Data Evaluation Report on the terrestrial field dissipation of flumioxazin

PMRA Submission Number {.....} EPA MRID Number 45375502

Data Requirement: PMRA Data Code:
EPA DP Barcode: D284048
OECD Data Point:
EPA Guideline: 164-1

Test material: Flumioxazin

End Use Product Name: Valor Herbicide
Valor WDG Herbicide

Concentration of a.i.: 51% by weight

Formulation type: Water dispersible granular

Active ingredient:
Common name: Flumioxazin
Chemical name:
IUPAC: N-(7-Fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2H-1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide.
CAS name: 2-[7-Fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1H-isoindole-1,3(2H)-dione.
CAS No: 103361-09-7.
Synonyms: V-53482, S-53482.
SMILES string:

Primary Reviewer: Julia McTague
Dynamac Corporation

Signature: Julie McTague
Date: March 10, 2003

QC Reviewer: Joan Harlin
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Date: 7/21/03

Company Code: [for PMRA]
Active Code: [for PMRA]
Use Site Category: [for PMRA]
EPA PC Code: 129034

CITATION: Schreier, T. 2001. Terrestrial field soil dissipation of flumioxazin in established walnuts. Unpublished study performed by Valent U.S.A. Corp., Valent Technical Center, Dublin, CA and submitted by Valent U.S.A. Corp., Walnut Creek, CA. Laboratory Project Identification: 20335. Experiment initiation July 13, 1999, and completion September 20, 2000 (p. 23). Final report issued January 17, 2001.

EXECUTIVE SUMMARY:

Soil dissipation/accumulation of N-(7-fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2H-1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide (flumioxazin) under U.S. field conditions was conducted in a bare plot located within a mature walnut orchard at one site in Fresno, CA (ecoregion not reported). The experiment was carried out in accordance with the U.S. EPA Pesticide Assessment Guidelines Subdivision N, 164-1, and in compliance with the U.S. EPA FIFRA (40 CFR Part 160) GLP standard. Flumioxazin was broadcast twice (30-day interval) onto bare soil at a target application of 0.420 kg a.i./ha/application (total application rate of 0.84 kg a.i./ha) in a 7.6 x 97.5 m plot. The maximum proposed label rate was not reported. Rainfall was supplemented with irrigation to reach 554% of the 30-year average rainfall. The control plot was located approximately 15.2 m away from the treated plot.

The application rate was verified using ten solvent saturation pads that were placed in the treated plot prior to both test applications. The mean recovery from the field application monitors was 96% and 95% of the theoretical application for the first and second application, respectively. Field spiking was not performed.

Soil samples were taken at 0 and 29 days following the first application and at 0, 1, 3, 7, 10, 14, 28, 42, 60, 90, 120, 181, 239, and 365 days following the second application to a depth of 0-90 cm. Soil samples were extracted with acetone:0.1N hydrochloric acid (5:1, v:v), partitioned into dichloromethane, cleaned up using florisil column chromatography, and analyzed for flumioxazin by gas chromatography using a nitrogen-phosphorus detector. Soil samples were not analyzed for any degradates of flumioxazin. The LOQ was 0.01 ppm and the LOD was 0.005 ppm. Samples were stored frozen for up to 375 days prior to analysis.

The measured zero-time concentration of flumioxazin in the 0-7.5 cm soil depth following the first application was 0.426 mg a.i./kg, which is 95.7% of the applied rate (reviewer-calculated based on a theoretical concentration of 0.445 mg/kg in the 7.5-cm soil depth). Flumioxazin dissipated to 0.053 mg a.i./kg (0-7.5 cm soil depth) by 29 days after the first application (one day prior to the second application). Following the second application, flumioxazin dissipated from a mean maximum concentration of 0.484 mg a.i./kg at 1 day after the second application to 0.298 mg a.i./kg by 10 days and 0.083 mg a.i./kg by 14 days, and was last detected at 0.015 mg a.i./kg at 239 days after the second application in the 0-7.5 cm soil depth. Flumioxazin was detected in the 7.5-15 cm soil layer at a mean maximum concentration of 0.049 mg a.i./kg immediately following the first application and was last detected above the LOQ at 0.037 mg/kg at 10 days after the second application. Flumioxazin was only detected above the LOQ once in the 15-30 cm soil layer, and was not detected above the LOD below that depth. All concentration data were reported on a wet-weight basis. Soil samples were not analyzed for any transformation products of flumioxazin.

Under field conditions at the test site, flumioxazin had a reviewer-calculated half-life value of 12.5 days; a DT90 value was not calculated. Flumioxazin was last detected in the soil above the LOD at the 239-day posttreatment sampling interval and does not have the potential to carryover.

The major route of dissipation of flumioxazin under terrestrial field conditions could not be determined because no transformation products were reported, the parent compound did not leach below 15 cm (with one exception), and volatilization and run-off were not studied.

RESULTS SYNOPSIS

Location/soil type: Fresno, California/Hanford Fine Sandy Loam.
Half-life: 12.5 days (reviewer-calculated).
DT90: Not determined.
Major transformation products detected: Samples were not analyzed for degradates of flumioxazin.
Dissipation routes: The dissipation routes could not be determined.

Study Acceptability: This study is classified supplemental and does not satisfy the guideline requirement for a terrestrial field dissipation study because the soil samples were not analyzed for degradates of flumioxazin.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study was conducted according to U.S. EPA Pesticide Assessment Guidelines Subdivision N, 164-1 (p. 1). A deviation from EPA Subdivision N is:

> Patterns of formation and decline of the degradates of flumioxazin were not determined. This does not affect the validity of the study.

COMPLIANCE: This study was conducted according to U.S. EPA FIFRA (40 CFR Part 160) Good Laboratory Practice Standards (p. 3). Signed and dated GLP Compliance, No Data Confidentiality, Certificate of Authenticity, and Quality Assurance Statements were provided (pp. 2-3, 5-6).

A. MATERIALS:

1. Test Material Flumioxazin

Chemical Structure of the active ingredient: See back.

Description: Water dispersible granular formulation (p. 12).

Storage conditions of test chemicals: Not provided

Physico-chemical properties of flumioxazin.

Parameter	Values	Comments
Water solubility	Not provided	
Vapour pressure/volatility	Not provided	
UV adsorption	Not provided	
pKa	Not provided	
K_{ow}/log K_{ow}	Not provided	
Stability of Compound at room temperature	Not provided	

2. Test site: The test site was located in Fresno County, CA near Fresno, in an area representative of tree nut agriculture (p. 12, Appendix V, p. 90). The bare-ground plot was located in a mature walnut orchard and had not been treated with any pesticides for three years prior to study initiation (p. 13).

Table 1: Geographic location, site description, and climatic data at the study site.

Details		
Geographic coordinates	Latitude	Not provided
	Longitude	Not provided
	Province/State	California
	Country	U.S.
	Ecoregion	Not provided
Slope Gradient		Not provided
Depth to ground water (m)		30.5 (estimated)
Distance from weather station used for climatic measurements		Rainfall data were collected on-site and temperature and humidity data were collected from the Excel Madera Research Station (distance not provided).
Indicate whether the meterological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.		Precipitation and irrigation during the study (395 days) totaled 58.68 inches and the 30 year historical average annual precipitation over the same period is 10.60 inches.

Data were obtained from pp. 12-13 and Appendix V, pp. 93-96 of the study report.

Table 2: Site usage and management history for the previous three years.

Use	Year	
Crops grown	Previous year	Walnut
	2 years previous	Walnut
	3 years previous	Walnut
Pesticides used	Previous year	None
	2 years previous	None
	3 years previous	None
Fertilizers used	Previous year	Not provided
	2 years previous	Not provided
	3 years previous	Not provided
Cultivation methods, if provided (e.g., tillage)	Previous year	Not provided
	2 years previous	Not provided
	3 years previous	Not provided

Data were obtained from p. 13 and Appendix V, p. 91 of the study report.

3. Soils

Table 3: Properties of the soil.

Property	Depth (cm)		
	0-30	**30-60**	**60-90**
Textural classification*	Sandy loam		
% sand	59	59	55
% silt	34	36	38
% clay	7	5	7
pH (1:1 soil:water)	6.4	6.8	6.9
Total organic matter (%)	1.5	0.4	0.3
CEC (meq/100g)	6.1	5.5	5.6
Bulk density (units not provided)	1.26	1.41	1.38
Moisture at 1/3 atm (%)	14.7	12.8	13.9
Taxonomic classification (e.g., ferro-humic podzol)	Coarse-loamy, mixed, superactive, nonacid, thermic Typic Xerorthents.		
Soil mapping unit	Not provided (Hanford fine sandy loam soil series).		

Data were obtained from pp. 12-13 and Appendix VI, p. 142 of the study report. The taxonomic classification was obtained from the NRCS.

B. EXPERIMENTAL DESIGN:

1. Experimental design

Table 4: Experimental design.

Details		
Duration of study		395 days
Uncropped (bare) or cropped		Bare (within a mature walnut orchard).
Control used (Yes/No)		Yes
No. of replications	Controls	1
	Treatments	1, divided into five designated sampling intervals.
Plot size (L x W, m)	Control	7.6 x 21.3
	Treatment	7.6 x 97.5
Distance between control plot and treated plot		15.2 m
Distance between treated plots		Not applicable
Application rate(s) used (g a.i/ha)		420 g a.i./ha/application (0.375 lb a.i./A/application)
Was the maximum label rate per ha used in study? (Yes/No)		Not provided
Number of applications		2
Application Date(s) (dd mm yyyy)		13/07/1999 12/08/1999
For multiple applications, application rate at Day 0 and at each application time (mg a.i./kg soil)		0.445 mg a.i./kg soil for both applications (reviewer-calculated based on the application rate of 420 g a.i./ha/application, a soil depth of 7.5 cm, and a bulk density of 1.26 g/cm^3).
Application method (eg., spraying, broadcast etc.)		Broadcast spray
Type of spray equipment, if used		Tractor-mounted spray boom with 15 DG8003VS nozzles. The boom height was 18 inches over the orchard floor.
Total volume of spray solution applied/plot **OR** total amount broadcasted/plot		20727 mL and 21073 mL for the first and second applications, respectively.
Identification and volume of carrier (e.g., water), if used		Water
Name and concentration of co-solvents, adjuvants and/or surfactants, if used		None

Details			
Indicate whether the following monthly reports were submitted: Average minimum and maximum precipitation Average minimum and maximum air temperature Average minimum and maximum soil temperature Average annual frost-free periods		Yes - daily and monthly total Yes - monthly No No	
Were the Pan evaporation data submitted?		Not provided	
Meteorological conditions during application		**First application**	**Second application**
	Cloud cover	30%	0%
	Temperature (°C)	30°C	18.3°C
	Humidity	53%	72%
	Sunlight (hr)	Not provided	Not provided
Pesticides used during study: name of product/a.i concentration: amount applied: application method:		Round-up Ultra Ten applications at 1 lb a.i./A Broadcast	
Supplemental irrigation used (Yes/No) If yes, provide the following details: No. of irrigation: Interval between irrigation: Amount of water added each time: Method of irrigation:		Yes 101 1-39 days 0.14-1.15 inches Sprinkler	
Indicate whether water received through rainfall + irrigation equals to the 30 year average rainfall (Yes/No)		Yes	
Were the application concentrations verified? (Briefly describe in Section 2, if used)		Yes	
Were field spikes used? (Briefly describe in Section 3, if used)		No	
Good agricultural practices followed (Yes or No)		Yes	
Indicate if any abnormal climatic events occurred during the study (eg., drought, heavy rainfall, flooding, storm, etc.)		None	

Details	
If cropped plots are used, provide the following details: Plant - Common name/variety: Details of planting: Crop maintenance (eg., fertilizers used):	 Walnut/Frankette Planted around 1950 with a row spacing of 40 feet and a tree spacing of 40 feet. Tree height was estimated to be 40 feet and the canopy cover was estimated to be 70% at the time of application. None
Volatilization included in the study (Yes/No) (if included, describe in Section 4)	No
Leaching included in the study (Yes/No) (if included, describe in Section 5)	Yes
Run off included in the study (Yes/No) (if included, describe in Section 6)	No

Data were obtained from pp. 12-13 and Appendix V, pp. 90, 92-95, 99-100, 102-104, and 105-107 of the study report.

2. Application Verification: The application rate was verified using two solvent saturation pads (20 x 20 cm) that were placed in each of the five sections of the treated plot prior to both test applications (p. 15 and Appendix V, p. 134). The pads were placed approximately 1 m apart on aluminium foil and held in position by one or more nails (Appendix I, p. 50). Following application, the pads were collected, placed in a glass jar, and stored frozen until analysis. The solvent saturation pads were extracted by shaking for 10 minutes with 100 mL of acetone, diluted with additional acetone, and analyzed by gas chromotography using a nitrogen-phosphorus detector (p. 18, Appendix III, pp. 67-68).

3. Field Spiking: Field spiking was not performed.

4. Volatilization: Volatilization was not measured.

5. Leaching: Soil cores were collected to a depth of 90 cm at 0 and 29 days following the first application and at 0, 1, 3, 7, 10, 14, 28, 42, 60, 90, 120, 181, 239, and 365 following the second application (pp. 15-16, Table II, pp. 27-28). The test plot received 0.3-0.7 inches of irrigation three days after each of the two test applications (p. 14).

6. Run off: Run off was not measured.

7. Supplementary Studies: A freezer storage stability study was previously conducted for flumioxazin in Iowa and Mississippi soil (p. 17). Freezer stored soil samples were fortified with flumioxazin (concentration not reported) and analyzed at 0, 30, 60, 120, 280, and 405 days (± 2 days) after fortification.

8. Sampling:

Table 5: Soil sampling.

Details	
Method of sampling (random or systematic)	Random
Sampling intervals	0 and 29 days following the first application and at 0, 1, 3, 7, 10, 14, 28, 42, 60, 90, 120, 181, 239, and 365 days following the second application.
Method of soil collection (e.g., cores)	Cores
Sampling depth	90 cm
Number of cores collected per plot	15
Number of segments per core	Six
Length of soil segments	7.5 cm (0-7.5 and 7.5-15 cm soil layers), 15 cm (15-30, 30-45, and 45-60 cm soil layers) or 30 cm (60-90 cm soil layer).
Core diameter (Provide details if more than one width)	6.0 cm (2.375 inches) for the 0-15 cm depth samples and 4.45 cm (1.75 inches) for the 15-90 cm depth samples.
Method of sample processing, if any	Soil samples were composited by depth into three samples (each sample containing one core from each subplot).
Storage conditions	Frozen
Storage length (days)	34-375

Data were obtained from pp. 15-17, Table II, pp. 27-28, and Appendix V, pp. 109 and 118 of the study report.

9. Analytical Procedures: The analytical method used for determining flumioxazin in soil was method RM-30D-2 (p. 18). A subsample (20 g) was extracted by shaking for 10 minutes with 50 mL of acetone:0.1N hydrochloric acid (5:1, v:v), soaked overnight at room temperature, and filtered through Whatman #1 filter paper (Appendix II, pp. 57-58). Following extraction, the residues were partitioned into dichloromethane, filtered through sodium sulfate, and the partition repeated. The dichloromethane extracts were combined and concentrated to dryness. The sample residue was reconstituted in ethyl acetate, diluted with hexane, and transferred to the top of a glass chromatographic column that had been rinsed with hexane:ethyl acetate (2:1, v:v). Flumioxazin was eluted from the column with hexane:ethyl acetate (2:1, v:v), and the eluate was evaporated to dryness, reconstituted in acetone, and analyzed by gas chromatography using a nitrogen-phosphorus flame ionization detector. The LOQ was 0.01 ppm and the LOD was 0.005 ppm (p. 18).

II. RESULTS AND DISCUSSION

A. APPLICATION MONITORS: The mean surface concentrations from the field application monitors were 4.02 $\mu g/cm^2$ and 4.00 $\mu g/cm^2$ for the first and second application, respectively, which is 96% and 95% of the theoretical application rate, respectively (p. 21, Appendix VII, pp. 147-148).

B. RECOVERY FROM FIELD SPIKES: Field spikes were not prepared.

C. MASS ACCOUNTING: A mass accounting was not included with the study report.

Table 6. Concentration of flumioxazin residues expressed as ppm in the treated plot.[1]

Compound	Soil depth (cm)	Sampling times (days)															
		First application		Second application													
		0[2]	29[2]	0	1	3	7	10	14	28	42	60	90	120	181	239	365
Flumioxazin	0-7.5	0.426	0.053	0.469	0.484	0.450	0.322	0.298	0.083	0.060	0.057	0.017	0.030	0.006	0.006	0.015	<0.005
	7.5-15	0.049	<0.005	0.025	0.040	0.025	0.029	0.037	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	15-30	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
	30-45	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	NA	<0.005	<0.005	<0.005	NA	NA	<0.005	NA	NA	<0.005
	45-60	NA	<0.005	NA	NA	NA	NA	NA	<0.005	NA	<0.005	NA	NA	<0.005	NA	NA	<0.005
	60-90	NA	<0.005	NA	NA	NA	NA	NA	<0.005	NA	<0.005	NA	NA	<0.005	NA	NA	<0.005

Data were obtained from p. 20 and Table I, pp. 24-26 in the study report. Total extractable and non-extractable residues and total recovery were not determined. NA - Not analyzed. All data are registrant-calculated means of three replicates except where noted. Non-detected values were averaged using one-half the detection limit (e.g., ½ of 0.005 ppm = 0.0025 ppm).

[1] Concentrations have not been corrected for soil moisture content or method recovery.

[2] Data are reviewer-calculated average values of the three replicate samples. Non-detected values were averaged using one-half the detection limit (e.g., ½ of 0.005 ppm = 0.0025 ppm).

4. PARENT COMPOUND: In the treated plot, the mean zero-time concentration in the 0-7.5 cm soil depth following the first application was 0.426 mg a.i./kg (reviewer-calculated average of three replicates), which is 95.7% of the applied rate (reviewer-calculated based on a theoretical concentration of 0.445 mg/kg in the 7.5-cm soil depth; Table I, pp. 24-26). Flumioxazin dissipated to 0.053 mg a.i./kg (0-7.5 cm soil depth) by 29 days after the first application (one day prior to the second application). Following the second application, flumioxazin dissipated from a mean maximum concentration of 0.484 mg a.i./kg at 1 day after the second application to 0.298 mg a.i./kg by 10 days and 0.083 mg a.i./kg by 14 days, and was last detected at 0.015 mg a.i./kg at 239 days after the second application in the 0-7.5 cm soil depth. Flumioxazin was detected in the 7.5-15 cm soil layer at a mean maximum concentration of 0.049 mg a.i./kg immediately following the first application and was last detected above the LOQ at 0.037 mg/kg at 10 days after the second application. Flumioxazin was only detected above the LOQ once in the 15-30 cm soil layer, at 0.019 mg a.i./kg (single replicate) at 10 days after the second application, and was not detected above the LOD below that depth. All concentration data were reported on a wet-weight basis.

The reviewer-calculated half-life for flumioxazin in soil under terrestrial field conditions was 12.5 days (r^2=0.884; 0-60 day data) using first order kinetics and based on concentration data for the 0-7.5 cm soil layer. The registrant did not report a DT90 value.

The dissipation pattern was biphasic, with greater than 90% dissipation of the test material by 60 days posttreatment of the second application and complete dissipation occurring by 365 days.

5. TRANSFORMATION PRODUCTS: The soil was not analyzed for the transformation products of flumioxazin.

6. EXTRACTABLE AND NON-EXTRACTABLE RESIDUES: Extractable and non-extractable residues were not measured.

Table 7: Dissipation routes of flumioxazin under field conditions.

Route of dissipation	% of applied amount (at the end of the study period)
Accumulation (residues) in soil/ carry over	0%
Transformation (% of transformation products)	Samples were not analyzed for degradates of flumioxazin.
Leaching, if measured	Did not leach beyond 30 cm
Volatilization, if measured	Not measured
Plant uptake, if measured	Not measured
Run off, if measured	Not measured
Total	0

Data were obtained from p. 20 and Table I, pp. 24-26 in the study report.

7. VOLATILIZATION: Volatilization was not measured.

8. PLANT UPTAKE: Plant uptake was not measured.

9. LEACHING: Flumioxazin was only detected above the LOQ (0.01 ppm) in one replicate sample below the 7.5-15 cm soil layer and was not detected above the LOD below the 15-30 cm soil layer (Table I pp. 24-26).

10. RUN OFF: Run off was not measured.

11. RESIDUE CARRYOVER: The DT90 value was not calculated. Flumioxazin was not detected after day 239 following the second application and has no potential for carryover into the following season.

12. SUPPLEMENTARY STUDY RESULTS: The freezer storage stability study indicates that flumioxazin is stable for up to 405 days of storage (p. 17). The samples analyzed after 405 days of freezer storage had recoveries of 87% and 100%, and there was no apparent pattern of decline over time.

III. STUDY DEFICIENCIES:

1. The study did not adequately address the dissipation of flumioxazin because samples were not analyzed for degradates of flumioxazin, the parent compound did not leach below 30 cm, and volatilization and run-off were not studied. The reviewer notes that one of the primary purposes of the terrestrial field dissipation study is to determine the patterns of formation and decline of the degradates of the test compound. The reviewer was unable to determine if any major degradates were observed during laboratory aerobic or anaerobic soil metabolism studies of the parent.

2. Concentration data were reported on a wet-weight basis (p. 20). The reviewer notes that because the moisture in the soil was not constant over time, the resulting concentration data may not be adequately compared over time, as a dilution or concentration effect may occur. Furthermore, since the soil moisture was not constant over time, the data cannot be accurately compared with data from other terrestrial field dissipation studies. All concentration data should be corrected for soil moisture for adequate comparison of concentration data over time and for use in the determination of the half-life. Average soil moisture data were reported for each sampling interval on page 16 of the study report. The soil moisture in the 0-7.5 cm soil depth ranged from as low as 7.4% to as high as 15.4%. Additionally, between 10 and 14 days after the second application, the sampling intervals nearest to the observed half-life, the soil moisture increased from 8.5% to 14.7%.

IV. REVIEWER'S COMMENTS:

1. The registrant-calculated half-life of flumioxazin was 12.5 days ($r^2 = 0.884$; 0-60 day data) and was calculated in the same manner as the reviewer-calculated half-life (p. 21 and Figure 2, p. 31). The observed half-life occurred between 10 and 14 days posttreatment of the second application.

2. A storage stability study was not conducted using either spiked field or spiked laboratory samples collected from the study site. However, the study author stated that the laboratory storage stability of flumioxazin on soil has been previously determined and reported in terrestrial field dissipation studies conducted in Iowa and Mississippi (p. 17). Results from those studies indicated that no significant degradation occurred during the 405-day storage interval.

3. The maximum proposed label rate was not reported, as required by Subdivision N Guidelines.

4. Neither pan evaporation nor evapotranspiration data were provided.

5. The physico-chemical properties of flumioxizan were not reported.

6. Control soil samples that were fortified with flumioxazin at 0.01, 0.025 and 0.05 ppm were analyzed with each set of samples to verify method performance (p. 19). The mean recovery for flumioxazin was 105.9 ± 11.5%, and 111.0 ± 8.5% for the 0.01 ppm and 0.05 ppm fortifications, respectively (Table III, p. 29).

7. The orchard floor was rototilled at 19 and 5 days prior to the first application and allowed to settle to insure bare-ground conditions at the time of the first application (p. 13 and Appendix V, p. 133). At 88 days after the second application (normal harvest), the walnut trees were shaken to remove the nuts and the nuts were raked from the plot and destroyed (p. 15). The field notes included in the study report state that care was taken when raking the treated plot to avoid disturbing or digging into the soil while raking (Appendix V, p. 137).

8. The study author stated that data from this study supplement data from previously submitted studies conducted in Illinois, Mississippi, Indiana, North Carolina, and Iowa (p. 11).

V. REFERENCES:

1. U.S. Environmental Protection Agency. 1982. Pesticide Assessment Guidelines, Subdivision N, Chemistry: Environmental Fate, Section 164-1, Terrestrial Field Dissipation Studies. Office of Pesticide and Toxic Substances, Washington, DC. EPA 540/9-82-021.

2. U.S. Environmental Protection Agency. 1993. Pesticide Registration Rejection Rate Analysis - Environmental Fate. Office of the Prevention, Pesticides, and Toxic Substances, Washington, DC. EPA 738-R-93-010.

3. U.S. Environmental Protection Agency. 1989. FIFRA Accelerated Reregistration, Phase 3 Technical Guidance. Office of the Prevention, Pesticides, and Toxic Substances, Washington, DC. EPA 540/09-90-078.

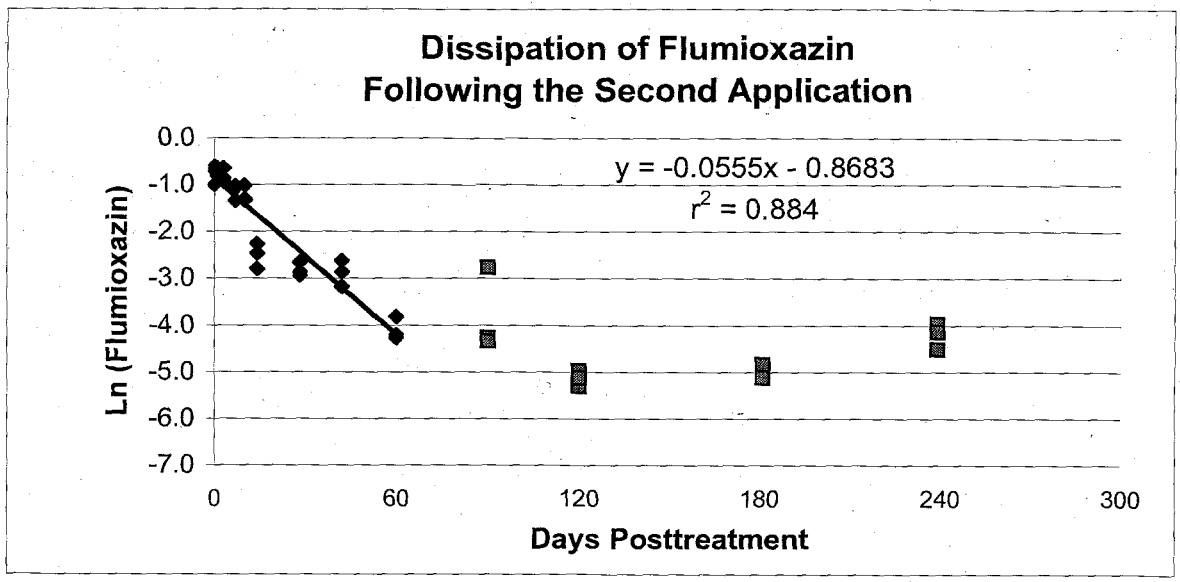
Attachment 1

Excel Spreadsheets

Chemical Name	Flumioxazin
PC Code	129034
MRID	45375502
Guideline No.	164-1

Half-life (days) = **12.5** *Half-life calculated using 0-60 day data.

Days Posttreatment	Flumioxazin (ppm)	Ln (flumioxazin)
0	0.368	-0.9997
0	0.542	-0.6125
0	0.498	-0.6972
1	0.448	-0.8030
1	0.524	-0.6463
1	0.481	-0.7319
3	0.400	-0.9163
3	0.424	-0.8580
3	0.525	-0.6444
7	0.358	-1.0272
7	0.263	-1.3356
7	0.344	-1.0671
10	0.362	-1.0161
10	0.270	-1.3093
10	0.263	-1.3356
14	0.085	-2.4651
14	0.104	-2.2634
14	0.061	-2.7969
28	0.053	-2.9375
28	0.057	-2.8647
28	0.070	-2.6593
42	0.073	-2.6173
42	0.042	-3.1701
42	0.057	-2.8647
60	0.014	-4.2687
60	0.022	-3.8167
60	0.015	-4.1997
90	0.063	-2.7646
90	0.014	-4.2687
90	0.013	-4.3428
120	0.005	-5.2983
120	0.007	-4.9618
120	0.006	-5.1160
181	0.008	-4.8283
181	0.006	-5.1160
239	0.019	-3.9633
239	0.011	-4.5099
239	0.016	-4.1352


Dissipation of Flumioxazin
Following the Second Application
y = -0.0555x - 0.8683
r2 = 0.884
Ln (Flumioxazin)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
0
60
120
180
240
300
Days Posttreatment

Attachment 2

Structures of Parent and Transformation Products

Flumioxazin

IUPAC name: N-(7-fluoro-3,4-dihydro-3-oxo-4-prop-2-ynyl-2*H*-1,4-benzoxazin-6-yl)cyclohex-1-ene-1,2-dicarboxamide

CAS name: 2-[7-Fluoro-3,4-dihydro-3-oxo-4-(2-propynyl)-2*H*-1,4-benzoxazin-6-yl]-4,5,6,7-tetrahydro-1*H*-isoindole-1,3(2H)-dione

CAS #: 103361-09-7