
22	4.323E-06
23	3.197E-06
24	2.364E-06
25	1.748E-06
26	1.293E-06
27	9.558E-07
28	7.068E-07
29	5.227E-07
30	3.865E-07
31	2.858E-07
32	2.113E-07
33	1.563E-07
34	1.156E-07
35	8.545E-08

Regression Analysis: Means and CVs for GA turf Granular

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0045	0.00488	0.000331	6.78
	0.0052			
	0.0049			
0.167	0.0022	0.00212	0.000494	23.3
	0.0016			
	0.0026			
1	0.0020	0.00142	0.00048	33.8
	0.0012			
	0.0011			
2	0.0050	0.00272	0.00199	73.2
	0.0013			
	0.0018			
3	0.0014	0.00127	0.000304	24
	0.0015			
	0.0009			
5	0.0011	0.00118	0.000043	3.64
	0.0012			
	0.0012			
7	0.0009	0.000704	0.000135	19.1
	0.0006			
	0.0006			
10	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for GA turf Granular



Regression Analysis: Summary Output for GA turf SC

Regression Statistics	
Multiple R	0.97488
R Square	0.950391
Adjusted R^2	0.948407
Standard Error	0.316366
Observations	27

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	47.93612	47.93612	478.94204	8.00449E-18
Residual	25	2.502188	0.100088		
Total	26	50.4383			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-5.60379	0.084407	-66.3897	1.233E-29	-5.777628005	-5.429947468
Slope	-0.40402	0.018461	-21.8847	8.004E-18	-0.442043153	-0.365999587

Half Life = 1.71562 Days

Predicted DFR Levels

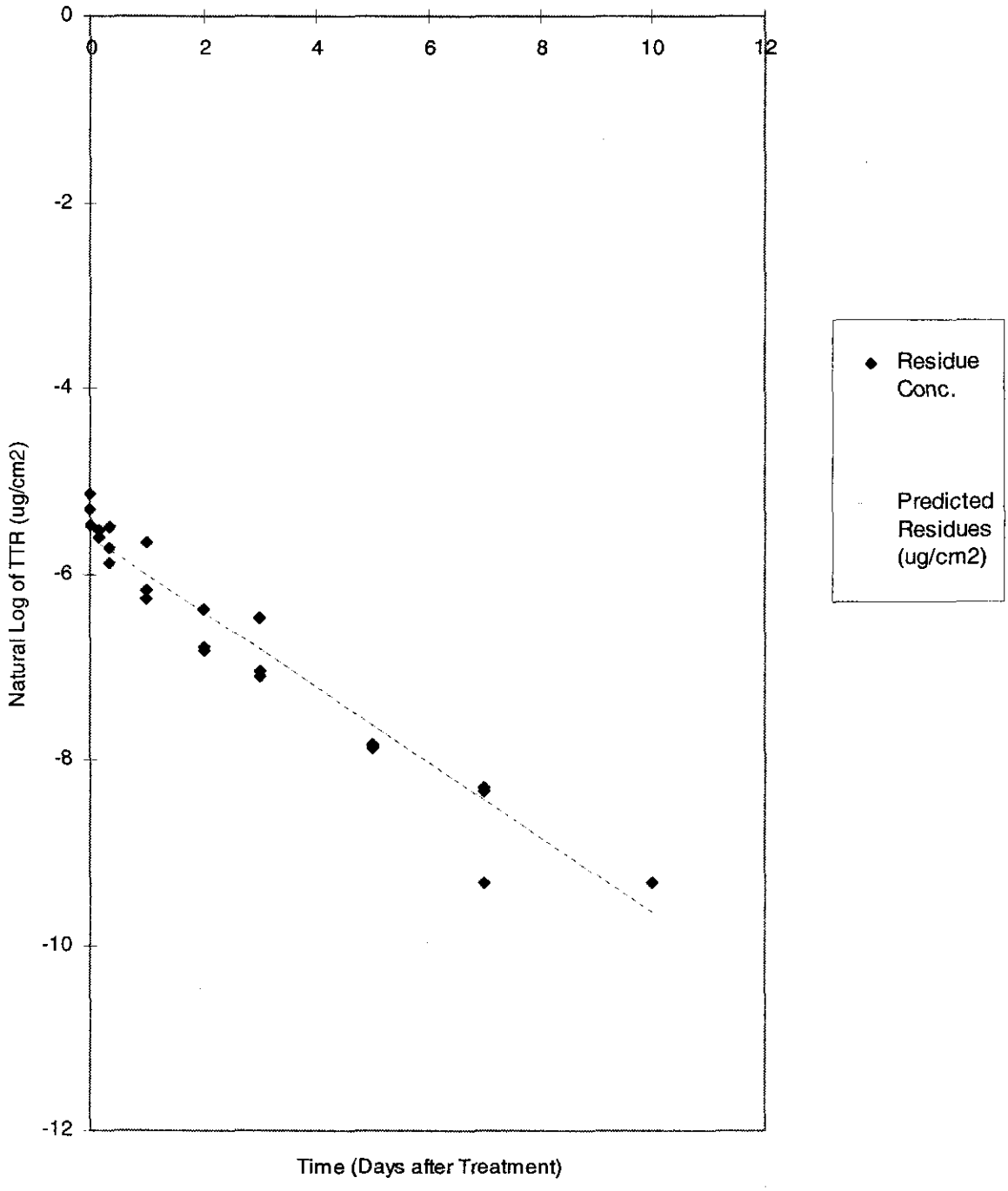
Time (Days)	Residue (ug/cm2)
0	0.003684
1	0.002459
2	0.001642
3	0.001096
4	0.000732
5	0.000489
6	0.000326
7	0.000218
8	0.000145
9	9.71E-05
10	6.48E-05
11	4.33E-05
12	2.89E-05
13	1.93E-05
14	1.29E-05
15	8.6E-06
16	5.74E-06
17	3.83E-06
18	2.56E-06
19	1.71E-06
20	1.14E-06

Time (Days)	Residue (ug/cm2)
21	7.613E-07
22	5.083E-07
23	3.393E-07
24	2.265E-07
25	1.513E-07
26	1.01E-07
27	6.742E-08
28	4.501E-08
29	3.005E-08
30	2.006E-08
31	1.339E-08
32	8.942E-09
33	5.97E-09
34	3.986E-09
35	2.661E-09

Regression Analysis: Means and CVs for GA turf SC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.0059	0.00501	0.000823	16.4
	0.0042			
	0.0049			
0.167	0.0040	0.00379	0.00017	4.48
	0.0037			
	0.0037			
0.333	0.0028	0.00342	0.000649	19
	0.0041			
	0.0033			
1	0.0035	0.00249	0.000853	34.2
	0.0021			
	0.0019			
2	0.0011	0.00131	0.000348	26.6
	0.0011			
	0.0017			
3	0.0009	0.00108	0.000411	38
	0.0016			
	0.0008			
5	0.0004	0.00039	5.9E-06	1.51
	0.0004			
	0.0004			
7	0.0001	0.000194	9.03E-05	46.6
	0.0003			
	0.0002			
10	0.0001	0.00009	1.82E-12	2.02E-06
	0.0001			
	0.0001			

Regression Analysis: Log of Transferable Turf Residue vs. Time for GA turf SC



13544

R155828

Chemical: Mesotrione

PC Code:
122990

HED File Code: 12000 Exposure Reviews
Memo Date: 10/9/2007
File ID: *DPD342065*
Accession #: 000-00-0124

HED Records Reference Center
1/15/2008