Versar inc.

MEMORANDUM

TO: Catherine Joseph

cc: 3771.101
J. Becker

FROM: Andrew Oravetz
Diane Baxter

DATE: April 26, 1999

SUBJECT: Review of *Determination of Dislodgeable Foliar Residues in Tobacco Treated with ORTHENE® 75 WSP* (MRID #447639-01)

This report reviews *Determination of Dislodgeable Foliar Residues in Tobacco Treated with ORTHENE® 75 WSP,* submitted in support of the registration requirements for the organophosphate insecticide acephate. Requirements for this study are specified by the U.S. Environmental Protection Agency's (US-EPA) OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Postapplication Exposure Monitoring Test Guidelines, 875.2100, Dislodgeable Foliar Residue Dissipation: Agricultural, [formerly, EPA Assessment Guidelines Subpart K, Reentry Exposure Series 132-1]. A postapplication exposure study was not included in the study report. Information which may be used to identify the study includes:

Title:	*Determination of Dislodgeable Foliar Residues in Tobacco Treated with ORTHENE® 75 WSP*, 475 pgs
Sponsor:	Joseph L. Powell Valent U.S.A. Corporation Valent Technical Center 6560 Trinity Court Dublin, CA 94568
Performing Laboratory:	Chemtrol Scientific Testing 121 Windsor Lane Edenton, NC 27932
Author & Study Director:	J. C. Lai
Date:	February 11, 1999
Identifying Codes:	MRID # 447639-01, Valent USA Lab. Proj. Indent. No. V11653

EXECUTIVE SUMMARY

The purpose of this study was to quantify dislodgeable foliar residues (DFRs) of the active ingredient in ORTHENE® 75 SP, acephate, and its metabolite methamidophos over time on tobacco. The data were intended to assist in determination of worker re-entry intervals. The usage scenario profiled acephate use on a hairy leaf crop in a hot humid climate.

The study met most of the OPPTS 875.2100 guideline criteria, with the following exceptions: (1) The study was conducted only in one location. The guidelines recommend that DFR studies be conducted in three geographically different locations per crop treated; (2) It is unclear whether DFR data were corrected for storage stability recovery; (3) Predicted foliar residues according to a first-order kinetics equation deviated significantly from the actual measured DFR values obtained.

The highest foliar acephate residue (i.e., 2.30 $\mu g/cm^2$) was found immediately after the first application, while the highest methamidophos residue (i.e., 0.032 $\mu g/cm^2$) occurred on Day 2 after the third application. After the third application, acephate residue dissipation appeared to be bi-phasic (i.e., an initial fast dissipation from Day 0 to Day 2 followed by slower dissipation from Day 2 to Day 35). It appears that there may be two types of residue whose bonding to leaf surfaces were distinctively different.

The study author calculated dissipation half-life values for acephate and methamidophos using two methods. The first, log linear least squares regression analysis, assumed first order kinetics, but considered two separate dissipation phases. For acephate, considering Day 0 to Day 2 data only, the calculated half-life was 0.72 days ($r = (-0.973)$). Considering all data (i.e., Day 0 to Day 35), the calculated half-life for acephate was 4.65 days ($r = (-0.917)$). The calculated half-life for methamidophos (Day 2 (peak) to Day 35) was 8.00 days ($r = (-0.988)$). The second method used employed a curve-fitting program (CurveExpert® v. 1.3) to generate an empirical exponential equation [i.e., $y = ae^{bx}$], from which was calculated the time at which 50 percent of the residues dissipated. For acephate, 50 percent dissipation was calculated to occur at 0.685 days ($R^2 = 0.98$); for methamidophos the calculated value was 9.11 days ($R^2 = 0.98$).

Versar re-analyzed the same data-sets using Microsoft EXCEL 97® linear regression function, considering Day 0 to Day 35 data, and calculated very similar half-life values: 5.2 days ($R^2 = 0.87$) for acephate and 8.0 days for methamidophos ($R^2 = 0.97$). Versar also calculated a half-life value for the combined residues of acephate and methamidophos. The half-life for combined residues was estimated to be 5.4 days ($R^2 = 0.88$). "Predicted" residues were found to deviate significantly from actual DFR values measured. An alternative approach might be needed to provide a better description of the DFR dissipation data.

Versar examined data variability as part of the linear regression exercise and found that coefficients of variance for replicate samples ranged from 4.78 percent to 31.8 percent for acephate residues, from 0 percent to 15.1 percent for methamidophos residues, and 4.9 percent to 30.5 percent for the combined residues. There are no specific requirements concerning the variability of replicate samples in the Pesticide Assessment Guidelines.

The field portion of the study was performed in Martin County, North Carolina, and involved a treated plot, divided into three replicate subplots and a control plot situated at least 100 feet away. Three applications of ORTHENE® 75 SP were made, seven days apart, using 0.77, 0.75, and 0.77 lb ai/A. (maximum label rate), in 10.2 to 10.5 gallons per acre (the minimum recommended volume) with a tractor-mounted boom sprayer, equipped with 8 nozzles. The effective swath was 15 feet and was directed 12 inches above the canopy. No irrigation was performed throughout the study.

Leaf punch samples were collected at the following intervals: just prior to application 1, just after application 1 when the spray had dried, 1 day before application 2, just after application 2, just before application 3, just after application 3, and day 1, 2, 3, 5, 7, 10, 14, 21, 28, 35 after the third application. The leaf punches were collected from the areas of the plants expected to receive the highest amount of spray during applications. At each interval, three replicate samples were collected from the each of the treated subplots and one sample was collected from the control plot. At intervals, when field fortification samples were prepared, six more samples were collected from the control plot.

Sample replicates each consisted of forty 1- inch (2.54 cm) diameter leaf punches collected at each interval, representing a total of 405 cm^2 surface area. (Leaf punches were collected only from leaves which had also been present at the first application). Insecticide residues were dislodged by extracting twice with 100 mL of 0.01 percent Triton X-100 solution. The extraction was performed by mechanically shaking the leaf punches in the Triton solution for ten minutes. All the samples were dislodged within 4 hours of collection. The dislodged samples were stored frozen until shipment.

The analytical method was validated prior to analysis. The LOD was 0.125 µg (0.0003 µg /cm^2) for acephate and 0.05 µg (0.0001 µg /cm^2) for methamidophos. The LOQ for both acephate and methamidophos was 0.0025 µg /cm^2. Fortification levels ranged from the LOD to concentrations above those found in the samples; that is, from 1 to 800 μg acephate and from 1 to 40 μg methamidophos. Recoveries averaged 98 percent for acephate and 112 percent for methamidophos.

Fortified field fortification recovery for acephate (all levels) averaged 93.4 +/-10 percent (C.V.; N=34). The mean recovery for methamidophos (both levels) was 95.9 percent +/- 18 percent (C.V.; N=34).

Storage stability of acephate and methamidophos residues stored frozen or refrigerated in 0.01 percent Triton X-100 was evaluated. Laboratory solutions of 0.01 percent Triton X-100 were fortified with between 12.5 μg acephate or between 5.0 μg methamidophos, and samples were analyzed at Days 1,7, 14, and 43. (Samples were analyzed up to 67 days after collection). The overall results show that acephate and methamidophos are stable in detergent solutions stored at -20°C to 5°C. However, the authors also state: "Several field fortified samples were extracted after 60 and 67 days of freezer storage and recoveries ranged from 78.5 percent to 99.5 percent for acephate and 67.5 percent to 89.0 percent for methamidophos."

Study Background

ORTHENE® 75 SP is an organophosphate insecticide used on a wide variety of crops, including: certain vegetables (e.g., head lettuce, dry and succulent beans, celery, cole crops, etc.), cranberries, cotton, mint, peanuts, tobacco, non-bearing citrus, and non-crop areas (e.g., wasteland and rights-of-way). ORTHENE® 75 SP is a soluble powder formulation containing the active ingredient (a.i.) acephate at 75 percent. The study presents DFR data for acephate and methamidophos residues before and after three spray applications of ORTHENE® 75 SP to tobacco. The data were submitted in response to a Data Call-in Notice issued by EPA, and are intended to assist in determination of worker re-entry intervals.

The study was conducted to characterize acephate residue dissipation after application to a hairy foliar type, tobacco, in a hot, humid climate zone, North Carolina. Plant metabolism studies conducted previously by Valent USA Corp. in lettuce, beans and cotton found that "...the major extractable residue was acephate, with minor amounts of methamidophos."

Test Site

The test site was located in Martin County, North Carolina, Region 2. Approximately 77 percent of the tobacco grown in the United States is grown in Region 2.

The test site consisted of a treated plot (subdivided into three subplots) and a control plot, situated at least 100 feet apart. Tobacco in the plots was cultivated and maintained according to normal agricultural practices. No pesticides containing acephate were applied to the tobacco plants before the study began.

Materials and Application

ORTHENE 75 WSP is formulated as a soluble powder containing 75 percent by weight technical grade acephate as the active ingredient (a.i.). The chemical structure is shown on p. 11 of the study report.

Due to a significant rain event (0.98") within 5 hours of the second application, a third foliar application of ORTHENE 75 WSP was made. Applications were made seven days apart, in the minimum recommended volume. Applications were made with a boom sprayer equipped with 8 nozzles. The effective swath was 15 feet and was directed 12 inches above the canopy. Application and meteorological information is presented in Table 1.

Sampling

Samples consisted of forty 2.54 cm diameter leaf punches (405 cm^2 total area) collected at intervals following application: just before application 1, after application 1 after the spray had dried, 1 day before application 2, just after application 2, 1 day before application 3, just after application 3, and at days 1, 2, 3, 5, 7, 10, 14, 21, 28, and 35 days after the third application. One

sample of untreated leaf punches was collected before the three samples of treated punches were collected.

The treated plot was divided into 3 subplots that were sampled separately at each interval. The leaf punches were collected from the areas of the plants expected to receive the highest amount of spray during applications.

Samples were placed in coolers on blue ice and transported to a field laboratory. Within 4 hours of collection, the samples were dislodged with a solution of 0.01 percent Triton X-100 in water. The samples were mechanically shaken for 10 minutes in 100 mL of solution. The solution was decanted and the samples were mechanically shaken for 10 minutes in 100 mL of solution a second time. This solution was decanted, combined with the first 100 mL, and frozen for shipment. Samples were stored frozen until analysis.

QA/QC

Sample History

The first application was made and sample collection was performed between June 12 and July 31, 1998. Analyses were completed by September 17, 1998. The study author provided a sample history table (see page 21) indicating the interval between sample collection and extraction ranged between 3 and 67 days.

Analytical methodology

The analytical methodology used was a proprietary Method RM-12HE-2 (see Appendix II of the study). It was validated prior to initiation of the DFR study. The method involved salting the samples with anhydrous sodium sulfate, extraction with ethyl acetate, and analysis via gas chromatography with flame photometric detection.

Calibration curves were generated using a minimum of 4 concentrations of the reference standards. The coefficient of variation (CV) for the response factors for the standards used was ±10 percent or less. Response factors with the corresponding CVs for the linearity of the data sets are provided in Appendix IV of the study report. The reproducibility of the gas chromatographic system was verified by determining the reproducibility of the standard measurement for each set of samples. The CV was ±10 percent or less.

Limit of Detection (LOD) & Limit of Quantitation (LOQ)

The LOD was 0.125 µg (0.0003 µg /cm^2) for acephate and 0.05 µg (0.0001 µg /cm^2) for methamidophos. The LOQ for both acephate and methamidophos was 0.0025 µg /cm^2.

Laboratory Recovery

Concurrent laboratory fortifications were analyzed with each set of samples by fortifying 100 mL of untreated detergent solution to monitor method performance. Laboratory fortification

samples (i.e., 1, 10, 200, and 800 µg acephate per 100 mL of detergent solution and at 1, 10, and 40 µg methamidophos per 100 mL of detergent solution) were analyzed concurrently with each set of DFR samples. Average laboratory spike recovery was 84.9 percent ± 11 percent for acephate and 98.0 percent ± 18 percent for methamidophos. Individual recovery values are provided in Table 6 of the study report, and are summarized in Appendix IV of the study report.

Storage Stability Recoveries

Storage stability of acephate and methamidophos residues stored frozen or refrigerated in 0.01 percent Triton X-100 was evaluated. Laboratory solutions of 0.01 percent Triton X-100 were fortified with between 12.5 μg acephate or between 5.0 μg methamidophos. Samples were capped and stored in either a freezer or refrigerator. Initial concentrations in each sample were verified just before storage and ranged between 65.7 percent and 107 percent for acephate and 53.7 percent and 118 percent for methamidophos. At Day 0, 7, 14 and 43, the stored samples were allowed to come to room temperature and duplicate aliquots were sampled and analyzed concurrently with an untreated control and a freshly fortified untreated control. Results are presented in Tables 7A and 7B of the study report. The authors present "Percent Apparent Recovery" values (i.e., residue recovered - μg/ original fortified - μg x 100), as well as "Percent Corrected Recovery," in which the recovered residue is corrected for percent recovery in the freshly fortified control. The overall results show that acephate and methamidophos are stable in detergent solutions stored at -20°C to 5°C.

The authors also state: "Several field fortified samples were extracted after 60 and 67 days of freezer storage and recoveries ranged from 78.5 percent to 99.5 percent for acephate and 67.5 percent to 89.0 percent for methamidophos."

Field Spike Recoveries

Fortification solutions (i.e., acephate or methamidophos in acetone) were prepared at the Valent Technical Center in Dublin, CA and shipped overnight on dry ice to North Carolina on May 13 and June 24, 1998. Solutions were stored frozen. At several intervals, triplicate samples of untreated leaf punches were "dislodged" in fortified detergent solutions, containing four levels of acephate and two levels of methamidophos. Raw data are found in Table 5 of the Study Report (see pg. 26). A summary of these data is found in Appendix IV of the Study Report. The mean recovery for acephate (all levels) was 93.4 +/-10 percent (N=34). The mean recovery for methamidophos (both levels) was 95.9 percent +/- 18 percent (N=34). See Table 2, below, for a summary of these data.

Results

The study author calculated dissipation half-life values for acephate and methamidophos using two methods. The first method, log linear least squares regression analysis, assumed first order kinetics, but considered two separate dissipation phases. For acephate, considering Day 0 to Day 2 data only, the calculated half-life was 0.72 days (r = (-0.973)). Considering all data (i.e., Day 0 to Day 35), the calculated half-life for acephate was 4.65 days (r = (-0.917)). The calculated half-life for methamidophos (Day 2 (peak) to Day 35) was 8.00 days (r = (-0.988)).

The second method used employed a curve-fitting program (CurveExpert® v. 1.3) to generate an empirical exponential equation [i.e., $y = ae^{bx}$], from which was calculated the time at which 50 percent of the residues dissipated. For acephate, 50 percent dissipation was calculated to occur at 0.685 days ($R^2 = 0.98$); for methamidophos the calculated value was 9.11 days ($R^2 = 0.98$).

Versar re-analyzed the same data-sets using Microsoft EXCEL 97® linear regression function, considering Day 0 to Day 35 data, and calculated very similar half-life values: 5.2 days ($R^2 = 0.87$) for acephate and 8.0 days for methamidophos ($R^2 = 0.97$). See Appendix A. Versar also calculated a half-life value for the combined residues of acephate and methamidophos. The half-life for combined residues was estimated to be 5.4 days ($R^2 = 0.88$). "Predicted" residues were found to deviate significantly from actual DFR values measured. An alternative approach might be needed to provide a better description of the DFR dissipation data.

Data Variability

Versar examined data variability as part of the linear regression exercise and found that coefficients of variance for replicate samples ranged from 4.78 percent to 31.8 percent for acephate residues, from 0 percent to 15.1 percent for methamidophos residues, and 4.9 percent to 30.5 percent for the combined residues. There are no specific requirements concerning the variability of replicate samples in the Pesticide Assessment Guidelines.

Compliance Checklist

Compliance with OPPTS Series 875, Occupational and Residential Exposure Test Guidelines, Group B: Postapplication Exposure Monitoring Test Guidelines, 875.2100, Dislodgeable Foliar Residue Dissipation: Agricultural, [formerly, EPA Assessment Guidelines Subpart K, Reentry Exposure Series 132-1] is critical. The itemized checklist below describes compliance with the major technical aspects of OPPTS 875.2100, and is based on the "Checklist for Residue Dissipation Data" used for study review by the U.S. EPA/OPP/HED. Additional data gaps identified in the study (not covered by the checklist) are also presented below:

- *Typical end use product of the active ingredient used.* This criterion was met. The product label was provided with the study report.

- *Site(s) treated representative of reasonable worst-case climatic conditions expected in intended use areas.* This criterion was partially met. As noted on p. 12 of the study report, the site chosen was in the major tobacco growing region of the United States. Whether or not reasonable "worst-case" climatic conditions were captured is unknown.

- *End use product applied by application method recommended for the crop. Application rate given and should be at the least dilution and highest, label permitted, application rate.* These criteria were met.

- *Application(s) occurred at time of season that the end-use product is normally applied to achieve intended pest control.* The criterion was met. Acephate applications were performed in June, during the typical pest management season.

- *If multiple applications are made, the minimum allowable interval between applications should be used.* This criterion was met. Three applications were made 7 days apart. The label directs: "repeat on a 7-day spray schedule or as necessary."

- *Meteorological conditions including temperature, wind speed, daily rainfall, and humidity provided for the duration of the study.* The criterion was met. Information on average air temperature, average wind speed and direction, humidity, and daily rainfall was provided.

- *Reported residue dissipation data in conjunction with toxicity data must be sufficient to support the determination of a reentry interval.* This criterion was partially met. DFR samples were provided through Day 35. Toxicity data were not provided in the study report.

- *Residue storage stability, method efficiency (residue recovery), and limit of quantification provided.* These criteria were met.

- *Duplicate foliar and/or soil samples collected at each collection period.* This criterion was met. Samples were collected in triplicated at each collection interval. Blank detergent solution samples were also analyzed. No soil samples were collected.

- *Control and baseline foliar or soil samples collected.* These criteria were met. Control samples were collected from the control plot at the corresponding sampling intervals. In addition, baseline samples (preapplication samples) were collected for both the treated plot and the control plot.

- *Sufficient collection times to establish dissipation curve.* This criterion was met. Samples were collected just before and just after all three applications, and 1, 2, 3, 5, 7, 10, 14, 21, 28, and 35 days after the third application; all samples were analyzed.

- *Foliar residue data expressed as ug or mg/cm^2 leaf surface area.* This criterion was met. Results were expressed as µg/cm^2.

Pertinent data gaps and other issues critical to the scientific validity and regulatory acceptability (i.e., Subdivision K compliance) of the study, not already addressed, are presented below.

- OPPTS 875.2100 (an Update to Subdivision K) specifically requires that the DFR samples be typically collected from at least three geographically distinct locations for each crop. In this study, DFR samples were collected only from one location.

- It is unclear whether the registrants corrected raw DFR data for laboratory or field recovery losses before running their regression analysis.

- "Predicted" residues calculated based on first-order kinetics deviated significantly from the actual DFR data. An alternative approach might be needed to provide a better description of the residue dissipation data.

Table 1 - Application and Meteorological Data

	Application 1	Application 2	Application 3
Date	June 12, 1998	June 19, 1998	June 26, 1998
Application Rate (lb ai/A)	0.77	0.75	0.77
Spray Volume (gal/A)	10.4	10.2	10.5
Application Method	Tractor Mounted Sprayer - Directed Over the Canopy		
Crop Information			
Crop	Tobacco		
Variety	NC-71 Primed		
Growth Stage	11-12 leaf	Vegetative	Early Bloom
Height (inches)	18	18-22	28-30
% Canopy Cover	25-30	50	60-70
Row Width (inches)	45		
Plant Spacing (inches)	24		
Environmental Conditions			
Temperature (°F)	89	73	76
Relative Humidity (%)	52	75	76
Mean Wind Speed (mph)	2.1-4.2	0	2.5-3.2
General Wind Conditions	S-SW	--	SW
% Cloud Cover	60	95	0
Rainfall (inches)	0.88	0.98	0.01
Timing after Application (hours)	18.5 42	5-5.5	47-71

Table 2 - Fortified Field Recoveries

Analyte	N	Fortification Level µg/mL	Avg. Recovery %	Coefficient of Variation %
Acephate	9	2.0	96.1	7.3
	3	0.2	90.6	4.5
	12	0.1	97.0	11
	10	0.01	87.5	8.3
Methamidophos	15	0.1	98.1	14
	19	0.01	94.2	20

Appendix A

Versar Regression Analysis

Regression Analysis: Summary Output for Acephate in NC

Regression Statistics	
Multiple R	0.93161
R Square	0.867897
Adjusted R^2	0.863636
Standard Error	0.606942
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	75.02617	75.02617	203.66594	3.59477E-15
Residual	31	11.41974	0.368379		
Total	32	86.44591			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.158788	0.150824	-7.683072	1.15E-08	-1.466395054	-0.851181394
Slope	-0.134099	0.009396	-14.27116	3.595E-15	-0.15326304	-0.11493449

Half Life = 5.16893 Days

Predicted DFR Levels

Time (Days)	Residue (ug/cm2)
0	0.313866
1	0.274477
2	0.240031
3	0.209908
4	0.183566
5	0.160529
6	0.140383
7	0.122765
8	0.107359
9	0.093886
10	0.082103
11	0.0718
12	0.062789
13	0.054909
14	0.048018
15	0.041992
16	0.036722
17	0.032114
18	0.028084
19	0.024559
20	0.021477

Time (Days)	Residue (ug/cm2)
21	0.0187819
22	0.0164248
23	0.0143636
24	0.012561
25	0.0109846
26	0.0096061
27	0.0084006
28	0.0073463
29	0.0064244
30	0.0056182
31	0.0049131
32	0.0042965
33	0.0037573
34	0.0032858
35	0.0028734

Regression Analysis: Means and CVs for Acephate in NC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	1.43	1.36	0.0651	4.78
	1.36			
	1.3			
1	0.333	0.428	0.136	31.8
	0.584			
	0.367			
2	0.196	0.198	0.0251	12.7
	0.174			
	0.224			
3	0.134	0.153	0.0225	14.7
	0.148			
	0.178			
5	0.09	0.096	0.00557	5.8
	0.097			
	0.101			
7	0.083	0.0817	0.0101	12.3
	0.091			
	0.071			
10	0.055	0.0497	0.00611	12.3
	0.043			
	0.051			
14	0.042	0.0327	0.0101	30.8
	0.034			
	0.022			
21	0.017	0.0187	0.00473	25.3
	0.015			
	0.024			
28	0.008	0.00767	0.000577	7.53
	0.007			
	0.008			
35	0.004	0.00467	0.000577	12.4
	0.005			
	0.005			

Regression Analysis: Summary Output for Methamidophos NC

Regression Statistics	
Multiple R	0.985766
R Square	0.971736
Adjusted R^2	0.970824
Standard Error	0.171341
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	31.28906	31.28906	1065.7854	1.42175E-25
Residual	31	0.91009	0.029358		
Total	32	32.19916			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-3.459477	0.042578	-81.25069	1.081E-37	-3.546314955	-3.372638803
Slope	-0.086599	0.002653	-32.64637	1.422E-25	-0.092009475	-0.081189243

Half Life = 8.004068 Days

Predicted DFR Levels

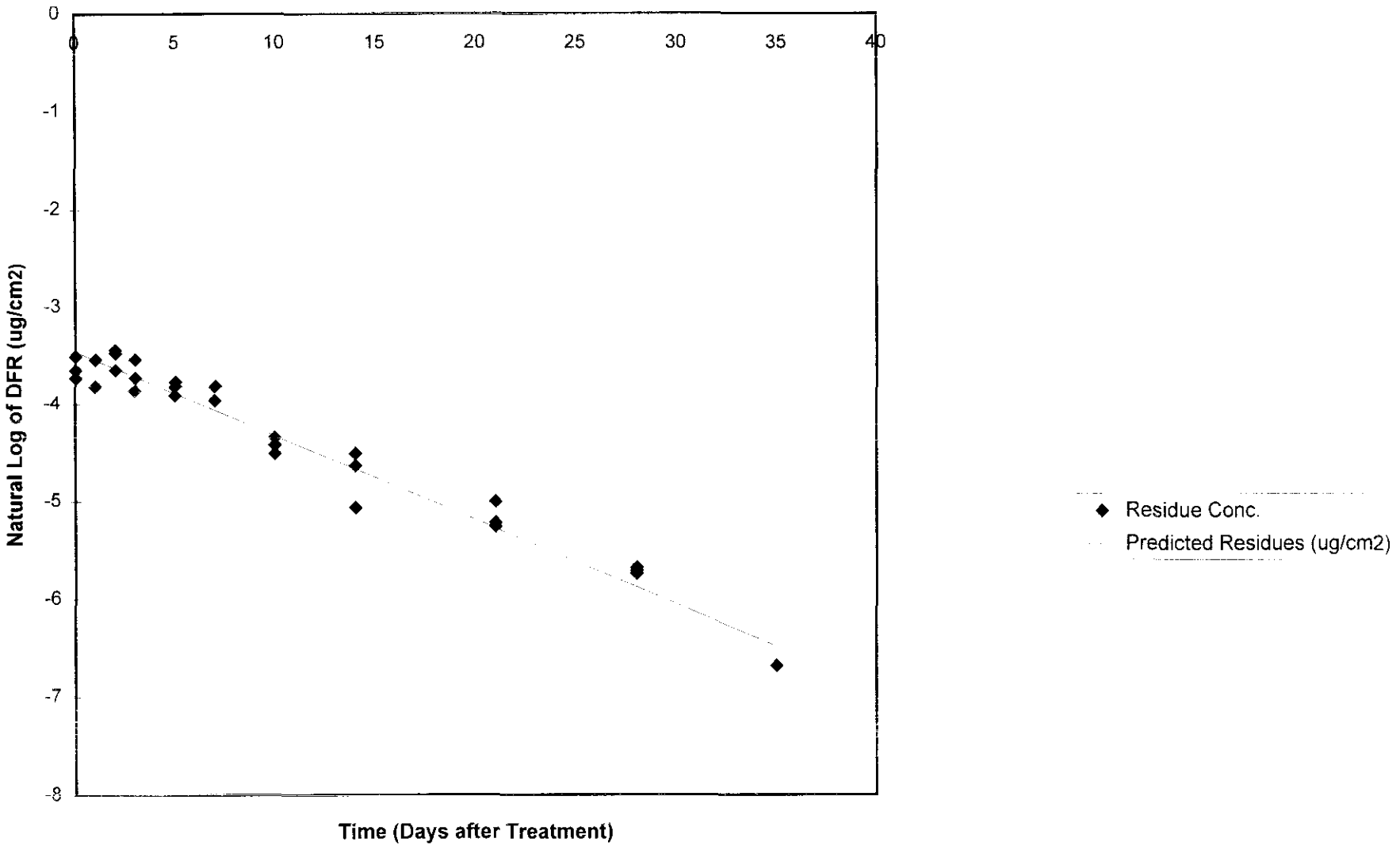
Time (Days)	Residue (ug/cm2)
0	0.031446
1	0.028838
2	0.026445
3	0.024252
4	0.02224
5	0.020395
6	0.018703
7	0.017151
8	0.015729
9	0.014424
10	0.013227
11	0.01213
12	0.011124
13	0.010201
14	0.009355
15	0.008579
16	0.007867
17	0.007214
18	0.006616
19	0.006067
20	0.005564

Time (Days)	Residue (ug/cm2)
21	0.0051023
22	0.004679
23	0.0042909
24	0.0039349
25	0.0036085
26	0.0033092
27	0.0030346
28	0.0027829
29	0.0025521
30	0.0023403
31	0.0021462
32	0.0019682
33	0.0018049
34	0.0016552
35	0.0015179

Regression Analysis: Means and CVs for Methamidophos NC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	0.03	0.0267	0.00306	11.4
	0.026			
	0.024			
1	0.022	0.0267	0.00404	15.1
	0.029			
	0.029			
2	0.032	0.0297	0.00321	10.8
	0.026			
	0.031			
3	0.021	0.0247	0.00404	16.4
	0.024			
	0.029			
5	0.02	0.0217	0.00153	7.04
	0.022			
	0.023			
7	0.019	0.02	0.00173	8.66
	0.022			
	0.019			
10	0.013	0.012	0.001	8.33
	0.011			
	0.012			
14	0.011	0.009	0.00243	27
	0.0097			
	0.0063			
21	0.0054	0.00577	0.000814	14.1
	0.0052			
	0.0067			
28	0.0033	0.0033	0.0001	3.03
	0.0032			
	0.0034			
35	0.00125	0.00125	2.06E-11	1.65E-06
	0.00125			
	0.00125			

Regression Analysis: Log of Methamidophos DFR on Tobacco vs. Time



Regression Analysis: Summary Output for Combined NC

Regression Statistics	
Multiple R	0.936182
R Square	0.876437
Adjusted R^2	0.872451
Standard Error	0.556776
Observations	33

ANOVA

	df	*SS*	*MS*	*F*	*Signif. F*
Regression	1	68.16375	68.16375	219.88369	1.27012E-15
Residual	31	9.609973	0.309999		
Total	32	77.77372			

	Coeff.	*Std. Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept	-1.037265	0.138357	-7.497	1.9E-08	-1.319446825	-0.7550832
Slope	-0.127819	0.00862	-14.82848	1.27E-15	-0.145399182	-0.11023865

Half Life = 5.422884 Days

Predicted DFR Levels

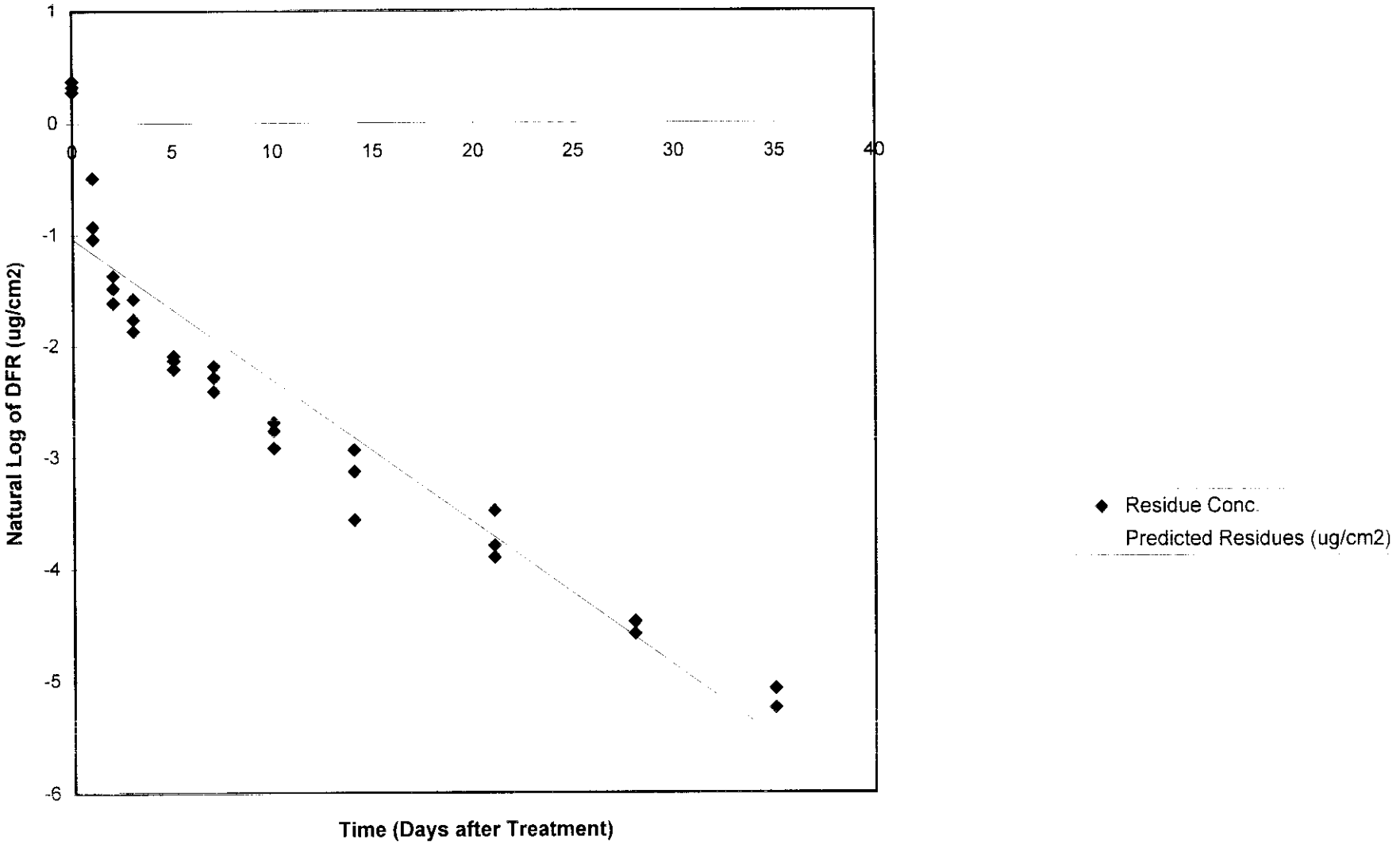
Time (Days)	Residue (ug/cm2)
0	0.354423
1	0.311896
2	0.274473
3	0.24154
4	0.212558
5	0.187054
6	0.16461
7	0.144859
8	0.127477
9	0.112182
10	0.098721
11	0.086876
12	0.076452
13	0.067279
14	0.059206
15	0.052102
16	0.045851
17	0.040349
18	0.035508
19	0.031247
20	0.027498

Time (Days)	Residue (ug/cm2)
21	0.0241986
22	0.021295
23	0.0187399
24	0.0164914
25	0.0145126
26	0.0127713
27	0.0112389
28	0.0098904
29	0.0087036
30	0.0076593
31	0.0067403
32	0.0059315
33	0.0052198
34	0.0045935
35	0.0040424

Regression Analysis: Means and CVs for Combined NC

Days after Last Treatment	Residues (ug/cm2)	Mean (ug/cm2)	Standard Deviation (ug/cm2)	Coefficient of Variation (%)
0	1.46	1.39	0.0681	4.9
	1.386			
	1.324			
1	0.355	0.455	0.139	30.5
	0.613			
	0.396			
2	0.228	0.228	0.0275	12.1
	0.2			
	0.255			
3	0.155	0.178	0.0265	14.9
	0.172			
	0.207			
5	0.11	0.118	0.00709	6.01
	0.119			
	0.124			
7	0.102	0.102	0.0115	11.3
	0.113			
	0.09			
10	0.068	0.0617	0.00709	11.5
	0.054			
	0.063			
14	0.053	0.0417	0.0125	29.9
	0.0437			
	0.0283			
21	0.0224	0.0244	0.00554	22.7
	0.0202			
	0.0307			
28	0.0113	0.011	0.000666	6.05
	0.0102			
	0.0114			
35	0.00525	0.00592	0.000577	9.75
	0.00625			
	0.00625			

Regression Analysis: Log of Combined DFR on Tobacco vs. Time



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R132635

Chemical: Acephate

PC Code:
103301

HED File Code: 19050 Versar DER Warning: May not have been QAed by EPA--CONTRACTOR DRAFT DOCUMENT

Memo Date: 4/26/1999

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