Data Evaluation Record on the terrestrial field dissipation of oryzalin

PMRA Submission Number {.....} EPA MRID Number 42138001

Data Requirement: PMRA Data Code:
EPA DP Barcode: 378627
OECD Data Point:
EPA Guideline: 835.6100

Test material: Oryzalin.

End Use Product name: Surlfan AS **Concentration of a.i.:** 39.9%
Formulation type: Aqueous suspension

Test material:
Common name: Oryzalin.
Chemical name:
IUPAC name: 3,5-Dinitro-4-(dipropylamino)benzenesulfonamide.
3,5-Dinitro-N^4,N^4-dipropylsulfanilamide.
CAS name: 4-(Dipropylamino)-3,5-dinitrobenzenesulfonamide.
CAS No: 19044-88-3.
Synonyms: OR-1; EL-119.
SMILES string: C1C(S(=O)(=O)N)=CC(N(O)O)=C(N(CCC)CCC)C=1N(O)O (EpiSuite version 4.0).

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Company Code:
Active Code:
Use Site Category:
EPA PC Code: 104201

CITATION: Decker, O.D. 1991. Oryzalin terrestrial field dissipation study. Unpublished study performed and submitted by North American Environmental Chemistry Laboratory, DowElanco, Greenfield, Indiana, and sponsored by DowElanco, Indianapolis, Indiana. Lab Study No. AAC8914. Experiment initiated June 28, 1989 and completed July 11, 1991 (p. 3). Final report issued November 25, 1991.

EXECUTIVE SUMMARY

Soil dissipation/accumulation of oryzalin (3,5-dinitro-4-(dipropylamino)benzenesulfonamide; Surflan AS) under US field conditions was studied using bare plots of silty clay loam soil near Conklin, Michigan (Site 1), loam soil near Fresno, California (Site 2), and sand soil near Live Oak, Florida (Site 3). The experiment was carried out in accordance with the USEPA Pesticide Assessment Guideline 835.6100, and in compliance with the USEPA FIFRA (40 CFR, Part 160) GLP standard. Oryzalin was broadcast once at a target rate of 7.5 kg a.i./ha (6.6 lb a.i./A) at Site 2 and 8.1 kg a.i./ha (7.2 lb a.i./A) at Sites 1 and 3 onto three subplots measuring *ca*. 12.2 x 15.2 m at Site 2, and 12.2 x 12.2 m at Sites 1 and 3. Oryzalin was applied at a rate that was 1.1 to 1.2 times the maximum use rate (not reported). Rainfall was supplemented with irrigation at each test site to reach 115%, 267%, and 117% of the historical average precipitation for Sites 1, 2, and 3, respectively. A control plot was established at each test site.

The application rate was not verified. Field spikes were not prepared. A storage stability and laboratory shipping study was conducted whereby control soil samples were fortified with oryzalin at concentrations of 0.0, 0.1, and 0.5 ppm and stored at 4°C until analysis at 0, 29, and 97 days. Although the soil samples from the primary study were stored for up to 121 days, the study author reported that the difference should not be a concern for sample integrity due to the stability pattern of oryzalin. Oryzalin appeared to be stable in soil from each test site that was stored at 4°C for up to 97 days. Recoveries ranged from 82 to 135%, with no pattern of decline.

Soil samples were collected from each test site immediately prior to application and at *ca*. 0, 7, 14, 30, 60, 120, 187/248/328, 364, and 450 days following application, with an additional sample collected at 713 days at Site 1. Soil samples were collected to a depth of 90 cm to determine the mobility of the test substance in the soil profile (excluding day 0 samples which were only collected to a depth of 15 cm). Oryzalin was extracted from soil samples by shaking with methanol, the samples were purified, and an aliquot was analyzed by HPLC with UV detection. Transformation products were not determined. The LOD was 0.01 ppm and the LOQ was 0.03 ppm, equivalent to 0.02 and 0.06 lb/A, respectively. Samples from each test site were stored frozen for up to 97-121 days before analysis.

At **Site 1 (Michigan, silty clay loam)**, the mean concentration of oryzalin in the 0-15 cm soil depth was 3.70 ppm at day 0, which is 83% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 4.45 mg a.i./kg in the 0-15 cm soil depth). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.87 ppm at day 14, which is 87% of the theoretical, decreasing to 0.08 ppm at day 713 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.06 ppm at day 120 and was only detected below 30 cm soil depth in the day 14 samples at a maximum of 0.30 ppm at the 60-76 cm soil depth.

At **Site 2 (California, loam)**, the mean concentration of oryzalin in the 0-15 cm soil depth was 2.93 ppm at day 0, which is 79% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 3.71 mg a.i./kg in the 0-15 cm soil depth). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.21 ppm at day 14, which is 86% of the theoretical, decreasing to 0.21 ppm at

day 477 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.03 ppm at day 477 and was not detected below 30 cm soil depth.

At **Site 3 (Florida, sand)**, the concentration of oryzalin in the 0-15 cm soil depth was 2.35 ppm at day 0, which is 66% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 3.54 mg a.i./kg in the 0-15 cm soil depth). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.48 ppm at day 13, which is 98% of the theoretical, decreasing to 0.02 ppm at day 467 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.02 ppm at day 363, and was not detected below 30 cm soil depth.

Under field conditions at **Site 1 (Michigan, silty clay loam)**, oryzalin had a reviewer-calculated half-life value of 130.8 days (r^2 = 0.8835) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (14-713 days). The reviewer calculated a half-life of 126.0 days (r^2 = 0.9097) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 56 and 120 days; the DT90 was between 442-713 days. The soil half-life of oryzalin for the total soil depths (0-90 cm) was 130.8 days (r^2 = 0.8845), calculated using linear regression; the non-linear total soil half-life was 126.0 days (r^2 = 0.9098). The total carryover of oryzalin was 2% of the applied at the end of the study period.

Under field conditions at **Site 2 (California, loam)**, oryzalin had a reviewer-calculated half-life value of 119.5 days (r^2 = 0.7989) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (14-477 days). The reviewer calculated a half-life of 115.5 days (r^2 = 0.9155) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 66 and 129 days; the DT90 was between 248-477 days. Oryzalin was detected only sporadically at mean concentrations <0.05 ppm at the 15-30 cm depth and was not detected below the 30 cm soil depth; therefore, a total soil half-life was not determined. The total carryover of oryzalin was 6% of the applied at the end of the study period.

Under field conditions at **Site 3 (Florida, sand)**, oryzalin had a reviewer-calculated half-life value of 66.6 days (r^2 = 0.7960) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (13-467 days). The reviewer calculated a half-life of 128.4 days (r^2 = 0.7920) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 124 and 187 days; the DT90 was between 187-363 days. Oryzalin was detected only once at a mean concentration of <0.02 ppm at the 15-30 cm depth and was not detected below the 30 cm soil depth; therefore, a total soil half-life was not determined. The total carryover of oryzalin was 1% of the applied at the end of the study period.

The major route of dissipation of oryzalin under terrestrial field conditions at the three test sites could not be determined because transformation products were not determined. Residues of oryzalin reached a maximum depth of 76 cm at the Site 1, but did not leach below the top 0-30 cm

at Sites 2 and 3, and volatilization and runoff were not studied. Oryzalin was present at the end of the study period at all three sites, indicating the potential for carryover.

RESULTS SYNOPSIS

Site 1
Location/soil type: Conklin, Michigan/silty clay loam (0-30 cm) over sandy loam (30-90 cm)
Half-life: 130.8 days (r^2 = 0.8835, linear, first-order; reviewer-calculated)
126.0 days (r^2 = 0.9097, nonlinear, one-compartment/two-parameter; reviewer-calculated)
DT50: 56-120 days
DT90: 442-713 days
Transformation products detected: Not determined
Dissipation routes: Could not be determined

Site 2
Location/soil type: Fresno, California/loam (0-30 cm) over sandy loam (30-122 cm)
Half-life: 119.5 days (r^2 = 0.7989, linear, first-order; reviewer-calculated)
115.5 days (r^2 = 0.9155, nonlinear, one-compartment/two-parameter; reviewer-calculated)
DT50: 66-129 days
DT90: 248-477 days
Transformation products detected: Not determined
Dissipation routes: Could not be determined

Site 3
Location/soil type: Live Oak, Florida/sand (0-122 cm)
Half-life: 66.6 days (r^2 = 0.7960, linear, first-order; reviewer-calculated)
100.5 days (r^2 = 0.7985, nonlinear, one-compartment/two-parameter; reviewer-calculated)
DT50: 124-187 days
DT90: 187-363 days
Transformation products detected: Not determined
Dissipation routes: Could not be determined

Study Acceptability: This study is classified **not acceptable**. The method of extraction may not have been sufficient based on the results observed in aerobic soil studies of oryzalin using the same extraction method, where relatively high levels of bound residues occurred as early as two weeks posttreatment. The transformation products of oryzalin were not determined; the soils were not adequately characterized; meteorological data were incomplete; an independent laboratory method validation was not conducted; application rates were not verified; and field spikes were not used.

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study was conducted according to USEPA Pesticide Assessment Guideline 835.6100 (164-1; p. 1). The following significant deviations from the objectives of USEPA guidelines were noted:

The transformation products of oryzalin were not determined, and the major routes of pesticide dissipation were not documented.

The method of extraction may not have been sufficient. Based on the results observed in aerobic soil studies of oryzalin using the same extraction method, relatively high levels of bound residues occurred as early as two weeks posttreatment.

The soils were not adequately characterized.

Meteorological data were incomplete.

An independent laboratory method validation was not conducted.

The application rates were not verified.

Field spikes were not used.

COMPLIANCE: The study was conducted in compliance with USEPA FIFRA (40 CFR, Part 160) Good Laboratory Practice standards (p. 3). Signed and dated Data Confidentiality, GLP Compliance, and Quality Assurance statements were provided (pp. 2-4). A Certificate of Authenticity was not reported; however a signature page was provided (p. 5).

A. MATERIALS:

1. Test Material Oryzalin (Surlan AS formulation; 39.9% a.i.; p. 10).

Chemical Structure of the active ingredient(s): See DER Attachment 1.

Description: Lot No. B8H04044 (Table V, p. 26; p. 10).

Storage conditions of test chemicals: Not reported.

Table 1: Physico-chemical properties of the active ingredient(s):

Paramater	**Value**	**Comment**
Chemical formula	NR	
Molecular mass	NR	
Water Solubility	NR	
Solvent Solubility:	NR	
Vapor Pressure/Volatility	NR	
UV Absorption	NR	
pKa	NR	
Log K_{ow}	NR	
Stability of compound at room temperature, if provided	NR	

NR - Not reported.

2. Test site: The three test sites were located in Conklin, Michigan, Fresno, California, and Live Oak, Florida (pp. 10-11; Table I-II, pp. 20-21). Test sites were pre-qualified by analyzing composited soil samples (to 48-inch depth) to ensure no residual compounds would interfere with the analytical method, and to ensure that the soil characteristics were typical for area of use (Appendix A, pp. 64-65). The sites were prepared by removing all existing vegetation and smoothing to yield a flat site and maintained typical per use on tree and vine crops. The Michigan test site, designated as Site 1, had silty clay loam soil (0-30 cm) over sandy loam (30-91 cm); the California test site, designated as Site 2, had loam soil (0-30 cm) over sandy loam (30-122 cm); and, the Florida site, designated as Site 3, had sand soil (0-122 cm; Tables IIIA-IIIC, pp. 22-24). Plot histories are reported in Table 3 below.

Table 2: Geographic location, site description, and climatic data at the study site.

Details		Test site		
		Site 1 (Silty clay loam)	**Site 2 (Loam)**	**Site 3 (Sand)**
Geographic coordinates	Latitude	Not reported	Not reported	Not reported
	Longitude	Not reported	Not reported	Not reported
	Province/State	Michigan	California	Florida
	Country	USA	USA	USA
	Ecoregion	Not reported	Not reported	Not reported
Slope Gradient		0%[1]	0%[1]	0%[1]
Depth to ground water (m)		30.5 m (100 ft.)	27 m (90 ft.)	3 m (10 ft) plus
Distance from weather station used for climatic measurements		Not reported[2]	Not reported[2]	Not reported[2]
Indicate whether the meteorological conditions before starting or during the study were within 30 year normal levels (Yes/No). If no, provide details.[3]		Total water input (precipitation plus irrigation) during the study period (measured June 1989 to June 1991) was 83.5 inches or 115% of the historical average.	Total water input (precipitation plus irrigation) during the study period (measured July 1989 to November 1990) was 33.4 inches or 267% of the historical average.	Total water input (precipitation plus irrigation) during the study period (measured September 1989 to December 1990) was 72.1 inches or 117% of the historical average.

Data were obtained from p. 11, Table I, p. 20; Appendix D, pp. 116-124 of the study report.
1 The grade at the test site was reported as 'flat' by the study author, which was assumed to be a 0% slope gradient.
2 In most cases, weather data were obtained from the Climatological Data Publications issued by the National Climatic Data Center in Ashville, North Carolina and from the nearest weather stations (not specified). Average historical precipitation data were not reported.
3 The actual monthly precipitation + irrigation and the percent of precipitation compared to the normal historical monthly precipitation was determined by the reviewer based on data from Appendix D, pp. 116-124 of the study report.

Table 3: Site usage and management history for the previous three years.

Use	**Year**	**Site 1 (Silty clay loam)**	**Site 2 (Loam)**	**Site 3 (Sand)**
Crops grown	Previous year	Fallow	Fallow	Fallow
	2 years previous	Fallow	Fallow	Fallow
	3 years previous	Fallow	Fallow	Fallow
Pesticides used	Previous year	None	None	None
	2 years previous	None	None	None
	3 years previous	None	None	None
Fertilizers used	Previous year	Not reported	Not reported	Not reported
	2 years previous	Not reported	Not reported	Not reported
	3 years previous	Not reported	Not reported	Not reported
Cultivation methods, if provided (eg., Tillage)	Previous year	Not reported	Not reported	Not reported
	2 years previous	Not reported	Not reported	Not reported
	3 years previous	Not reported	Not reported	Not reported

Data were obtained from Table II, p. 21 of the study report.

3. Soils: A total of eight soil samples were collected from selected areas around each test site to a depth of 122 cm, sectioned into *ca*. 30-cm increments, and composited for soil characterization (p. 11; Appendix A, p. 64).

Table 4a: Properties of the soil from Site 1 (Michigan, silty clay loam).

Property	Depth (cm)			
	0-30	**30-60**	**60-91**	**91-122**
Textural classification[1]	Silty clay loam	Sandy loam	Sandy loam	Loamy sand
% sand	12	56	76	84
% silt	51	32	14	8
% clay	37	12	10	8
pH (1:1 soil:water)	7.0	6.5	6.3	6.2
Organic matter (%)	3.4	3.3	0.6	0.4
Organic carbon (%)	2.0	1.9	0.4	0.2
CEC (meq/100 g)	12.4	7.1	2.7	3.5
Bulk density (g/cm^3)	1.22	1.20	1.53	1.48
Moisture at 1/3 atm (%)	28.50	16.91	7.72	5.92
Taxonomic classification (e.g., ferro-humic podzol)	Not provided			
Soil mapping unit	Not provided			

Data were obtained from Table IIIA, p. 22 of the study report. The soil series name was not reported. Organic carbon was calculated by the study author as %OC = OM by combustion x 0.58.
1 Textural classifications were confirmed by the reviewer using the NRCS soil texture calculator http://soils.usda.gov/technical/aids/investigations/texture/ which calculates texture based on the percent sand and clay.

Table 4b: Properties of the soil from Site 2 (California, loam).

Property	Depth (cm)			
	0-30	**30-60**	**60-91**	**91-122**
Textural classification[1]	Loam	Sandy loam	Sandy loam	Sandy loam
% sand	46	54	62	62
% silt	31	31	27	29
% clay	23	15	11	9
pH (1:1 soil:water)	6.6	6.6	7.8	8.0
Organic matter (%)	0.8	0.3	0.1	0.1
Organic carbon (%)	0.5	0.2	0.1	0.1
CEC (meq/100 g)	11.6	9.1	12.0	12.4
Bulk density (g/cm^3)	1.34	1.26	1.26	1.24
Moisture at 1/3 atm (%)	17.53	16.85	17.29	16.47
Taxonomic classification (e.g., ferro-humic podzol)	Not provided			
Soil mapping unit	Not provided			

Data were obtained from Table IIIB, p. 23 of the study report. The soil series name was not reported. Organic carbon was calculated by the study author as %OC = OM by combustion x 0.58.
1 Textural classifications were confirmed by the reviewer using the NRCS soil texture calculator http://soils.usda.gov/technical/aids/investigations/texture/ which calculates texture based on the percent sand and clay.

Table 4c: Properties of the soil from Site 3 (Florida, sand).

Property	Depth (cm)			
	0-30	**30-60**	**60-91**	**91-122**
Textural classification[1]	Sand	Sand	Sand	Sand
% sand	92	93	94	92
% silt	2	1	0	2
% clay	6	6	6	6
pH (1:1 soil:water)	5.5	5.4	5.2	4.9
Organic matter (%)	1.3	0.5	0.5	0.2
Organic carbon (%)	0.8	0.3	0.3	0.1
CEC (meq/100 g)	1.1	0.5	0.5	0.5
Bulk density (g/cm^3)	1.53	1.59	1.54	1.51
Moisture at 1/3 atm (%)	3.03	2.39	1.93	1.81
Taxonomic classification (e.g., ferro-humic podzol)	Not provided			
Soil mapping unit	Not provided			

Data were obtained from Table IIIC, p. 24 of the study report. The soil series name was not reported. Organic carbon was calculated by the study author as %OC = OM by combustion x 0.58.
1 Textural classifications were confirmed by the reviewer using the NRCS soil texture calculator http://soils.usda.gov/technical/aids/investigations/texture/ which calculates texture based on the percent sand and clay.

Table 5: Properties of the irrigation water from all three test sites.

Property	Silty clay loam		Loam	Sand
	Pond	Well	Fresno Irrigation	Well
pH	7.8	8.1	7.5	7.7
COD (mg/L)	52	<5	<2	<5
Suspended Solids (mg/L)	27	3	<1	Not reported.
Dissolved Solids (mg/L)	Not reported.	Not reported.	Not reported.	262

Data were obtained from Table IV, p. 25 of the study report.

B. EXPERIMENTAL DESIGN:

1. Experimental design:

Oryzalin was surface applied once to bare soil using Surflan AS at the Michigan and Florida sites on June 28, 1989 and September 8, 1989, respectively at a target rate of 7.2 lb a.i./A (equivalent to 8.0 kg a.i./ha; Table V, p. 26). Oryzalin was surface applied once to bare soil using Surflan AS at the California site on July 18, 1989 at a target rate of 6.6 lb a.i./A (equivalent to 7.4 kg a.i./ha; Table V, p. 26). This represents 1.1 to 1.2 times the maximum proposed use rate on tree and vine crops. Plots were sprinkler irrigated as necessary during the study.

Table 6: Experimental design.

Details		**Test site**		
		Site 1 (MI, Silty clay loam)	**Site 2 (CA, Loam)**	**Site 3 (FL, Sand)**
Duration of study		713 days	477 days	467 days
Uncropped (bare) or cropped		Bare	Bare	Bare
Control used (Yes/No)		Yes	Yes	Yes
No. of replications	Controls	One	One	One
	Treatments	Three	Three	Three
Plot size (L x W m)	Controls	12.2 x 12.2 m	12.2 x 15.2 m	12.2 x 12.2 m
	Treatments	12.2 x 12.2 m	12.2 x 15.2 m	12.2 x 12.2 m
Distance between control plot and treated plot[1]		*ca*. 30.5 m	*ca*. 53 m	*ca*. 53 m
Distance between treated plots[2]		*ca*. 3.7 m	*ca*. 3.7 m	*ca*. 3.7 m
Application rate(s) used (g a.i/ha)		8140 g a.i./ha	7460 g a.i./ha	8110 g a.i./ha
Was the maximum label rate per ha used in study? (Yes/No)		Yes	Yes	Yes
Number of applications		One	One	One
Application Date(s) (dd mm yyyy)		28/6/89	18/7/89	8/9/89
Concentration expected in the 0-5 cm soil zone, based on the target first application rate and soil density (mg a.i./kg soil)		4.45 mg a.i./kg soil	3.71 mg a.i./kg soil	3.54 mg a.i./kg soil
Application method (eg., spraying, broadcast etc.)		Broadcast	Broadcast	Broadcast
Type of spray equipment, if used		Backpack broadcast sprayer equipped with 3 8003 T-Jet nozzles spaced 18 inches (45 cm) apart (distance above target not reported). Sprayer band width of 6 ft.	Compressed air tractor-mounted broadcast sprayer equipped with 6 XRB 8003 VS nozzles spaced 20 inches (51cm) apart (distance above target not reported). Sprayer band width of 10 ft.	Delavan PTO roller pump split broadcast sprayer equipped with 8 SS8002LP flat fan T-Jet nozzles spaced 20 inches (51cm) apart (distance above target not reported). Sprayer band width of 13.3 ft.
Total volume of spray solution applied/plot **OR** total amount broadcasted/plot[3]		4,557 mL/plot	6,950 mL/plot	5,557 mL/plot
Identification and volume of carrier (e.g., water), if used		Water: 27,255 mL/application	Water: 21,096 mL/application	Water: 16,758 mL/application

Details		Test site		
		Site 1 (MI, Silty clay loam)	**Site 2 (CA, Loam)**	**Site 3 (FL, Sand)**
Name and concentration of co-solvents, adjuvants and/or surfactants, if used		None	None	None
Indicate whether the following monthly reports were submitted: Precipitation: Average minimum and maximum air temperature: Average minimum and maximum soil temperature: Average annual frost-free periods:		 Yes Yes Yes No	 Yes Yes Yes No	 Yes Yes Yes No
Indicate whether the Pan evaporation data were submitted		Yes	Yes	Yes
Meteorological conditions during application	Cloud cover	Sunny and clear	Clear	Partly cloudy
	Temperature (°C)	26	36	32
	Relative Humidity	Not reported.	Not reported.	Not reported.
	Wind speed (mph) and direction	3-5, NNW	5, NW	3-5, ENE
	Sunlight (hr)	Not reported	Not reported	Not reported
Pesticides used during study: Name of product/a.i conc.: Amount applied: Application method:		Unwanted vegetation removed by spot treating with herbicide such as Roundup (not further described). Soil within the plots was not disturbed.		
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. Sprinkler irrigated as needed. Only monthly totals reported. Not applicable. 0.25 inches Sprinkler irrigation.	Yes. Sprinkler irrigated as needed. Only monthly totals reported. Not applicable. 0.90-4.50 inches Sprinkler irrigation.	Yes. Sprinkler irrigated as needed. Only monthly totals reported. Not applicable. 0.50-6.32 inches Sprinkler irrigation.
Indicate whether water received through rainfall + irrigation equals the 30 year average rainfall (Yes/No)		Total water input (precipitation plus irrigation) during the study period (measured June 1989 to June 1991) was 83.5 inches or 115% of the historical average.	Total water input (precipitation plus irrigation) during the study period (measured July 1989 to November 1990) was 32.4 inches or 259% of the historical average.	Total water input (precipitation plus irrigation) during the study period (measured September 1989 to December 1990) was 72.1 inches or 117% of the historical

Details	Test site		
	Site 1 (MI, Silty clay loam)	**Site 2 (CA, Loam)**	**Site 3 (FL, Sand)**
			average.
Were the application concentrations verified?	No	No	No
Were field spikes used?	No	No	No
Good agricultural practices followed (Yes or No)	Not reported	Not reported	Not reported
Indicate if any abnormal climatic events occurred during the study (eg., drought, heavy rainfall, flooding, storm etc.)	None reported	None reported	None reported
If cropped plots are used, provide the following details: Plant - Common name/variety: Details of planting: Crop maintenance:	N/A	N/A	N/A
Volatilization included in the study (Yes/No)	No	No	No
Leaching included in the study (Yes/No)	Yes	Yes	Yes
Run off included in the study (Yes/No)	No	No	No

Data were obtained from pp. 11-13; Tables VIA-VIC, pp. 27-29; Table VII, p. 30; Figures 3A-3C, pp. 51-53; Figure 4, p. 54; Figure 5, p. 55; Appendix A, pp. 65-66; Table II, p. 73; Appendix D, pp. 116-124 of the study report.

1 The buffer zone between the treated and control plots was difficult to read in the Figures provided, therefore distances are estimates.

2 Within each treated plot, a *ca*. 8.5 x 9.8 m 'sampling area' was established, creating a 3.7-m buffer zone between sampling areas of adjacent plots.

3 Total spray volume calculated by the reviewer based on the spray volume rate (gal/acre) and area treated per plot (acres).

2. Application Verification: The application rate was not verified.

3. Field Spiking: Field spikes were not prepared.

4. Volatilization: Volatilization was not measured.

5. Leaching: A total of fifteen cores were collected from each test site at immediately following and at 1-2 days prior to the application and at *ca*. 6-7, 13-14, 28-32, 56-67, 120-129, 187-328, 363-364, 442-477 and 713 days (Michigan only) following the application, to a depth of 90 cm, to determine the mobility of the test substance in the soil profile (excluding day 0 samples which were only collected to a depth of 15 cm; pp. 12-14; pp. 35-43; Appendix A, pp. 66-68).

6. Runoff: Runoff was not studied.

7. Supplementary Study: A storage stability and laboratory shipping study was conducted whereby control soil samples were fortified with oryzalin at concentrations of 0.0, 0.1, and 0.5 ppm and stored at 4°C until analysis at 0, 29, and 97 days (p. 14; Table VII, p. 31). Although the soil samples from the primary study were stored for up to 121 days, the study author reported that the difference should not be a concern for sample integrity due to the stability pattern of oryzalin.

8. Sampling:

Table 7: Soil sampling

Details	Site 1 (Silty clay loam)	Site 2 (Loam)	Site 3 (Sand)
Method of sampling (random or systematic)	Systematic	Systematic	Systematic
Sampling intervals	-1, 0, 7, 14, 28, 56, 120, 328, 364, 442, and 713 days	-1, 0, 6, 14, 28, 66, 129, 248, 364, and 477 days	-1, 0, 7, 13, 32, 67, 124, 187, 363 and 467 days
Method of soil collection (eg., cores)	Cores (0-15 and 15-90 cm depth)	Cores (0-15 and 15-90 cm depth)	Cores (0-15 and 15-90 cm depth)
Sampling depth	90 cm (15 cm for day 0 samples)	90 cm (15 cm for day 0 samples)	90 cm (15 cm for day 0 samples)
Number of cores collected per plot	15	15	15
Number of segments per core	Six	Six	Six
Length of soil segments (after sectioning)	15 cm	15 cm	15 cm
Core diameter	9.3 cm (3.65 inches) for 0-15 cm depth cores, 8 cm (3.125 inches) for 15-30 cm depth cores, 5 cm (2.1 inches) for 30-60 cm depth cores and 3 cm (1.165 inches) for 30-90 cm depth cores	9.3 cm (3.65 inches) for 0-15 cm depth cores, 8 cm (3.125 inches) for 15-30 cm depth cores, 5 cm (2.1 inches) for 30-60 cm depth cores and 3 cm (1.165 inches) for 30-90 cm depth cores	9.3 cm (3.65 inches) for 0-15 cm depth cores, 8 cm (3.125 inches) for 15-30 cm depth cores, 5 cm (2.1 inches) for 30-60 cm depth cores and 3 cm (1.165 inches) for 30-90 cm depth cores
Method of sample processing, if any	Cores were composited by subplot and depth (5 samples per composite) at each sampling interval, and the samples were thoroughly mixed.	Cores were composited by subplot and depth (5 samples per composite) at each sampling interval, and the samples were thoroughly mixed.	Cores were composited by subplot and depth (5 samples per composite) at each sampling interval, and the samples were thoroughly mixed.
Storage conditions	4°C	4°C	4°C
Storage length	Up to 97 days, partial set up to 121 days	Up to 97 days, partial set up to 104-105 days	Up to 97 days

Data were obtained from pp. 12-14; Tables XA-XC, pp. 35-43A; Appendix H, pp. 283-318 of the study report.

9. Analytical Procedures:

Number of soil samples analysed per treatment or composite sample: All composite soil samples (five replicates from 0-15 and 15-30 cm depths; three replicates below the 30-cm depth) were analyzed at each sampling interval (pp. 13-14).

Extraction, clean up and concentration of soil samples: Oryzalin was extracted from soil samples (50 g) by shaking (10 minutes) with 100 mL of methanol, filtering into a boiling flask, and evaporating to dryness using a rotary evaporator with water bath (30-45°C; Appendix J, pp. 342-343). Samples were then reconstituted in 2.5 mL methanol, swirled, 7.5 mL water was added, and the samples were swirled to mix. Samples were purified using a C_{18} cartridge conditioned with acetonitrile (10 mL), methanol (10 mL), then purified water (10 mL) prior to adding the reconstituted sample and the flask rinse (2.5 mL each of methanol and water). The cartridge was washed (hexane and isopropanol/water) and the wash was discarded. The sample was eluted with 10 mL acetonitrile:water (1:1, v:v) by vacuum (not to exceed 5 psi) into test tubes, capped, and vortexed, and an aliquot was analyzed by HPLC with UV detection.

Identification and quantification of parent compound and transformation products: Extracts were analyzed for oryzalin by HPLC (C_{18} Allech Ultrmex ODS column, 25 cm x 4.6 mm, 5 μm) using a mobile phase gradient of acetonitrile:water (55:45, v:v), flow rate 1.0 mL/minute with UV detection (239 nm; Appendix J, p. 343). Final HPLC solutions were found to be stable for up to two weeks if stored in culture tubes with snap caps at room temperature in the dark (Appendix J, p. 345). The retention time of oryzalin was not reported. Purity of the reference standards was not reported.

Method validation soil samples fortified at 0.01, 0.025, 0.10 and 5.0 ppm resulted in recoveries of 68-123% (Appendix J, Table I, p. 346). Laboratory recovery efficiency was also determined by fortifying duplicate control samples with 0.1 ppm oryzalin and analyzing the samples along with the field samples (p. 16). The laboratory recoveries for the silty clay loam, loam, and sand soils averaged 88 ± 10% (range 69-113%, n = 42), 88 ± 16% (range 70-115%, n = 38), and 91 ± 10% (range 75-112%, n = 42), respectively (Tables IXA-IXC, pp. 32-34).

Detection limits (LOD, LOQ) for the parent compound and transformation products in soil: The LOD was 0.01 ppm and the LOQ was 0.03 ppm, equivalent to 0.02 and 0.06 lb/A, respectively (p. 15; Appendix J, p. 345).

II. RESULTS AND DISCUSSION

1. APPLICATION MONITORS: Application monitors were not prepared.

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

3. MASS ACCOUNTING: A mass accounting was not determined.

Table 8a. Mean concentration (± st. dev.) of oryzalin residues expressed as ppm in soil, at Site 1 (Michigan, silty clay loam).

Compound	Soil depth (cm)	Sampling times (days)									
		0	**7**	**14**	**28**	**56**	**120**	**328**	**364**	**442**	**713**
Oryzalin	0-15	3.70 ± 0.72	3.22 ± 0.40	3.87 ± 0.78	3.82 ± 1.06	2.17 ± 0.85	1.70 ± 0.45	1.30 ± 0.57	0.52 ± 0.23	0.41 ± 0.17	0.08 ± 0.04
	15-30	ND	ND	0.03 ± 0.02	ND	ND	0.06 ± 0.05	0.03 ± 0.00	ND	ND	ND
	30-45	ND	ND	0.08 ± 0.09	ND	ND	ND	ND	ND	ND	ND
	45-60	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
	60-76	ND	ND	0.30 ± 0.43	ND	ND	ND	ND	ND	ND	ND
	76-90	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Replicate data were obtained from Table XA, pp. 35-38 of the study report. Values are reviewer-calculated means of five (0-30 cm) or three (30-90) composite samples. The LOD was 0.01 ppm and the LOQ was 0.03 ppm. The reviewer used a value of ½(LOQ+LOD) for all replicate detections reported by the study author in parentheses as below the LOQ (0.03 ppm) when occurring on an interval with other replicate values >LOQ.
NA = Not analyzed.

Table 8b. Mean concentration (± st. dev.) of oryzalin residues expressed as ppm in soil, at Site 2 (California, loam).

Compound	Soil depth (cm)	Sampling times (days)								
		0	**6**	**14**	**28**	**66**	**129**	**248**	**364**	**477**
Oryzalin	0-15	2.93 ± 0.24	2.88 ± 0.30	3.21 ± 0.38	2.40 ± 0.50	1.42 ± 0.31	1.06 ± 0.34	1.45 ± 0.25	0.20 ± 0.08	0.21 ± 0.08
	15-30	ND	0.02 ± 0.01	0.02 ± 0.00	0.02 ± 0.00	ND	ND	ND	ND	0.03 ± 0.02
	30-45	ND	ND	ND	ND	ND	ND	ND	ND	ND
	45-60	ND	ND	ND	ND	ND	ND	ND	ND	ND
	60-76	ND	ND	ND	ND	ND	ND	ND	ND	ND
	76-90	ND	ND	ND	ND	ND	ND	ND	ND	ND

Replicate data were obtained from Table XB, pp. 39-41 of the study report. Values are reviewer-calculated means of five (0-30 cm) or three (30-90) composite samples. The LOD was 0.01 ppm and the LOQ was 0.03 ppm. The reviewer used a value of ½(LOQ+LOD) for all replicate detections reported by the study author in parentheses as below the LOQ (0.03 ppm) when occurring on an interval with other replicate values >LOQ.
NA = Not analyzed.

Table 8c. Mean concentration (± st. dev.) of oryzalin residues expressed as ppm in soil, at Site 3 (Florida, sand).

Compound	Soil depth (cm)	Sampling times (days)								
		0	**7**	**13**	**32**	**67**	**124**	**187**	**363**	**467**
Oryzalin	0-15	2.35 ± 1.28	2.23 ± 1.08	3.48 ± 0.65	2.39 ± 1.44	0.82 ± 0.75	2.36 ± 0.59	0.97 ± 0.23	0.07 ± 0.01	0.02 ± 0.01
	15-30	ND	ND	ND	ND	ND	ND	ND	0.02 ± 0.00	ND
	30-45	ND	ND	ND	ND	ND	ND	ND	ND	ND
	45-60	ND	ND	ND	ND	ND	ND	ND	ND	ND
	60-76	ND	ND	ND	ND	ND	ND	ND	ND	ND
	76-90	ND	ND	ND	ND	ND	ND	ND	ND	ND

Replicate data were obtained from Table XC, pp. 42-43A of the study report. Values are reviewer-calculated means of five (0-30 cm) or three (30-90) composite samples. The LOD was 0.01 ppm and the LOQ was 0.03 ppm. The reviewer used a value of ½(LOQ+LOD) for all replicate detections reported by the study author in parentheses as below the LOQ (0.03 ppm) when occurring on an interval with other replicate values >LOQ.
NA = Not analyzed.

4. PARENT COMPOUND: At **Site 1 (Michigan, silty clay loam)**, the mean concentration of oryzalin in the 0-15 cm soil depth was 3.70 ppm at day 0, which is 83% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 4.45 mg a.i./kg in the 0-15 cm soil depth; Table VIA, p. 27; Table XA, p. 36). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.87 ppm at day 14, which is 87% of the theoretical, decreasing to 1.70 ppm at day 120 and was 0.08 ppm at day 713 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.06 ppm at day 120, and was only detected below the 30-cm soil depth in the day 14 samples at a maximum mean of 0.30 ppm at the 60-76 cm soil depth.

At **Site 2 (California, loam)**, the mean concentration of oryzalin in the 0-15 cm soil depth was 2.93 ppm at day 0, which is 79% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 3.71 mg a.i./kg in the 0-15 cm soil depth; Table VIB, p. 28; Table XB, p. 37). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.21 ppm at day 14, which is 86% of the theoretical, decreasing to 1.42 ppm at day 66, and was 0.21 ppm at day 477 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.03 ppm at day 477, and was not detected below the 30 cm-soil depth.

At **Site 3 (Florida, sand)**, the mean concentration of oryzalin in the 0-15 cm soil depth was 2.35 ppm at day 0, which is 66% of the theoretical (reviewer-calculated based on the theoretical day 0 concentration of 3.54 mg a.i./kg in the 0-15 cm soil depth; Table VIB, p. 28; Table XB, p. 37). In the 0-15 cm soil depth, oryzalin was a maximum mean of 3.48 ppm at day 13, which is 98% of the theoretical, decreasing to 0.97 ppm at day 187, and was 0.02 ppm at day 467 (study termination). Oryzalin was detected in the 15-30 cm soil depth at a maximum mean of 0.02 ppm at day 363, and was not detected below the 30-cm soil depth.

HALF-LIFE: Under field conditions at **Site 1 (Michigan, silty clay loam)**, oryzalin had a reviewer-calculated half-life value of 130.8 days ($r^2 = 0.8835$) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (14-713 days). The reviewer calculated a half-life of 126.0 days ($r^2 = 0.9097$) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 56 and 120 days; the DT90 was between 442-713 days. The soil half-life of oryzalin for the total soil depths (0-90 cm) was 130.8 days ($r^2 = 0.8845$), calculated using linear regression; the non-linear half-life was 126.0 days ($r^2 = 0.9098$).

Under field conditions at **Site 2 (California, loam)**, oryzalin had a reviewer-calculated half-life value of 119.5 days ($r^2 = 0.7989$) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (14-477 days). The reviewer calculated a half-life of 115.5 days ($r^2 = 0.9155$) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 66 and 129 days; the DT90 was between 248-477 days. Oryzalin was detected only sporadically at mean concentrations <0.05 ppm at the 15-30 cm depth and was not detected below the 30 cm soil depth; therefore, a total soil half-life was not determined.

Under field conditions at **Site 3 (Florida, sand)**, oryzalin had a reviewer-calculated half-life value of 66.6 days (r^2 = 0.7960) in soil, calculated using linear regression of ln-transformed concentration data and the equation $t_{½} = ln\ 2 / k$, where k is the rate constant, and based on all replicate concentration data from the 0-15 cm soil layer (13-467 days). The reviewer calculated a half-life of 100.5 days (r^2 = 0.7985) using Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data. The observed DT50 value occurred between 124 and 187 days; the DT90 was between 187-363 days. Oryzalin was detected only once at a mean concentration of <0.01 ppm at the 15-30 cm depth, and was not detected below the 30-cm soil depth; therefore, a total soil half-life was not determined.

Table 9: Half-lives/DT50/DT90 (0-15 cm depth) – Oryzalin

	Half-life/DT50[1] (days)	**Regression equation**	**r^2**	**Observed DT50 (days)**	**Observed DT90 (days)**
Site 1 (Michigan, silty clay loam)					
Linear/natural log	130.8	y = -0.0053x + 1.326	0.8835	56-120	442-713
Nonlinear/normal	126.0	y = 0.0055exp(+3.9330x)	0.9097		
Site 2 (California, loam)					
Linear/natural log	119.5	y = -0.0058x + 1.0217	0.7989	66-129	248-477
Nonlinear/normal	115.5	y = 0.0060exp(+2.9612x)	0.9155		
Site 3 (Florida, sand)					
Linear/natural log	66.6	y = -0.0104x + 1.2024	0.7960	124-187	187-363
Nonlinear/normal	100.5	y = 0.0069exp(+3.2260x)	0.7985		

1 Determined by the primary reviewer using Excel 2007 (linear, first-order) and Sigmaplot v 9.0 (nonlinear, one-compartment/two-parameter) and individual sample data from the 0-15 cm soil layer.

5. TRANSFORMATION PRODUCTS: Transformation products were not determined.

Table 10: Chemical names and CAS numbers for the transformation products of oryzalin.

Applicants Code Name	**CAS Number**	**Chemical Name**	**Chemical Formula**	**Molecular Weight (g/mol)**	**Smiles String**
Not determined.					

6. EXTRACTABLE AND NON-EXTRACTABLE RESIDUES: Non-extractable residues were not measured.

Table 11: Dissipation routes of oryzalin under field conditions.

Route of dissipation	**% of applied amount (at the end of the study period)**		
	Site 1 (Michigan, silty clay loam)	**Site 2 (California, loam)**	**Site 3 (Florida, sand)**
Accumulation (residues) in soil/ carry over	2%	6%	1%
Transformation (% of transformation products)	Not determined	Not determined	Not determined
Leaching, if measured	Not determined	Not determined	Not determined
Volatilization, if measured	Not measured	Not measured	Not measured
Plant uptake, if measured	N/A	N/A	N/A
Run off, if measured	Not measured	Not measured	Not measured
Total	2%	6%	1%

7. VOLATILIZATION: The concentration of applied oryzalin lost through volatilization was not determined at the test sites.

8. PLANT UPTAKE: N/A.

9. LEACHING: Oryzalin was not detected below the top 0-30 cm soil depth at any of the test sites, with the exception of two detections with means of 0.12 and 0.50 ppm at 30-45 and 60-76 cm soil depths, respectively, on day 14 at the silty loam site (Michigan; Tables XA-XC, pp. 36-43A).

10. RUNOFF: Runoff was not studied at the test sites.

11. RESIDUE CARRYOVER: The total carryover of residues of oryzalin was 2%, 6%, and 1% at the silty clay loam, loam, and sand sites, respectively, at the end of the study period.

12. SUPPLEMENTARY STUDY RESULTS: The storage stability data showed that oryzalin appeared to be stable in soil from each test site stored at 4°C for up to 97 days (Table VIII, p. 31). Recoveries ranged from 82 to 135%, with no pattern of decline.

III. STUDY DEFICIENCIES:

1. The transformation products of oryzalin were not determined, and the major routes of pesticide dissipation were not documented. Although the aerobic soil metabolism study did not show major degradates (but multiple minor degradates), the extraction method used in that study was of questionable adequacy. If a new, acceptable aerobic soil metabolism study indicates that oryzalin forms major degradates in aerobic soil, those degradates must be monitored in the field studies.

2. The method of extraction may not have been sufficient based on the results observed in aerobic soil studies of oryzalin using the same extraction method, where relatively high levels of bound residues occurred as early as two weeks posttreatment. In that study (MRID 41322801), the extraction procedure appeared to be inadequate to remove all identifiable [^{14}C]residues from the soil. Aerobic soil metabolism study samples were only extracted, as in this terrestrial field dissipation study, by shaking with methanol. At 0.5 months in the aerobic soil metabolism study, nonextractable [^{14}C]residues were already greater than 20% of the applied, and at study termination nonextractable [^{14}C]residues totaled 63.1% of the applied.

3. The soils were not adequately characterized. Soil series names and taxonomic classifications were not provided.

4. Meteorological data were incomplete. Only total monthly irrigation data were provided (Appendix D, pp. 115-124). USEPA guidelines request that the amount of rainfall and irrigation be reported from first application to each sampling. Daily rainfall and irrigation amounts are necessary to determine if any abnormal climatic events occurred which may affect the movement of the parent and transformation products in the soil profile.

5. An independent laboratory method validation was not conducted. A method validation study should be completed, separate from and prior to the analysis of the test samples, to verify the analytical methods.

6. The application rate was not verified. Although the study author reported that oryzalin was applied to the test plots at a nominal rate of 6.6 lb a.i./acre including a 10% excess to assure that no less than the maximum label rate was present at time zero, actual concentrations indicated that 17-34% of the applied was not accounted for at time zero (pp. 11-12; Tables XA-XC-pp. 35-43A; Appendix A, p. 66).

7. Field spikes were not used to determine the stability of soil samples under field conditions prior to analysis.

IV. REVIEWER'S COMMENTS:

1. The study authors stated that the degradation of oryzalin was biphasic at the Michigan (silty clay loam) and the California (loam) sites, with linear half-lives of 77 and 58 days, respectively in the first phase and 146 and 138 days, respectively in the second phase (p. 17; Table XI, p. 44; Figures 9A-9C, pp. 59-61). The degradation was linear at the Florida (sand) site, with a half-life of 68 days.

2. The code number for oryzalin was reported to be EL-119 (Appendix G, p. 141).

3. The study author designated the Michigan site as experiment number BJB8-05, the California site as experiment number LES89-02, and the Florida site as experiment number WHH89-06 (Table I, p. 20).

4. The study author analyzed the soil for residues of oryzalin using Method Number AM-AA-CA-R145-AA-755, titled "Determination of Oryzalin in Soil by High-Performance Liquid Chromatography" (pp. 14, 19; Appendix J, pp. 336-347).

5. Although historical precipitation values were not reported, the variation from monthly rainfall norms at each site was reported based on values for years 1951-1980 from the nearest weather stations located in Grand Rapids, Michigan; Fresno, California; and Live Oak, Florida (p. 11). At the Michigan (silty clay loam), California (loam) and Florida (sand) sites, the rainfall deviated from monthly norms by +0.44 inches, -0.13 inches, and -1.28 inches, respectively. The deviation from monthly temperature norms was +1.27°F for the Michigan and California sites; average historic monthly air temperature was not available for the Florida site.

6. Oryzalin was applied to the test plots at a nominal rate of 6.6 lb a.i./acre including a 10% excess to assure that no less than the maximum label rate was present at time zero (pp. 11-12; Appendix A, p. 66). The actual application rate was 6.6 to 7.2 lb a.i./acre or 1.1 to 1.2 times the maximum use rate on tree and vine crops. The test material was applied in two passes at a half-rate for each pass.

7. According to the study protocol, if rainfall during the study period was less than the 30-year average plus 20%, supplemental irrigation would be applied every two weeks to bring it to that moisture level using monthly averages (Appendix A, p. 65; Table 2, p. 73). If rainfall was not common and irrigation is the method of applying moisture during the normal growing season, than the normal irrigation patterns would be followed, and at least 2 inches every two weeks would be applied.

8. The sampling pattern was systematic (p. 13). Within each test plot a designated 'sampling area' (28 x 32 ft.) was established creating a 12-ft. buffer zone between each sampling area and adjacent plots to avoid spray drift contamination. Within each sampling area, fifteen sampling stations (4 x 4 ft.) were established (Figure 5, p. 55). Soil samples were collected starting in the lower left-corner of each station.

9. The study author suggested that the residues found in the lower depth soil samples from the Michigan and California sites were not consistent, and are suspected to be due to either field or laboratory contamination (p. 17).

V. REFERENCES:

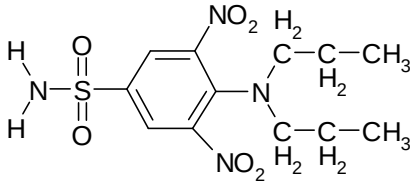
1. U.S. Environmental Protection Agency. 2008. Fate, Transport and Transformation Test Guidelines, OPPTS 835.6100, Terrestrial Field Dissipation. Office of Prevention, Pesticides and Toxic Substances, Washington, DC. EPA 712-C-08-020.

2. 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.

Attachment 1: Structure of Test Material

Oryzalin [OR-1; EL-119]

IUPAC Name: 3,5-Dinitro-4-(dipropylamino)benzenesulfonamide.
3,5-Dinitro-N^4,N^4-dipropylsulfanilamide.
CAS Name: 4-(Dipropylamino)-3,5-dinitrobenzenesulfonamide.
CAS Number: 19044-88-3.
SMILES String: C1C(S(=O)(=O)N)=CC(N(O)O)=C(N(CCC)CCC)C=1N(O)O (EpiSuite version 4.0).
Empirical formula: $C_{12}H_{18}N_4O_6S$ **Molecular formula:** $C_{12}H_{18}N_4O_6S$



*** structure complexity/form was sacrificed to obtain SMILES string**