Data Evaluation Report on the aquatic field dissipation of penoxsulam

PMRA Submission Number {.....} EPA MRID Number 45830804

Data Requirement: PMRA Data Code:
EPA DP Barcode: D288160
OECD Data Point:
EPA Guideline: 164-2

Test material: DE-638

End Use Product name: DE-638 GF-239 **Concentration of a.i.:** 19.6%
Formulation type: Liquid

Active ingredient
Common name: Penoxsulam.
Chemical name
IUPAC: 3-(2,2-Difluoroethoxy)-*N*-(5,8-dimethoxy[1,2,4]triazolo[1,5-*c*]pyrimidin-2-yl)-α,α,α-trifluorotoluene-2-sulfonamide.
CAS name: 2-(2,2-Difluoroethoxy)-*N*-(5,8-dimethoxy[1,2,4]triazolo[1,5-*c*]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide.
CAS No: 219714-96-2.
Synonyms: XDE-638; TSN 102147
SMILES string: n1c(nc2n1c(ncc2OC)OC)NS(=O)(=O)c3c(cccc3C(F)(F)F)OCC(F)F

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Company Code:
Active Code:
Use Site Category:
EPA PC Code: 119031

CITATION: Knuteson, J.A. and G.E. Schelle. 2002. Environmental fate field study of DE-638 herbicide in direct-seeded and water-seeded rice culture systems in the USA. Unpublished study performed by Dow AgroSciences LLC, Indianapolis, IN, Agricultural Advisors, Inc., Live Oak, CA, G & H Associates, Inc., Stuttgart, AK, and Agvise Laboratories, Inc., Northwood, ND, and submitted by Dow AgroSciences LLC, Indianapolis, IN. Laboratory Study ID: 000285. Experiment initiation June 27, 2000, and completion January 29, 2002 (p.3). Final report issued October 23, 2002.

(1)

ABSTRACT

Field Dissipation - Aquatic

Penoxsulam (3-(2,2-difluoroethoxy)-*N*-(5,8-dimethoxy[1,2,4]triazolo[1,5-*c*]pyrimidin-2-yl)-α,α,α-trifluorotoluene-2-sulfonamide; DE-638; **formulated as a liquid** containing a nominal 19.6% penoxsulam) was applied once at a target application rate of 100 g a.i./ha (2 times the current proposed label rate of 49 g a.i./ha) onto a bareground and a dry-seeded rice plot of Amagon silt loam soil in Arkansas, and onto a bareground and a wet-seeded rice plot of Oswald clay soil in California. The plots at the Arkansas field site were flooded 11 days after application. Plots at both field sites remained flooded through the growing season. Water samples were collected for analysis of penoxsulam and seven transformation products: 2-(2,2-difluoroethoxy)-N-(5,6-dihydro-8-methoxy-5-oxo [1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide (5-hydroxy-DE-638), 5,8-dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-amine (2-amino-TP), 3-[[[2-(2,2-difluoroethoxy)-6-(trifluoromethyl)phenyl] sulfonyl]amino]-1H-1,2,4-triazole-5-carboxylic acid (BSTCA), 2-(2,2-difluoroethoxy)-6-(trifluoromethyl)benzenesulfonic acid (BSA), 5,8-dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-ylsulfamic acid (DE-638 TPSA), 2-(2,2-difluoroethoxy)-6-(trifluoromethyl)-benzenesulfonamide (sulfonamide), and 2-amino-8-methoxy[1,2,4]triazolo[1,5-c]pyrimidin-5-ol (5-hydroxy-2-amino-TP). Soil samples were collected for the analysis of penoxsulam and five transformation products: 5-hydroxy-DE-638, 2-amino-TP, BSTCA, BSA, and sulfonamide for up to one year after application. The LOQ in water and soil were 0.003 µg/mL and 0.003 µg/g, respectively, for all analytes.

Arkansas field site

Dissipation of penoxsulam in the Arkansas test plots was dominated by soil kinetics following application to bareground and dry-seeded rice plots. Calculated half-life values for penoxsulam in soil were 13.0 days ($r^2 = 0.81$) for the bareground plot and 13.8 days ($r^2 = 0.76$) for the cropped plot, based on data points through 83 days posttreatment. Penoxsulam dissipated in the paddy water with a calculated half-life value of 3.5 days ($r^2 = 0.97$) in the bareground plot and 3.8 days ($r^2 = 0.92$) in the cropped plot. Penoxsulam dissipated from the **total system** with a calculated half-life value of **15.2 days** ($r^2 = 0.94$) in the **bareground plot** and **16.0 days** ($r^2 = 0.93$) in the **cropped plot**.

Penoxsulam dissipated in the 0- to 3-inch soil depth from a maximum concentration of 0.0795-0.0877 µg/g at 0-1 days to 0.0262-0.0474 µg/g by 7-13 days, and to less than the LOQ by 55 days posttreatment (bareground and cropped plots). Residues of penoxsulam and its transformation products were generally confined to the 0- to 3, 3- to 6, and 6- to 9-inch soil layers; however, residues were detected above the LOQ in the cropped plot as deep as the 12- to 15-inch soil depth. The only transformation products detected in the **soil** at a mean concentration above the LOQ were **BSTCA** and **5-OH DE-638**. The transformation product BSA was detected in both test plots, but was not detected above the LOQ. The transformation products 2-amino-TP and sulfonamide were not detected in either test plot.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (AR bareground plot).

Days post-treatment	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA
	0- to 3-inch depth			3- to 6-inch depth			6- to 9-inch depth		
0	**0.0795**	**0.0066**	ND	**0.0057**	ND	ND	ND	ND	ND
1	**0.0676**	**0.0042**	**0.0069**	**0.0057**	ND	ND	ND	ND	ND
3	**0.0642**	(0.0028)	**0.0164**	ND	ND	ND	ND	ND	ND
7	**0.0352**	ND	**0.0187**	ND	ND	ND	ND	ND	ND
11	**0.0262**	ND	**0.0177**	ND	ND	ND	ND	ND	ND
13	**0.0352**	**0.0043**	**0.0175**	**0.0057**	(0.0014)	(0.0024)	NS	NS	NS
18	**0.0145**	**0.0061**	**0.0157**	**0.0104**	**0.0068**	**0.0061**	ND	ND	(0.0014)
21	**0.0094**	**0.0043**	**0.0121**	**0.0110**	**0.0070**	**0.0080**	(0.0013)	(0.0017)	(0.0011)
25	**0.0052**	**0.0035**	**0.0108**	**0.0076**	**0.0091**	**0.0075**	ND	ND	ND
28	**0.0039**	**0.0036**	**0.0108**	**0.0047**	**0.0070**	**0.0057**	(0.0018)	(0.0023)	(0.0016)
55	(0.0016)	(0.0013)	**0.0083**	(0.0018)	**0.0036**	**0.0104**	(0.0015)	**0.0055**	**0.0056**
83	(0.0014)	(0.0010)	**0.0116**	ND	**0.0031**	**0.0063**	ND	(0.0028)	**0.0047**
193	ND	ND	**0.0076**	ND	(0.0014)	**0.0088**	ND	(0.0013)	**0.0032**
264	ND	ND	**0.0078**	ND	(0.0014)	**0.0072**	NS	NS	NS
349	ND	ND	ND	ND	ND	ND	ND	ND	ND

Values in parenthesis are below the limit of quantitation (0.003 µg/mL). NS = Not sampled.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (AR cropped plot).

Days post-treatment	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA
	0- to 3-inch depth			3- to 6-inch depth			6- to 9-inch depth			9- to 12-inch depth		
0	**0.0645**	(0.0024)	ND	ND	ND	ND	ND	ND	ND	NA	NA	NA
1	**0.0877**	**0.0057**	**0.0037**	(0.0016)	ND	ND	ND	ND	ND	NA	NA	NA
3	**0.0568**	**0.0037**	**0.0038**	**0.0032**	ND	ND	ND	ND	ND	NA	NA	NA
7	**0.0396**	(0.0026)	**0.0063**	(0.0017)	ND	ND	ND	ND	ND	NA	NA	NA
11	**0.0474**	(0.0017)	**0.0072**	(0.0029)	ND	ND	ND	ND	ND	NA	NA	NA
13	**0.0356**	**0.0031**	**0.0096**	**0.0222**	**0.0040**	**0.0048**	(0.0027)	ND	ND	NA	NA	NA
18	**0.0134**	**0.0031**	**0.0075**	**0.0141**	**0.0065**	**0.0037**	(0.0023)	ND	ND	NA	NA	NA
21	**0.0082**	**0.0034**	**0.0067**	**0.0107**	**0.0090**	**0.0037**	**0.0041**	**0.0049**	ND	NA	NA	NA
25	**0.0053**	(0.0019)	**0.0050**	**0.0081**	**0.0064**	**0.0045**	**0.0036**	(0.0027)	(0.0015)	NA	NA	NA
28	**0.0043**	(0.0022)	**0.0049**	**0.0060**	**0.0071**	**0.0042**	**0.0033**	**0.0045**	(0.0012)	NA	NA	NA
55	(0.0020)	(0.0013)	**0.0034**	(0.0014)	**0.0038**	**0.0042**	(0.0013)	**0.0038**	**0.0031**	NA	NA	NA
83	(0.0018)	ND	(0.0020)	ND	(0.0017)	**0.0033**	ND	(0.0022)	**0.0032**	NA	NA	NA
193	(0.0014)	ND	(0.0027)	ND	ND	**0.0050**	ND	ND	**0.0031**	NA	NA	NA
264	(0.0014)	ND	**0.0045**	ND	ND	**0.0046**	ND	ND	(0.0030)	(0.0012)	**0.0048**	**0.0032**
349	(0.0011)	ND	**0.0055**	ND	ND	**0.0063**	ND	ND	**0.0031**	ND	(0.0021)	(0.0029)

Values in parenthesis are below the limit of quantitation (0.003 µg/mL). NS = Not sampled. NA = Not analyzed.

Penoxsulam was detected in the **paddy water** at maximum concentrations of 0.0050 µg/mL in the bareground plot and 0.0153 µg/mL in the cropped plot, then quickly dissipated to concentrations below the LOQ. Maximum penoxsulam concentrations occurred at 2 days following flooding (13 days posttreatment, the first sampling interval that water samples were collected for analysis). Transformation products of penoxsulam were not detected in the paddy water at any sampling interval with the exception of **BSTCA**, which was detected at a maximum concentration of 0.0031 µg/mL in the bareground plot (18 days posttreatment, 7 days after flooding) and at 0.0033 µg/mL in the cropped plot (13 days posttreatment, 2 days after flooding).

California field site

Dissipation of penoxsulam in the California test plots was dominated by water kinetics following application to flooded bareground and wet-seeded rice plots. Penoxsulam dissipated in the paddy water with calculated half-life values of 4.8 days ($r^2 = 0.99$) in the bareground plot and 6.8 days ($r^2 = 0.98$) in the cropped plot. Calculated half-life values for penoxsulam in soil were 13.9 days ($r^2 = 0.53$) for the bareground plot and 26.2 days ($r^2 = 0.84$) for the cropped plot. Penoxsulam dissipated from the **total system** with a calculated half-life value of **5.0 days** ($r^2 = 0.99$) in the **bareground plot** and **10.4 days** ($r^2 = 0.97$) in the **cropped plot**.

The only transformation products detected in the **paddy water** at a mean concentration above the LOQ were **BSTCA** and **TPSA**. The transformation product BSA was detected in the bareground plots, but was not detected above the LOQ. The transformation products 5-OH DE-638, sulfonamide, 2-amino-TP, and 5-OH-2-amino-TP were not detected in either test plots.

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Mean concentration (µg/mL) of penoxsulam and its transformation products in paddy water.

Days post-treatment	DE-638	BSTCA	TPSA	BSA	Days post-treatment	DE-638	BSTCA	TPSA	BSA
Bareground plot					Cropped plot				
0	**0.0634**	ND	(0.0010)	ND	0	**0.0717**	ND	ND	ND
0.5	**0.0607**	(0.0011)	ND	ND	0.5	**0.0591**	ND	ND	ND
1	**0.0593**	(0.0011)	ND	ND	1	**0.0628**	ND	ND	ND
2	**0.0557**	(0.0019)	(0.0017)	ND	2	**0.0593**	(0.0012)	(0.0013)	ND
3	**0.0440**	(0.0030)	(0.0022)	ND	3	**0.0522**	(0.0022)	(0.0017)	ND
5	**0.0393**	**0.0035**	**0.0031**	ND	5	**0.0445**	(0.0026)	(0.0018)	ND
7	**0.0296**	**0.0037**	**0.0032**	ND	7	**0.0358**	**0.0030**	(0.0022)	ND
10	**0.0182**	**0.0045**	**0.0032**	(0.0011)	10	**0.0263**	**0.0034**	(0.0023)	ND
14	**0.0070**	**0.0039**	(0.0026)	ND	14	**0.0157**	**0.0032**	(0.0017)	ND
21	(0.0029)	**0.0043**	(0.0022)	(0.0013)	21	**0.0060**	(0.0028)	(0.0014)	ND
30	ND	(0.0026)	(0.0011)	ND	30	**0.0041**	(0.0030)	ND	ND

Values in parenthesis are below the limit of quantitation (0.003 µg/mL).

Penoxsulam dissipated in the 0- to 3-inch soil depth from a maximum concentration of 0.0134-0.0137 µg/g at day-0 to less than the LOQ by 14 days in the bareground plot and by 60 days in the cropped plot. Residues of penoxsulam and its transformation products were generally confined to the 0- to 3-inch soil layer. However, residues were detected above the LOQ in the cropped plot as deep as the 3- to 6-inch soil depth. The only transformation products detected in the **soil** at a mean concentration above the LOQ were **BSTCA** and **5-OH DE-638**. The transformation product BSA was detected once in the cropped plot, below the LOQ, and the transformation products 2-amino-TP and sulfonamide were not detected in either test plots.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (CA bareground plot).

Days post-treatment	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA
	0- to 3-inch depth			3- to 6-inch depth			6- to 9-inch depth		
0	**0.0134**	ND	ND	ND	ND	ND	ND	ND	ND
0.5	**0.0034**	ND	ND	ND	ND	ND	ND	ND	ND
1	**0.0063**	ND	ND	ND	ND	ND	ND	ND	ND
2	**0.0060**	ND	ND	ND	ND	ND	ND	ND	ND
3	**0.0054**	ND	ND	ND	ND	ND	ND	ND	ND
5	**0.0054**	ND	ND	ND	ND	ND	ND	ND	ND
7	**0.0067**	(0.0013)	(0.0018)	ND	ND	ND	ND	ND	ND
10	**0.0053**	(0.0012)	(0.0023)	ND	ND	ND	ND	ND	ND
14	(0.0029)	ND	(0.0023)	ND	ND	ND	ND	ND	ND
21	(0.0027)	(0.0014)	**0.0038**	ND	ND	ND	ND	ND	ND
30	ND	ND	**0.0037**	ND	ND	ND	ND	ND	ND
60	ND	ND	**0.0037**	ND	ND	ND	ND	ND	ND
90	ND	ND	**0.0033**	ND	ND	ND	ND	ND	ND
185	ND	ND	**0.0036**	ND	ND	ND	ND	ND	ND
288	ND	ND	(0.0019)	ND	ND	ND	ND	ND	ND
367	ND	ND	(0.0024)	ND	ND	ND	ND	ND	ND

Values in parenthesis are below the limit of quantitation (0.003 µg/mL). NS = Not sampled.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (CA cropped plot).

Days post-treatment	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA
	0- to 3-inch depth				3- to 6-inch depth				6- to 9-inch depth			
0	**0.0137**	ND	ND	ND	ND	ND	ND	ND	(0.0016)	ND	ND	ND
0.5	**0.0068**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	**0.0076**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	**0.0081**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	**0.0107**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	**0.0108**	(0.0017)	ND	(0.0019)	ND	ND	ND	ND	ND	ND	ND	ND
7	**0.0109**	(0.0024)	ND	(0.0022)	ND	ND	ND	ND	ND	ND	ND	ND
10	**0.0126**	**0.0035**	ND	**0.0042**	ND	ND	ND	ND	ND	ND	ND	ND
14	**0.0100**	**0.0047**	ND	**0.0058**	ND	ND	ND	ND	ND	ND	ND	ND
21	**0.0058**	**0.0049**	ND	**0.0072**	ND	ND	ND	ND	ND	ND	ND	ND
30	**0.0041**	**0.0044**	ND	**0.0085**	ND	ND	ND	ND	ND	ND	ND	ND
60	(0.0019)	(0.0021)	ND	**0.0117**	ND	(0.0014)	ND	(0.0026)	ND	ND	(0.0012)	ND
90	(0.0011)	ND	ND	**0.0086**	ND	ND	ND	(0.0016)	ND	ND	ND	ND
185	ND	ND	ND	**0.0118**	ND	ND	ND	**0.0056**	NS	NS	NS	NS
288	ND	ND	ND	**0.0084**	ND	ND	ND	(0.0011)	ND	ND	ND	ND
367	ND	ND	ND	**0.0067**	ND	ND	ND	**0.0106**	ND	ND	ND	(0.0014)

Values in parenthesis are below the limit of quantitation (0.003 µg/mL). NS = Not sampled.

Study Acceptability: This study is classified **supplemental** and does not satisfy the US EPA Subdivision N Guideline §164-2 for aquatic field dissipation because it was not possible to determine if the penoxsulam degradation products, which may be of toxicological concern, that formed in the paddy water through aqueous photolysis partitioned into the sediment.

MATERIALS AND METHODS

The aquatic field dissipation of penoxsulam ((3-(2,2-difluoroethoxy)-*N*-(5,8-dimethoxy[1,2,4]triazolo[1,5-*c*]pyrimidin-2-yl)-α,α,α-trifluorotoluene-2-sulfonamide, DE-638), formulated as GF-239 (a liquid containing a nominal 0.196 g a.i./g), was conducted on a bareground and dry-seeded rice plot in Arkansas and a bareground and wet-seeded rice plot in California (p.25). For the application, the GF-239 formulation was mixed with water and crop oil concentrate (2.5% v/v in the tank mix, p.29).

Arkansas field site

The Arkansas test plots (160 x 48 ft for the cropped plot, 160 x 50 ft for the bareground plot) were located in Arkansas County on an Amagon silt loam soil (0- to 7.6-inch depth: 15-17% sand, 64-68% silt, 17-19% clay, pH 5.3-6.1, 1.9-2.0% organic matter, CEC 9.2-10.0 meq/100 g, bulk density 1.20-1.28 g/cm^3; pp.25-26; Tables 2-3, pp.52-53). The treated plots each consisted of five replicate subplots which were each divided into sampling blocks which comprised the sampling locations for water and soil samples (p.27). A control plot (160 x 49 ft) was also established at the test site and planted with rice. The control plot was located an unspecified distance from the treated plot. All three plots were rotary-tilled on May 24, 2000 (approximately one month prior to application), and the cropped and control plots were planted with rice (Lemont variety; p.27). The rice was planted ½ to ¾ inch deep in rows spaced approximately 7 inches apart.

Penoxsulam was applied once, on June 29, 2000, at a target application rate of 100 g a.i./ha (2 times the current proposed label rate of 49 g a.i./ha) onto the dry test plots (pp.28-30). The application was made using a backpack sprayer with four flat-fan DG TeeJet 110015 VS nozzles aimed straight down at a height of 18 inches above the surface. Meteorological conditions during application were as follows: wind speed and direction <3 mph from the north to northeast, air temperature 68°F, and relative humidity 95%. The rice on the cropped plot was at the 2-leaf to 2-tiller growth stage (6- to 10-inch plant height) at the time of application.

To verify the application rate, six large filter paper discs (27-inch diameter) were placed on the ground in each treated test plot (at least one in each treated subplot) prior to application (p.30). Filter paper discs were analyzed 2 days after collection (Appendix E, p.513). Discs were extracted by shaking for 30 minutes with acetonitrile, and the extracts were analyzed using LC/MS/MS. The mean recovery of penoxsulam from the filter paper discs was 90.4%

of the expected for the cropped plot and 90.5% of the expected for the bareground plot (Table 7, p.56).

Following application, the plots were kept dry until 11 days after treatment with penoxsulam (July 10, 2000) and then flooded with well water (p.27). Characteristics of the water were as follows: pH 7.5, conductivity 0.97 mmhos/cm, total dissolved solids 504 ppm, turbidity 22.8 NTU, and alkalinity 306 mg $CaCO_3$/L (Table 4, p.53). The water level ranged from 5 to 8 cm above the soil surface throughout the growing season (Table 5, p.54). The last irrigation event occurred on September 5, 2000 (68 days after penoxsulam application) because the rice was beginning to ripen (p.27; Table 6, p.55). The rice was not harvested and crop residues were left on the plots.

California field site

The California test plots (355 x 15 ft for the cropped plot, 359 x 17 ft for the bareground plot) were located in Sutter County on an Oswald clay soil (0- to 7.6-inch depth: 39% sand, 29% silt, 32% clay, pH 6.5-6.6, 2.7-3.9% organic matter, CEC 22.0-23.6 meq/100 g, bulk density 1.29-1.37 g/cm^3; pp.25-26; Tables 2-3, pp.52-53). The treated plots each consisted of five replicate subplots which contained numbered sample-line markers that comprised the sampling locations for water and soil samples (pp.27-28). A control plot (dimensions not reported) was also established at the test site and planted with rice. The control plot was located an unspecified distance from the treated plot. The cropped and control plots were planted with rice (M-202 variety) on June 11, 2000 (16 days prior to application) by broadcasting the seed over the paddy water.

The plots were flooded with well water prior to planting the rice (p.27). Characteristics of the water were as follows: pH 7.1, conductivity 0.16 mmhos/cm, total dissolved solids 130 ppm, turbidity 8.59 NTU, and alkalinity 71 mg $CaCO_3$/L (Table 4, p.53). The water level ranged from 5 to 10 cm above the soil surface throughout the growing season (Table 5, p.54). The last irrigation event occurred on September 10, 2000 (75 days after penoxsulam application; Table 6, p.55). The rice was not harvested and crop residues were left on the plots.

Penoxsulam was applied once, June 27, 2000, at a target application rate of 100 g a.i./ha (2 times the current proposed label rate of 49 g a.i./ha) onto the flooded plot (pp.28-30). The application was made using a 2-man rice boom and backpack sprayer with ten flat fan VS8001 XR nozzles aimed straight down at a height of 18 inches above the water surface. Meteorological conditions during application were as follows: no wind, air temperature 76°F, and relative humidity 57% (pp.28-29). The rice was at the 4-5 leaf growth stage (7- to 8-inch plant height) at the time of application.

To verify the application rate, six large filter paper discs (27-inch diameter) were placed in each treated test plot (at least one in each treated subplot) prior to application (p.30). The discs were placed on low platforms holding the disc just above the paddy water level. Filter paper discs were analyzed 8 days after collection (Appendix E, p.513). Discs were extracted

by shaking for 30 minutes with acetonitrile and the extracts were analyzed using LC/MS/MS. The mean recovery of penoxsulam from the filter paper discs was 97.3% of the expected for the cropped plot and 94.6% of the expected for the bareground plot (Table 7, p.56). As further confirmation of the target application rate, the concentration of penoxsulam in day-0 paddy water samples was 95% of the theoretical for the bareground plot and 106% of the theoretical for the cropped plot (pp.42-43; Appendix G, Tables 3-4, pp.557-560).

Meteorological Monitoring (both field sites)

Meteorological and paddy water conditions were collected from an on-site weather station (p.37). The weather station recorded water level and temperature (approximately 2.5 inches from paddy bottom), soil temperature, relative humidity, wind speed and direction, air temperature, total solar radiation, and precipitation. In addition, multi-electrode redox potential probes were placed inside the treated cropped plot to measure redox potential at 1 cm and 3 cm above the soil and at 1 cm and 3 cm below the soil surface (p.38).

Sampling Methods and Sample Analysis (both field sites)

Water and soil sampling schedule for both test sites.

Arkansas Test Site			California Test Site		
Date	**Days Posttreament**	**Matrix Sampled**	**Date**	**Days Posttreatment**	**Matrix Sampled**
6/28/00	Pretreatment	Soil	6/26/00	Pretreatment	Soil and Water
6/29/00	0	Soil	6/27/00	0	Soil and Water
6/30/00	1	Soil	6/27/00	0.5	Soil and Water
7/2/00	3	Soil	6/28/00	1	Soil and Water
7/6/00	7	Soil	6/29/00	2	Soil and Water
7/10/00	11	Soil[1]	6/30/00	3	Soil and Water
7/12/00	13	Soil and Water	7/2/00	5	Soil and Water
7/17/00	18	Soil and Water	7/4/00	7	Soil and Water
7/20/00	21	Soil and Water	7/7/00	10	Soil and Water
7/24/00	25	Soil and Water	7/11/00	14	Soil and Water
7/27/00	28	Soil and Water	7/18/00	21	Soil and Water
8/23/00	55	Soil	7/27/00	30	Soil and Water
9/20/00	83	Soil	8/26/00	60	Soil
1/8/01	193	Soil	9/25/00	90	Soil
3/20/01	264	Soil	12/29/00	185	Soil

6/13/01	349	Soil	4/11/01	288	Soil
			6/29/01	367	Soil

Data were obtained from Table 8, p.57 of the study report.
[1] Prior to flooding on 7/10/2000.

Water samples (25 mL) were collected from the middle of the water column using an automatic handheld pipette pump attached to a disposable glass pipette (p.31). Following collection, samples were either placed in freezer storage at the field facility or shipped to the sponsor's facility the same day as collected. At the sponsor's facility, water samples were combined to produce three composite samples (each consisting of one replicate from each of the five subplots) per sampling event (Appendix D, p.163). Water samples were stored frozen for up to 515 days prior to analysis (Appendix D, Table 1, p.178).

Soil samples were manually collected when the plots were flooded and by sampling probe when the plots were dry (pp.31-32). Soil samples were collected to a minimum depth of 15 cm. Following collection, cores were either placed in freezer storage at the field facility or shipped to the sponsor's facility the same day as collected. At the sponsor's facility, cores were sectioned into 3-inch segments and combined to produce three composite samples (each consisting of one replicate from each of the five subplots) per segment and sampling event (p.33). Composite samples were mixed with dry ice and ground through an Agvise Model 2001 Hammermill equipped with a 1/4-inch screen and placed back into frozen storage until analysis (Appendix D, p.163). Soil samples were stored frozen for up to 561 days prior to analysis (Appendix D, Table 1, pp.178-180).

For each sampling event at the Arkansas test site, three sampling blocks within each of the five subplots were randomly selected as the sampling location for that event to produce a total of 15 samples per event (p.27). For each sampling event at the California test site, one sample-line was randomly selected in each of the five subplots as the sampling location for that event (pp.27-28). Each sample-line at the California test site consisted of three fixed sample positions along the transect across the test plot to produce a total of 15 samples per event. When soil and water samples were to be collected from the same sampling area, water samples were collected first to prevent disturbance of the water column.

Water and soil samples were analyzed for penoxsulam and the transformation products 5-hydroxy-DE-638 (5-OH DE-638), 5,8-dimethoxy DE-638 metabolite (2-amino-TP), triethylammonium of DE-638 metabolite (BSTCA), DE-638 sulfonic acid metabolite (BSA), and sulfonamide. Water samples were also analyzed for the additional transformation products DE-638 TPSA and 2-amino-8-methoxy (5-hydroxy-2-amino-TP; Appendix D, p.164). Soil samples were not analyzed for TPSA and 5-OH-2-amino-TP because these transformation products were found only in the laboratory aqueous photolysis studies of penoxsulam (Appendix A, p.127).

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Complete chemical names for penoxsulam and its transformation products.

Applicant's Code Name	Chemical Name	Molecular Weight	Media Analyzed
DE-638 (penoxsulam)	2-(2,2-Difluoroethoxy)-N-(5,8-dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl)-benzenesulfonamide	483	Water Soil
5-Hydroxy DE-638; 5-OH DE-638; 5-OH	2-(2,2-Difluoroethoxy)-N-(5,6-dihydro-8-methoxy-5-oxo [1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide	469	Water Soil
BSTCA	3-[[[2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)phenyl]sulfonyl]amino]-1H-1,2,4-triazole-5-carboxylic acid	416	Water Soil
BSA	2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)benzenesulfonic acid	306	Water Soil
DE-638 TPSA; TPSA	5,8-Dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-ylsulfamic acid	275	Water
2-Amino-TP	5,8-Dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-amine	195	Water Soil
5-Hydroxy-2-amino-TP; 5-OH-2-amino-TP; 5-OH-2-ATP	2-Amino-8-methoxy[1,2,4]triazolo[1,5-c]pyrimidin-5-ol	181	Water
Sulfonamide	2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)-benzenesulfonamide	305	Water Soil

Chemical names and molecular weights were obtained from Figure 1, pp.99-101 of the study report. A discussion of the rationale for the exclusion of the transformation products TPSA and 5-OH-2-ATP from the soil method can be found in Appendix A, p.127 of the study report.

Water samples were analyzed according to the method GRM 01.30 (Appendix D, p.165). Sample aliquots were analyzed by HPLC with tandem mass spectrometry detection. Analysis was performed using a YMC ODS AM column and a PE/Sciex API 2000 tandem mass selective detector. The limits of detection and quantitation were 0.001 µg/mL and 0.003 µg/mL, respectively, for all analytes in water (Appendix D, p.167).

Soil samples were analyzed according to the method GRM 01.31 (Appendix D, p.165). Samples aliquots (5 g) were extracted twice by shaking with acetonitrile:1.0 N HCl (90:10, v:v). The soil was centrifuged following each extraction step and the extracts were combined. An aliquot of the extract was evaporated and reconstituted in 0.1 N HCl, and then purified using a hydrophilic-lipophilic balanced solid phase extraction plate using a Tecan Genesis Workstation 150. After evaporating to dryness, the eluate was reconstituted and analyzed by HPLC with tandem mass spectrometry detection. Analysis was performed using an Agilent Zorbax SB-C8 column and a PE/Sciex API 3000 tandem mass selective detector. The limits of detection and quantitation were 0.001 µg/g and 0.003 µg/g, respectively, for all analytes in soil (Appendix D, p.167).

To determine the efficiency of the analytical methods, samples of water were fortified with penoxsulam and the transformation products 5-hydroxy-DE-638, 2-amino-TP, BSTCA, BSA, DE-638 TPSA, sulfonamide, and 5-hydroxy-2-amino-TP over the range of 0.003 to 0.09 µg/mL. Samples of soil were fortified with penoxsulam and the transformation products 5-hydroxy-DE-638, 2-amino-TP, BSTCA, BSA, and sulfonamide over the range of 0.003 to 0.20 µg/g (Appendix D, pp.166-167).

Mean (± SD) concurrent recoveries of penoxsulam and its transformation products from water and soil.

Analyte	Percent Recovery	
	Water	Soil
DE-638 (penoxsulam)	98 ± 6	83 ± 6
5-Hydroxy DE-638	102 ± 8	83 ± 6
BSTCA	100 ± 9	77 ± 4
BSA	105 ± 9	86 ± 6
DE-638 TPSA	90 ± 6	NA
2-Amino-TP	98 ± 4	91 ± 10
5-Hydroxy-2-amino-TP	80 ± 4	NA
Sulfonamide	103 ± 8	76 ± 4

Means were obtained from Appendix D, p.167 and Tables 2-15, pp.181-202 of the study report.

To determine the stability of penoxsulam and selected transformation products during transport and storage, travel spikes were prepared by fortifying control soil from the two field sites with penoxsulam, 5-OH DE-638, and BSTCA at 5 ng/g, and by fortifying laboratory tap water with penoxsulam, 5-OH DE-638, 2-amino-TP, BSA, DE-638 TPSA, and BSTCA at 15 ng/mL (p.36; Appendix C, pp.135-137). Fortified samples were shipped to the field sites, stored and shipped back to the analytical laboratory with a group of field samples. Fortified water samples were acidified with acetic acid and analyzed by LC/MS/MS while fortified soil samples were extracted with acetonitrile:1 N HCl (90:10, v:v), purified with a C18 SPE cartridge and evaporated to dryness, reconstituted in acetonitrile:water:acetic acid (10:89.5:0.5, v:v:v) and analyzed by LC/MS/MS. Water samples were analyzed within 2-15 days of fortification and soil samples were analyzed within 54-55 days of fortification. All recoveries were within the acceptable range of 70-120% with one exception (Appendix C, Table 1, p.138).

Percent recoveries of penoxsulam and its transformation products from travel spikes.

Analyte	Water		Soil	
	Arkansas Site	California Site	Arkansas Site	California Site
Penoxsulam (DE-638)	97	95	108	99
5-OH	75	75	81	80
BSTCA	98	109	102	131
2-Amino-TP	100	97	Not analyzed	Not analyzed
BSA	98	88	Not analyzed	Not analyzed
TPSA	102	107	Not analyzed	Not analyzed

Data were obtained from Appendix C, Table 1, p.138 of the study report.

RESULTS/DISCUSSION

Arkansas field site

Penoxsulam (3-(2,2-difluoroethoxy)-*N*-(5,8-dimethoxy[1,2,4]triazolo[1,5-*c*]pyrimidin-2-yl)-α,α,α-trifluorotoluene-2-sulfonamide; DE-638; formulated as a liquid containing a nominal 19.6% penoxsulam), applied once at a target application rate of 100 g a.i./ha (2 times the current proposed label rate of 49 g a.i./ha) onto a bareground and dry-seeded rice plot of Amagon silt loam soil, dissipated in the paddy water with a calculated half-life values of 3.5 days ($r^2 = 0.97$) in the bareground plot, and 3.8 days ($r^2 = 0.92$) in the cropped plot, based on all data points. Calculated half-life values for penoxsulam in soil were 13.0 days ($r^2 = 0.81$) for the bareground plot and 13.8 days ($r^2 = 0.76$) for the cropped plot, based on data points through 83 days posttreatment. Penoxsulam dissipated from the total system with a calculated half-life value of 15.2 days ($r^2 = 0.94$) in the bareground plot and 16.0 days ($r^2 = 0.93$) in the cropped plot.

In the **bareground plot**, penoxsulam was detected in the **paddy water** at a mean concentration of 0.0050 µg/mL at 13 days posttreatment (2 days after flooding) and was detected below the LOQ at 18 and 21 days posttreatment (Table 14, p.90). Transformation products of penoxsulam were not detected in the paddy water at any sampling interval, with the exception of **BSTCA**, which was detected at a maximum concentration of 0.0031 µg/mL at 18 days posttreatment (7 days after flooding), and was detected below the LOQ at all other sampling intervals.

Mean concentration (µg/mL) of penoxsulam and its transformation products in paddy water (AR bareground plot).

Days post-treatment	Days after flooding	DE-638	5-OH	BSTCA	Sulfona-mide	TPSA	BSA	2-amino-TP	5-OH-2-amino-TP
13	2	**0.0050**	ND	(0.0030)	ND	ND	ND	ND	ND
18	7	(0.0021)	ND	**0.0031**	ND	ND	ND	ND	ND
21	10	(0.0012)	ND	(0.0025)	ND	ND	ND	ND	ND
25	14	ND	ND	(0.0020)	ND	ND	ND	ND	ND
28	17	ND	ND	(0.0017)	ND	ND	ND	ND	ND

Data were obtained from Table 14, p.90 in the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL).

In the **cropped plot**, penoxsulam was detected in the **paddy water** at a mean concentration of 0.0153 µg/mL at 13 days posttreatment (2 days after flooding), decreased to 0.0035 µg/mL by 18 days, and was detected below the LOQ at 21 and 25 days posttreatment (Table 14, p.90). Transformation products of penoxsulam were not detected in the paddy water at any sampling interval, with the exception of **BSTCA**, which was detected at a maximum concentration of 0.0033 µg/mL at 13 days posttreatment (2 days after flooding), and was detected below the LOQ at all other sampling intervals.

Mean concentration (µg/mL) of penoxsulam and its transformation products in paddy water (AR cropped plot).

Days post-treatment	Days after flooding	DE-638	5-OH	BSTCA	Sulfona-mide	TPSA	BSA	2-amino-TP	5-OH-2-amino-TP
13	2	**0.0153**	ND	**0.0033**	ND	ND	ND	ND	ND
18	7	**0.0035**	ND	(0.0018)	ND	ND	ND	ND	ND
21	10	(0.0020)	ND	(0.0012)	ND	ND	ND	ND	ND
25	14	(0.0013)	ND	(0.0014)	ND	ND	ND	ND	ND
28	17	ND	ND	(0.0010)	ND	ND	ND	ND	ND

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Data were obtained from Table 14, p.90 in the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL).

In the **bareground plot**, penoxsulam was initially detected in the 0- to 3-inch depth of the **soil** at a maximum concentration of 0.0795 µg/g at day 0, decreased to 0.0262 µg/g by 11 days (the last sampling interval before flooding) and 0.0039 µg/g by 28 days, and was detected below the LOQ at 55 and 83 days posttreatment (Appendix H, Table 2, p.580). Penoxsulam was detected in the 3- to 6-inch soil depth at a maximum concentration of 0.0110 µg/g at 21 days posttreatment and decreased to 0.0047 µg/g by 28 days, and was detected below the LOQ at 55 days. Penoxsulam was not detected above the LOQ in soil below the 3- to 6-inch soil depth. The only two transformation products detected in the soil at a mean concentration above the LOQ were BSTCA and 5-OH DE-638. **BSTCA** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0187 µg/g at 7 days posttreatment, decreased steadily to 0.0078 µg/g by 264 days, and was not detected at 349 days. BSTCA was detected in the 3- to 6-inch and 6- to 9-inch soil depths at maximum concentrations of 0.0104 µg/g and 0.0056 µg/g, respectively, both at 55 days posttreatment, and was not detected below the 6- to 9-inch soil depth. **5-OH DE-638** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0066 µg/g at day-0, decreased to 0.0036 µg/g by 28 days, and was detected below the LOQ at 55 and 83 days posttreatmnent. 5-OH DE-638 was detected in the 3- to 6-inch and 6- to 9-inch soil depths at maximum concentrations of 0.0091 µg/g (25 days) and 0.0055 µg/g (55 days), respectively, and was not detected below the 6- to 9-inch soil depth.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (AR bareground plot).

Days post-treatment	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA
	0- to 3-inch depth				3- to 6-inch depth				6- to 9-inch depth			
0	**0.0795**	**0.0066**	ND	ND	**0.0057**	ND	ND	ND	ND	ND	ND	ND
1	**0.0676**	**0.0042**	ND	**0.0069**	**0.0057**	ND	ND	ND	ND	ND	ND	ND
3	**0.0642**	(0.0028)	(0.0019)	**0.0164**	ND	ND	ND	ND	ND	ND	ND	ND
7	**0.0352**	ND	(0.0020)	**0.0187**	ND	ND	ND	ND	ND	ND	ND	ND
11	**0.0262**	ND	(0.0019)	**0.0177**	ND	ND	ND	ND	ND	ND	ND	ND
13	**0.0352**	**0.0043**	ND	**0.0175**	**0.0057**	(0.0014)	ND	(0.0024)	NS	NS	NS	NS
18	**0.0145**	**0.0061**	ND	**0.0157**	**0.0104**	**0.0068**	ND	**0.0061**	ND	ND	ND	(0.0014)
21	**0.0094**	**0.0043**	ND	**0.0121**	**0.0110**	**0.0070**	ND	**0.0080**	(0.0013)	(0.0017)	ND	(0.0011)
25	**0.0052**	**0.0035**	ND	**0.0108**	**0.0076**	**0.0091**	ND	**0.0075**	ND	ND	ND	ND
28	**0.0039**	**0.0036**	ND	**0.0108**	**0.0047**	**0.0070**	ND	**0.0057**	(0.0018)	(0.0023)	ND	(0.0016)
55	(0.0016)	(0.0013)	ND	**0.0083**	(0.0018)	**0.0036**	ND	**0.0104**	(0.0015)	**0.0055**	ND	**0.0056**
83	(0.0014)	(0.0010)	ND	**0.0116**	ND	**0.0031**	ND	**0.0063**	ND	(0.0028)	ND	**0.0047**
193	ND	ND	ND	**0.0076**	ND	(0.0014)	ND	**0.0088**	ND	(0.0013)	ND	**0.0032**
264	ND	ND	ND	**0.0078**	ND	(0.0014)	ND	**0.0072**	NS	NS	NS	NS
349	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Data obtained from Appendix H, Table 2, p.580 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL). The transformation products 2-amino-TP and sulfonamide were not detected in the soil at any sampling interval. NS = Not sampled.

In the **cropped plot**, penoxsulam was initially detected in the 0- to 3-inch depth of the **soil** at a maximum concentration of 0.0877 µg/g at 1 day posttreatment, decreased to 0.0396-0.0474 µg/g by 7-11 days (0-4 days before flooding) and 0.0043 µg/g by 28 days, and was detected below the LOQ from 55 to 349 days posttreatment (Appendix H, Table 2, pp.581-582). Penoxsulam was detected in the 3- to 6-inch soil depth at a maximum concentration of 0.0222 µg/g at 13 days posttreatment, decreased to 0.0060 µg/g by 28 days, and was detected below the LOQ at 55 days. Penoxsulam was detected in the 6- to 9-inch soil depth above the LOQ at 0.0033-0.0041 µg/g from 21 to 28 days posttreatment, and was not detected above the LOQ below that depth. The only two transformation products detected in the soil at a mean concentration above the LOQ were BSTCA and 5-OH DE-638. **BSTCA** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0096 µg/g at 13 days posttreatment, and decreased to 0.0045-0.0055 µg/g by 264-349 days. BSTCA was detected in the 3- to 6-inch, 6- to 9-inch, and 9- to 12-inch soil depths at maximum concentrations of 0.0063 µg/g (349 days), 0.0032 µg/g (83 days), and 0.0032 µg/g (264 days) respectively, and was not detected above the LOQ in soil below the 9- to 12-inch soil depth. **5-OH DE-638** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0057 µg/g at 1 day posttreatment, decreased to 0.0031-0.0034 µg/g by 13 to 21 days, and was detected below the LOQ at 25, 28, and 55 days posttreatment. 5-OH DE-638 was detected in the 3- to 6-inch, 6- to 9-inch, 9- to 12-inch, and 12- to 15-inch soil depths at maximum concentrations of 0.0090 µg/g (21 days), 0.0049 µg/g (21 days), 0.0048 µg/g (264 days), and 0.0047 µg/g (264 days), respectively, and was not detected above the LOQ in soil below the 12- to 15-inch soil depth.

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Mean concentration (µg/g) of penoxsulam and its transformation products in soil (AR cropped plot).

Days post-treatment	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA
	0- to 3-inch depth				3- to 6-inch depth				6- to 9-inch depth			
0	**0.0645**	(0.0024)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	**0.0877**	**0.0057**	(0.0011)	**0.0037**	(0.0016)	ND	ND	ND	ND	ND	ND	ND
3	**0.0568**	**0.0037**	ND	**0.0038**	**0.0032**	ND	ND	ND	ND	ND	ND	ND
7	**0.0396**	(0.0026)	ND	**0.0063**	(0.0017)	ND	ND	ND	ND	ND	ND	ND
11	**0.0474**	(0.0017)	(0.0014)	**0.0072**	(0.0029)	ND	ND	ND	ND	ND	ND	ND
13	**0.0356**	**0.0031**	ND	**0.0096**	**0.0222**	**0.0040**	ND	**0.0048**	(0.0027)	ND	ND	ND
18	**0.0134**	**0.0031**	ND	**0.0075**	**0.0141**	**0.0065**	ND	**0.0037**	(0.0023)	ND	ND	ND
21	**0.0082**	**0.0034**	ND	**0.0067**	**0.0107**	**0.0090**	ND	**0.0037**	**0.0041**	**0.0049**	ND	ND
25	**0.0053**	(0.0019)	ND	**0.0050**	**0.0081**	**0.0064**	ND	**0.0045**	**0.0036**	(0.0027)	ND	(0.0015)
28	**0.0043**	(0.0022)	ND	**0.0049**	**0.0060**	**0.0071**	ND	**0.0042**	**0.0033**	**0.0045**	ND	(0.0012)
55	(0.0020)	(0.0013)	ND	**0.0034**	(0.0014)	**0.0038**	ND	**0.0042**	(0.0013)	**0.0038**	ND	**0.0031**
83	(0.0018)	ND	ND	(0.0020)	ND	(0.0017)	ND	**0.0033**	ND	(0.0022)	ND	**0.0032**
193	(0.0014)	ND	ND	(0.0027)	ND	ND	ND	**0.0050**	ND	ND	ND	**0.0031**
264	(0.0014)	ND	ND	**0.0045**	ND	ND	ND	**0.0046**	ND	ND	ND	(0.0030)
349	(0.0011)	ND	ND	**0.0055**	ND	ND	ND	**0.0063**	ND	ND	ND	**0.0031**

Data obtained from Appendix H, Table 2, pp.581-582 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL). The transformation products 2-amino-TP and sulfonamide were not detected in the soil at any sampling interval. NS = Not sampled.

Average air temperature and rainfall for the study duration were near normal (pp.39-40; Figure 8, p.108). Rainfall totaled 41 inches during the study period, which is approximately 84% of the 30-year normal precipitation for the same period (Table 13, p.89). Precipitation was not supplemented with irrigation after the plots were drained. Daily environmental data (rainfall, air temperature, relative humidity, wind speed, and solar radiation) were reported in Table 10 (pp.62-73). Redox measurements in the cropped plot indicated that the soil became anaerobic soon after the plot was flooded, and that the paddy water was generally aerobic at 3 cm above the soil and intermediate to reducing at 1 cm above the soil (pp.41-42; Figures 14-15, pp.114-115). Following the rice growing season, the soil dried and became aerobic before fall rains kept the soil wet and reduced.

California field site

Penoxsulam (DE-638; formulated as a liquid containing a nominal 19.6% penoxsulam), applied once at a target application rate of 100 g a.i./ha (2 times the current proposed label rate of 49 g a.i./ha) onto a bareground and wet-seeded rice plot of Oswald clay soil, dissipated in the paddy water with a calculated half-life values of 4.8 days ($r^2 = 0.99$) in the bareground plot and 6.8 days ($r^2 = 0.98$) in the cropped plot. Calculated half-life values for penoxsulam in soil were 13.9 days ($r^2 = 0.53$) for the bareground plot and 26.2 days ($r^2 = 0.84$; based on data points through 90 days posttreatment) for the cropped plot. Penoxsulam dissipated from the total system with a calculated half-life value of 5.0 days ($r^2 = 0.99$) in the bareground plot and 10.4 days ($r^2 = 0.97$) in the cropped plot.

In the **bareground plot**, penoxsulam was detected in the **paddy water** at a mean concentration of 0.0634 µg/mL at day 0, decreased steadily to 0.0296 µg/mL by 7 days and 0.0070 µg/mL by 14 days, and was detected below the LOQ at 21 days posttreatment (Table 14, p.90). The transformation product **BSTCA** was detected above the LOQ from 5 to 21 days posttreatment at concentrations ranging from 0.0035 to 0.0045 µg/mL, and was detected below the LOQ at 30 days posttreatment. The transformation product **TPSA** was detected above the LOQ from 5 to 10 days at concentrations ranging from 0.0031 to 0.0032 µg/mL, and was detected below the LOQ from 14 to 30 days posttreatment. The only additional transformation product detected in the paddy water was BSA, which was not detected above the LOQ at any sampling interval.

Mean concentration (µg/mL) of penoxsulam and its transformation products in paddy water (CA bareground plot).

Days post-treatment	DE-638	5-OH	BSTCA	Sulfona-mide	TPSA	BSA	2-amino-TP	5-OH-2-amino-TP
0	**0.0634**	ND	ND	ND	(0.0010)	ND	ND	ND
0.5	**0.0607**	ND	(0.0011)	ND	ND	ND	ND	ND
1	**0.0593**	ND	(0.0011)	ND	ND	ND	ND	ND
2	**0.0557**	ND	(0.0019)	ND	(0.0017)	ND	ND	ND
3	**0.0440**	ND	(0.0030)	ND	(0.0022)	ND	ND	ND
5	**0.0393**	ND	**0.0035**	ND	**0.0031**	ND	ND	ND
7	**0.0296**	ND	**0.0037**	ND	**0.0032**	ND	ND	ND
10	**0.0182**	ND	**0.0045**	ND	**0.0032**	(0.0011)	ND	ND
14	**0.0070**	ND	**0.0039**	ND	(0.0026)	ND	ND	ND
21	(0.0029)	ND	**0.0043**	ND	(0.0022)	(0.0013)	ND	ND
30	ND	ND	(0.0026)	ND	(0.0011)	ND	ND	ND

Data were obtained from Table 14, p.90 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL).

In the **cropped plot**, penoxsulam was detected in the **paddy water** at a mean concentration of 0.0717 µg/mL at day 0, decreased steadily to 0.0358 µg/mL by 7 days and 0.0157 µg/mL by 14 days, and was detected at 0.0041 µg/mL at 30 days posttreatment (Table 14, p.90). The transformation product **BSTCA** was detected above the LOQ from 7 to 14 days posttreatment at concentrations ranging from 0.0030 to 0.0034 µg/mL, and was detected below the LOQ at 21 and 30 days posttreatment. The only additional transformation product detected in the paddy water was TPSA, which was not detected above the LOQ at any sampling interval.

Mean concentration (µg/mL) of penoxsulam and its transformation products in paddy water (CA cropped plot).

Days post-treatment	DE-638	5-OH	BSTCA	Sulfona-mide	TPSA	BSA	2-amino-TP	5-OH-2-amino-TP
0	**0.0717**	ND	ND	ND	ND	ND	ND	ND
0.5	**0.0591**	ND	ND	ND	ND	ND	ND	ND
1	**0.0628**	ND	ND	ND	ND	ND	ND	ND
2	**0.0593**	ND	(0.0012)	ND	(0.0013)	ND	ND	ND
3	**0.0522**	ND	(0.0022)	ND	(0.0017)	ND	ND	ND
5	**0.0445**	ND	(0.0026)	ND	(0.0018)	ND	ND	ND
7	**0.0358**	ND	**0.0030**	ND	(0.0022)	ND	ND	ND
10	**0.0263**	ND	**0.0034**	ND	(0.0023)	ND	ND	ND
14	**0.0157**	ND	**0.0032**	ND	(0.0017)	ND	ND	ND
21	**0.0060**	ND	(0.0028)	ND	(0.0014)	ND	ND	ND
30	**0.0041**	ND	(0.0030)	ND	ND	ND	ND	ND

Data were obtained from Table 14, p.90 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL).

24

In the **bareground plot**, penoxsulam was initially detected in the 0- to 3-inch depth of the **soil** at a maximum concentration of 0.0134 µg/g at day 0, ranged from 0.0053 to 0.0067 µg/g from 1 to 10 days posttreatment, and was detected below the LOQ at 14 and 21 days posttreatment (Appendix H, Table 2, p.582). The only transformation product detected in the soil at a mean concentration above the LOQ was BSTCA. **BSTCA** was detected in the 0- to 3-inch soil depth at 0.0033-0.0038 µg/g from 21 to 185 days posttreatment, and was detected below the LOQ at 288 and 367 days. Penoxsulam and BSTCA were not detected below the 0- to 3-inch soil depth at any sampling interval.

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (CA bareground plot).

Days post-treatment	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA	DE-638	5-OH	BSTCA
	0- to 3-inch depth			3- to 6-inch depth			6- to 9-inch depth		
0	**0.0134**	ND	ND	ND	ND	ND	ND	ND	ND
0.5	**0.0034**	ND	ND	ND	ND	ND	ND	ND	ND
1	**0.0063**	ND	ND	ND	ND	ND	ND	ND	ND
2	**0.0060**	ND	ND	ND	ND	ND	ND	ND	ND
3	**0.0054**	ND	ND	ND	ND	ND	ND	ND	ND
5	**0.0054**	ND	ND	ND	ND	ND	ND	ND	ND
7	**0.0067**	(0.0013)	(0.0018)	ND	ND	ND	ND	ND	ND
10	**0.0053**	(0.0012)	(0.0023)	ND	ND	ND	ND	ND	ND
14	(0.0029)	ND	(0.0023)	ND	ND	ND	ND	ND	ND
21	(0.0027)	(0.0014)	**0.0038**	ND	ND	ND	ND	ND	ND
30	ND	ND	**0.0037**	ND	ND	ND	ND	ND	ND
60	ND	ND	**0.0037**	ND	ND	ND	ND	ND	ND
90	ND	ND	**0.0033**	ND	ND	ND	ND	ND	ND
185	ND	ND	**0.0036**	ND	ND	ND	ND	ND	ND
288	ND	ND	(0.0019)	ND	ND	ND	ND	ND	ND
367	ND	ND	(0.0024)	ND	ND	ND	ND	ND	ND

Data were obtained from Appendix H, Table 2, pp.582-583 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL). The transformation products BSA, 2-amino-TP and sulfon-amide were not detected in the soil at any sampling interval. NS = Not sampled.

25

In the **cropped plot**, penoxsulam was initially detected in the 0- to 3-inch depth of the **soil** at a maximum concentration of 0.0137 µg/g at day 0, was variable from 0.0068 to 0.0126 µg/g from 12 hours to 14 days, then decreased to 0.0041 µg/g by 30 days, and was detected below the LOQ at 60 and 90 days posttreatment (Appendix H, Table 2, p.583). The only two transformation products detected in the soil at a mean concentration above the LOQ were BSTCA and 5-OH DE-638. **BSTCA** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0118 µg/g at 185 days posttreatment, and decreased to 0.0067 µg/g by 367 days. **5-OH DE-638** was detected in the 0- to 3-inch soil depth at a maximum concentration of 0.0049 µg/g at 21 days, decreased to 0.0044 µg/g by 30 days, and was detected below the LOQ at 60 days posttreatment. Penoxsulam and its transformation products were not detected above the LOQ in soil below the 0- to 3-inch depth, with the exception of two detections of BSTCA in the 3- to 6-inch soil depth at 185 days (0.0056 µg/g) and 367 days (0.0106 µg/g; Appendix H, Table 2, p.584).

Mean concentration (µg/g) of penoxsulam and its transformation products in soil (CA cropped plot).

Days post-treatment	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA	DE-638	5-OH	BSA	BSTCA
	0- to 3-inch depth				3- to 6-inch depth				6- to 9-inch depth			
0	**0.0137**	ND	ND	ND	ND	ND	ND	ND	(0.0016)	ND	ND	ND
0.5	**0.0068**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	**0.0076**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2	**0.0081**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3	**0.0107**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
5	**0.0108**	(0.0017)	ND	(0.0019)	ND	ND	ND	ND	ND	ND	ND	ND
7	**0.0109**	(0.0024)	ND	(0.0022)	ND	ND	ND	ND	ND	ND	ND	ND
10	**0.0126**	**0.0035**	ND	**0.0042**	ND	ND	ND	ND	ND	ND	ND	ND
14	**0.0100**	**0.0047**	ND	**0.0058**	ND	ND	ND	ND	ND	ND	ND	ND
21	**0.0058**	**0.0049**	ND	**0.0072**	ND	ND	ND	ND	ND	ND	ND	ND
30	**0.0041**	**0.0044**	ND	**0.0085**	ND	ND	ND	ND	ND	ND	ND	ND
60	(0.0019)	(0.0021)	ND	**0.0117**	ND	(0.0014)	ND	(0.0026)	ND	ND	(0.0012)	ND
90	(0.0011)	ND	ND	**0.0086**	ND	ND	ND	(0.0016)	ND	ND	ND	ND
185	ND	ND	ND	**0.0118**	ND	ND	ND	**0.0056**	NS	NS	NS	NS
288	ND	ND	ND	**0.0084**	ND	ND	ND	(0.0011)	ND	ND	ND	ND
367	ND	ND	ND	**0.0067**	ND	ND	ND	**0.0106**	ND	ND	ND	(0.0014)

Data obtained from Appendix H, Table 2, pp.583-584 of the study report. Values in parenthesis are below the limit of quantitation (0.003 µg/mL). The transformation products 2-amino-TP and sulfonamide were not detected in the soil at any sampling interval. NS = Not sampled.

Average air temperature and rainfall for the study duration were near normal (pp.39-40; Figure 9, p.109). Rainfall totaled 14 inches during the study period, which is approximately 83% of the 30-year normal precipitation for the same period (Table 13, p.89). Precipitation was not supplemented with irrigation after the plots were drained. Daily environmental data (rainfall, air temperature, relative humidity, wind speed, and solar radiation) were reported in Table 11 (pp.74-87). Redox measurements in the cropped plot indicated that the soil was very anaerobic during the period in which the plot was flooded, and that the paddy water was aerobic at 3 cm above the soil and intermediate to reducing at 1 cm above the soil (pp.41-42; Figures 16-17, pp.116-117). Following the rice growing season, the soil dried and became aerobic.

DEFICIENCIES/DEVIATIONS

1. The study authors stated that four additional transformation products were detected in laboratory studies at ≥10% of the applied penoxsulam besides the seven transformation products analyzed for in this study, but that in a meeting with US EPA EFED on January 23, 2001, it was agreed upon to not include these transformation products in the analytical methods (Appendix A, pp.127-128). However, the agreement to not include these transformation products in the analytical methods was contingent upon a lack of toxicity to non-target organisms and to human. At a May 19, 2004 meeting of Health Effects Division's MARC, it was determined that two of the penoxsulam transformation not evaluated in the soil matrix of this study, SFA and 5,8-diOH, are considered residues of concern for EFED water assessments.

2. Penoxsulam was applied at 100 g a.i./ha, which is 2 times the current proposed label rate of 49 g a.i./ha. The use of exaggerated dose rates may affect the degradation rate of the chemical relative to the degradation rate which would occur under normal use rates. While exaggerated rates may be used to facilitate residue identification, EPA requires that kinetics studies be conducted with the proposed maximum usage rate (*Pesticide Reregistration Rejection Rate Analysis*. 1993. U.S. EPA Document: EPA 738-R-93-010, pp.66-67). Mean recoveries of penoxsulam from the application rate verification pads ranged from 90.4 to 97.3% of the expected for all test plots (Table 7, p.56). The study authors further stated that the calculated application rates, based on the calibrated spray rates and the application pass-times, were 101.0 and 101.2 g a.i./ha for the cropped and bareground plots at the California site and 101.8 and 103.8 g a.i./ha for the cropped and bareground plots at the Arkansas site (p.30).

3. The storage stability data were inadequate to demonstrate that penoxsulam and its transformation products are stable in frozen soil/refrigerated water for the duration of time in which the test samples were stored prior to analysis. The study authors stated that a laboratory frozen storage stability study of penoxsulam and transformation products in soil and water is currently in progress, and that preliminary results indicate that penoxsulam and its transformation products are stable in frozen soil for at least 327 days and in refrigerated water for at least 130 days (penoxsulam) or 284 days (penoxsulam transformation products; pp.34-

35). The reviewer notes that the maximum length of storage for the test samples were 561 days for soil and 515 days for water (Appendix D, Table 1, pp.178-180). The authors stated that the storage stability study is scheduled to continue for up to approximately 2 years (Appendix D, p.164).

4. In addition to the storage stability study of penoxsulam and its transformation products conducted separately, the study authors reported additional stability data for penoxsulam in water that were obtained by comparing test water samples analyzed for penoxsulam within about 30 days of sample collection and then again at a later time (pp.34-36; Table 9, pp.58-61). These data indicated that, on average, there was very little change in penoxsulam recoveries from the first to second assays, indicating stability of penoxsulam during storage. However, the reviewer notes that this is not the preferred method for determining storage stability.

5. The registrant calculated half-life and DT_{90} values for penoxsulam in rice paddy water (reported on both a mass and concentration basis) and the total soil/water test system for test plots at both field sites and in soil at the Arkansas field site. Registrant-calculated half-life values for penoxsulam in water were 3.3-4.1 days in the Arkansas bareground and cropped plots and 4.5-7.1 days in the California bareground and cropped plots (Tables 16-17, p.92; Figures 18-20, pp.118-120), and best-estimate half-life values in soil ranged from 13 to 16 days in the Arkansas bareground and cropped plots (Table 19, p.95; Figures 21-22, pp.121-122). Dissipation of penoxsulam from the total system was determined after converting concentrations in water and soil to mass per plot and then summing the water and soil values to obtain a total system mass of penoxsulam on the test plot (Table 20, pp.96-97). Registrant-calculated best-fit half-lives for penoxsulam in the total soil/water system were 13.2 days for the Arkansas bareground plot, 16.0 days for the Arkansas cropped plot, 5.0 days for the California bareground plot, and 10.4 days for the California cropped plot (Table 22, p.98; Figures 25-26, pp.125-126).

6. A plot history was not reported for any of the test plots, at both field sites.

7. The study authors stated that laboratory environmental fate and chemistry studies indicated that penoxsulam degrades through two separate pathways, the photolytic degradation pathway which is initiated by cleavage of the sulfonamide bridge portion of the parent molecule and through the biodegradation pathway which proceeds through degradation of the pyrimidine ring and its substituents (pp.21-22).

8. Physical properties of penoxsulam were reported in Table 1 (p.51).

9. The two different test systems, application to dry-seeded rice in Arkansas and to wet-seeded rice in California, were used in the study because they represent the two major cultural practices for rice planting and herbicide application in the USA (p.22).

10. The reviewer noted an error in the test plot sampling design section of the study report (p.27). The study authors reported that five sampling blocks were selected from each of

the five subplots in the Arkansas treated test plots per sampling event to produce a total of 15 samples per treated test plot per sample event. However, this would produce a total of 25 samples per sample event. The reviewer reported the sampling design so as to agree with the design at the California test site, in which 3 samples were collected from each of 5 subplots. Clarification by the registrant may be necessary.

11. Signed and dated Good Laboratory Practice, Quality Assurance and No Data Confidentiality statements were provided with the study (pp.2-4).

Attachment 1

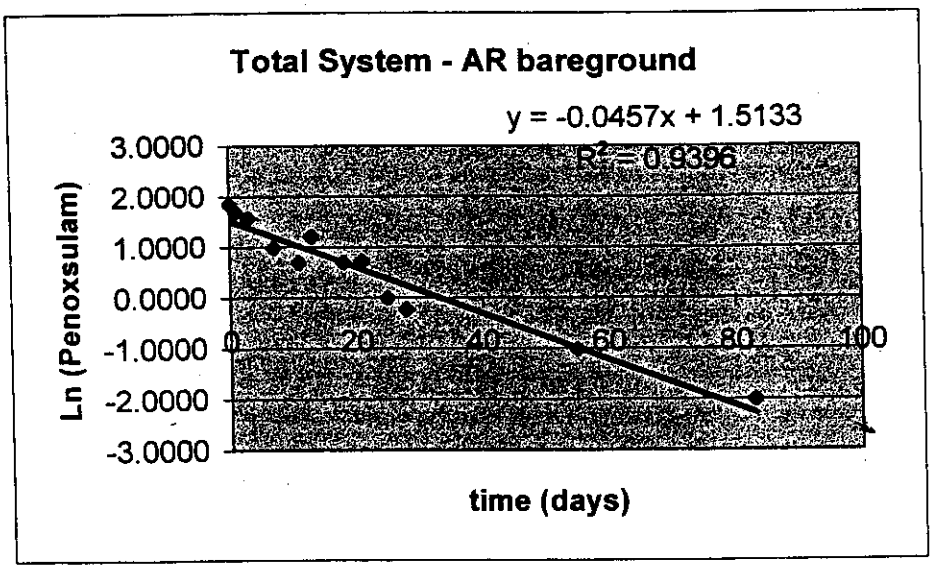
Excel Spreadsheets

Chemical Name	Penoxsulam	**Arkansas Total System**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 15.2

Days Posttreatmen	Penoxsulam (g/plot)	Ln (Penoxsulam)
0	6.2748	1.8365
1	5.3957	1.6856
3	4.7678	1.5619
7	2.6561	0.9769
11	1.9909	0.6886
13	3.3177	1.1993
18	1.9912	0.6887
21	2.0397	0.7128
25	0.9861	-0.0140
28	0.7863	-0.2404
55	0.3595	-1.0230
83	0.1330	-2.0174
193	0.0558	-2.8860
264	0.0341	-3.3785

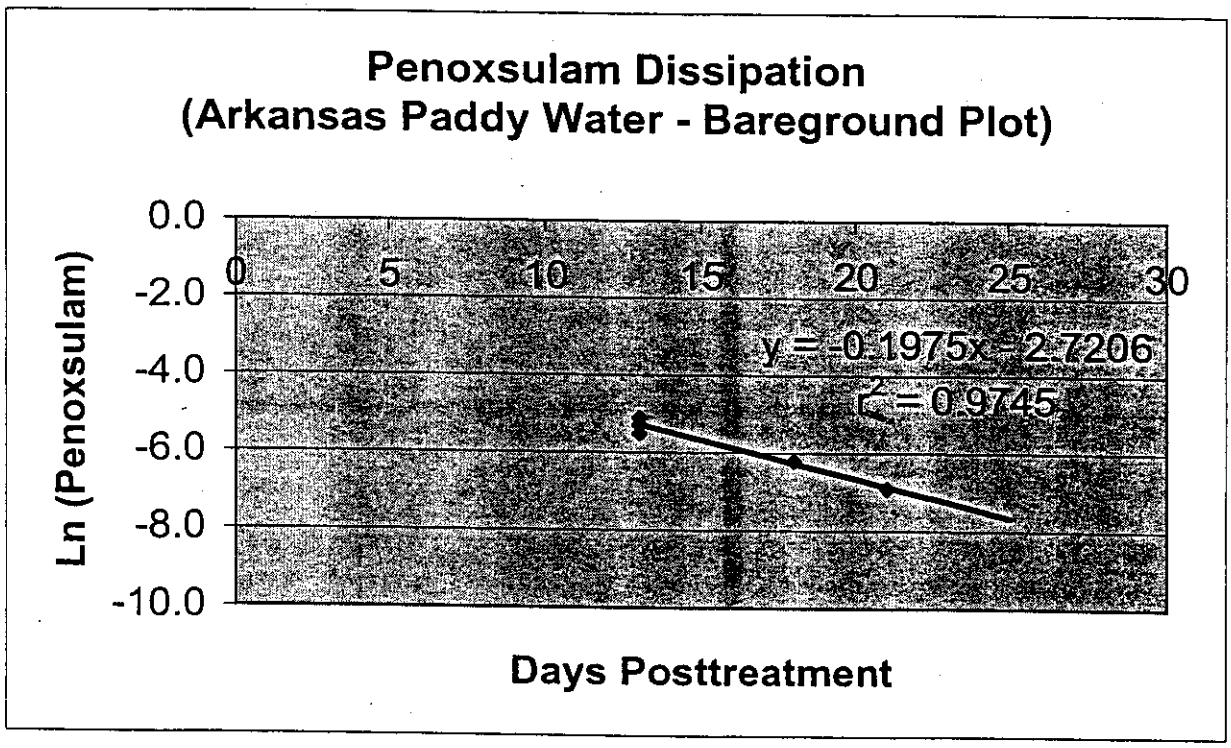
Data obtained from Table 20, p. 96 of the study report.



Chemical Name	Penoxsulam	**Arkansas Paddy Water**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	
Half-life (days) =	**3.5**	* Half-life based on all data points

Days Posttreatment	Penoxsulam (ug/mL)	Ln (Penoxsulam)
13	0.005	-5.2983
13	0.004	-5.5215
13	0.006	-5.1160
18	0.002	-6.2146
18	0.002	-6.2146
18	0.002	-6.2146
21	0.001	-6.9078
21	0.001	-6.9078
21	0.001	-6.9078
25	ND	
25	ND	
25	ND	
28	ND	
28	ND	
28	ND	

Data obtained from Appendix G, Table 5, pp. 561-563 of the study report.
* Some replicate values may be reviewer-calculated means of multiple analyses.



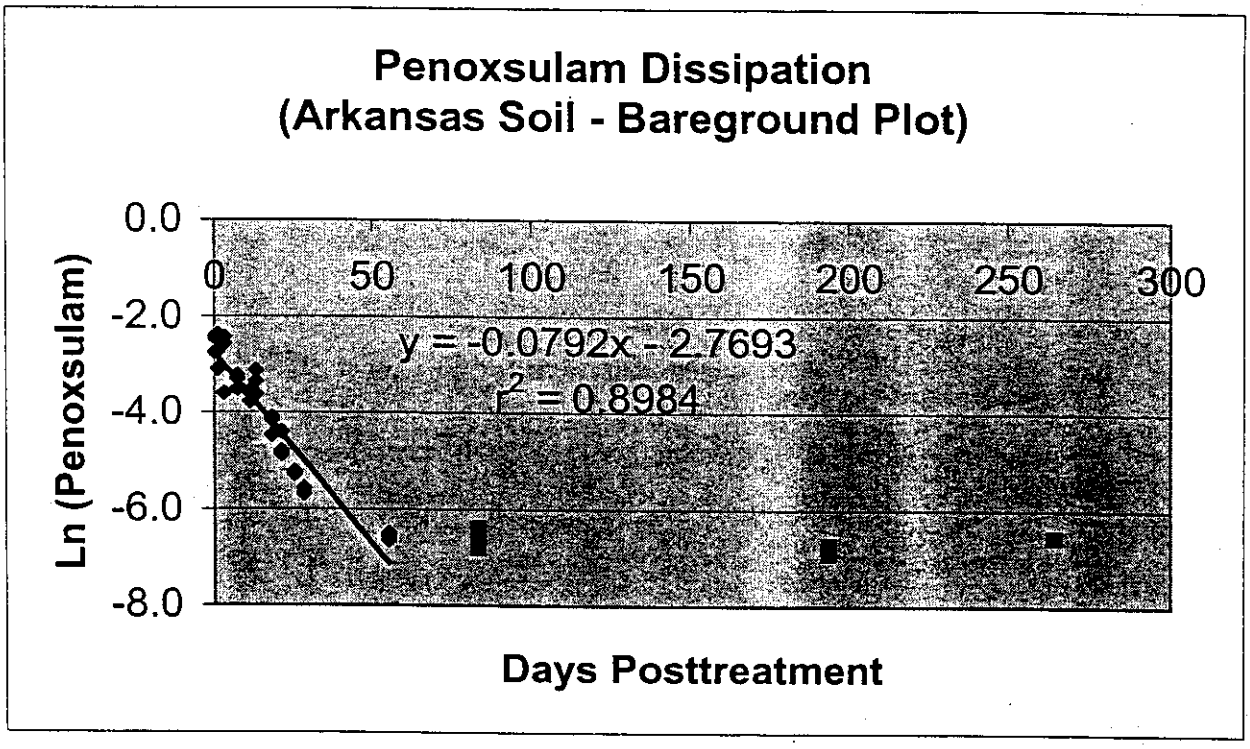
Chemical Name	Penoxsulam	**Arkansas Soil (0- to 3-inch depth)**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = **8.8**

* Half-life based on 0- to 55-day posttreatment data points.

Days Posttreatment	Penoxsulam (ug/g)	Ln (Penoxsulam)
0	0.0860	-2.4534
0	0.0637	-2.7536
0	0.0888	-2.4214
1	0.0449	-3.1033
1	0.0652	-2.7303
1	0.0927	-2.3784
3	0.0883	-2.4270
3	0.0274	-3.5972
3	0.0767	-2.5679
7	0.0394	-3.2340
7	0.0298	-3.5132
7	0.0365	-3.3104
11	0.0229	-3.7766
11	0.0285	-3.5579
11	0.0273	-3.6009
13	0.0267	-3.6231
13	0.0349	-3.3553
13	0.0438	-3.1281
18	0.0165	-4.1044
18	0.0114	-4.4741
18	0.0156	-4.1605
21	0.0077	-4.8665
21	0.0083	-4.7915
21	0.0123	-4.3982
25	0.0054	-5.2214
25	0.0051	-5.2785
25	0.0053	-5.2400
28	0.0034	-5.6840
28	0.0038	-5.5728
28	0.0038	-5.5728
55	0.0013	-6.6454
55	0.0015	-6.5023
55	0.0014	-6.5713
83	0.0015	-6.5023
83	0.0011	-6.8124
83	0.0017	-6.3771
193	0.0012	-6.7254
193	0.0011	-6.8124
193	0.0010	-6.9078
264	0.0014	-6.5713
264	0.0014	-6.5713
264	0.0000	
349	0.0000	
349	0.0000	
349	0.0000	

Data obtained from Appendix H, Table 1, pp. 565-579 of the study report.
* Some replicate values may be reviewer-calculated means of multiple analyses.

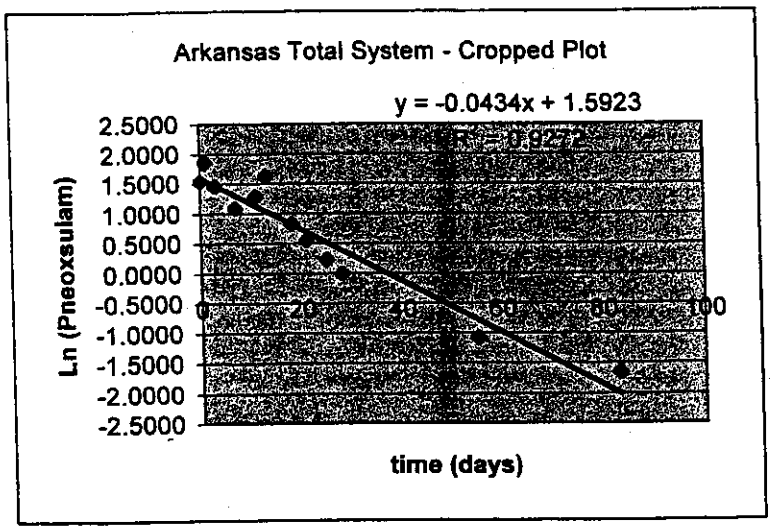


Chemical Name	Penoxsulam	**Arkansas Total System**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 16.0

Days Posttreatment	Penoxsulam (g/plot)	(Penoxsulam)
0	4.6462	1.5360
1	6.3121	1.8425
3	4.2579	1.4488
7	2.9439	1.0797
11	3.5777	1.2747
13	5.0443	1.6183
18	2.2537	0.8126
21	1.7108	0.5370
25	1.2539	0.2263
28	0.9793	-0.0209
55	0.3372	-1.0871
83	0.1903	-1.6592
193	0.1217	-2.1062
264	0.2561	-1.3622
349	0.1045	-2.2586

Data obtained from Table 20, p. 96 of the study report.

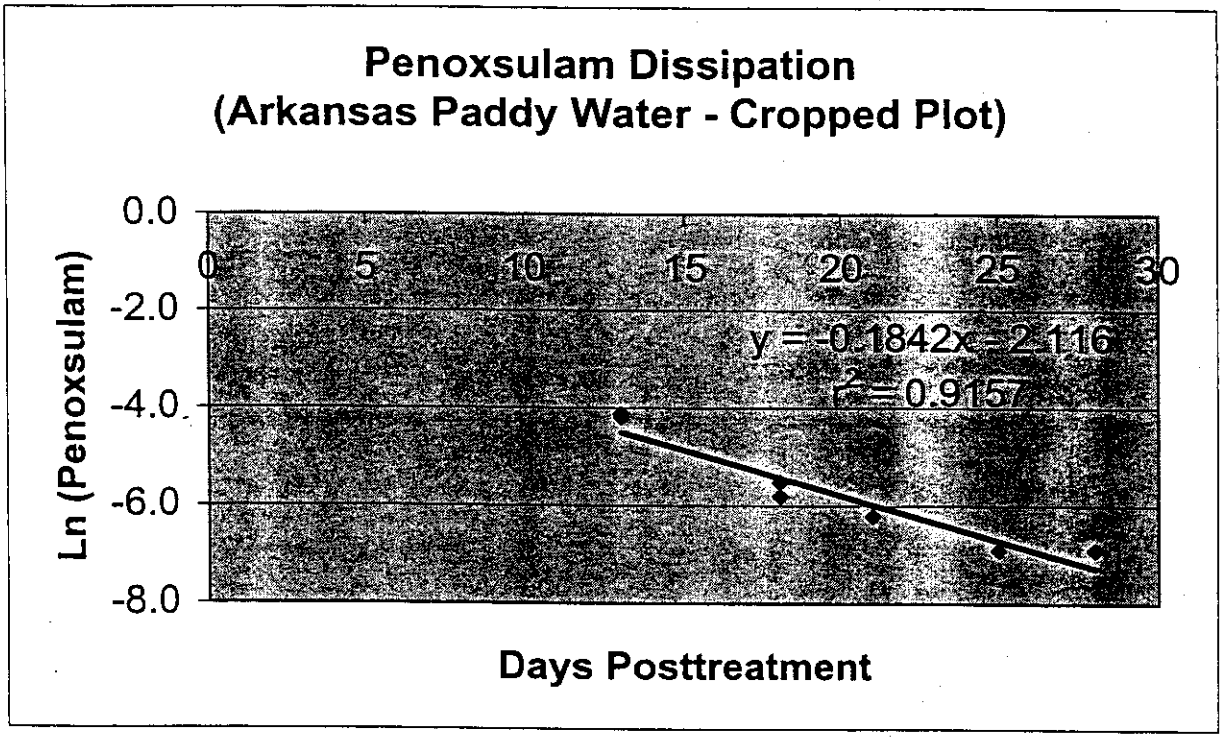


Chemical Name	Penoxsulam	**Arkansas Paddy Water**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = **3.8** * Half-life based on all data points

Days Posttreatment	Penoxsulam (ug/mL)	Ln (Penoxsulam)
13	0.015	-4.1997
13	0.015	-4.1997
13	0.016	-4.1352
18	0.003	-5.8091
18	0.003	-5.8091
18	0.004	-5.5215
21	0.002	-6.2146
21	0.002	-6.2146
21	0.002	-6.2146
25	0.001	-6.9078
25	0.001	-6.9078
25	0.001	-6.9078
28	0.001	-6.9078
28	0.001	-6.9078
28	0.001	-6.9078

Data obtained from Appendix G, Table 5, pp. 561-563 of the study report.
* Some replicate values may be reviewer-calculated means of multiple analyses.



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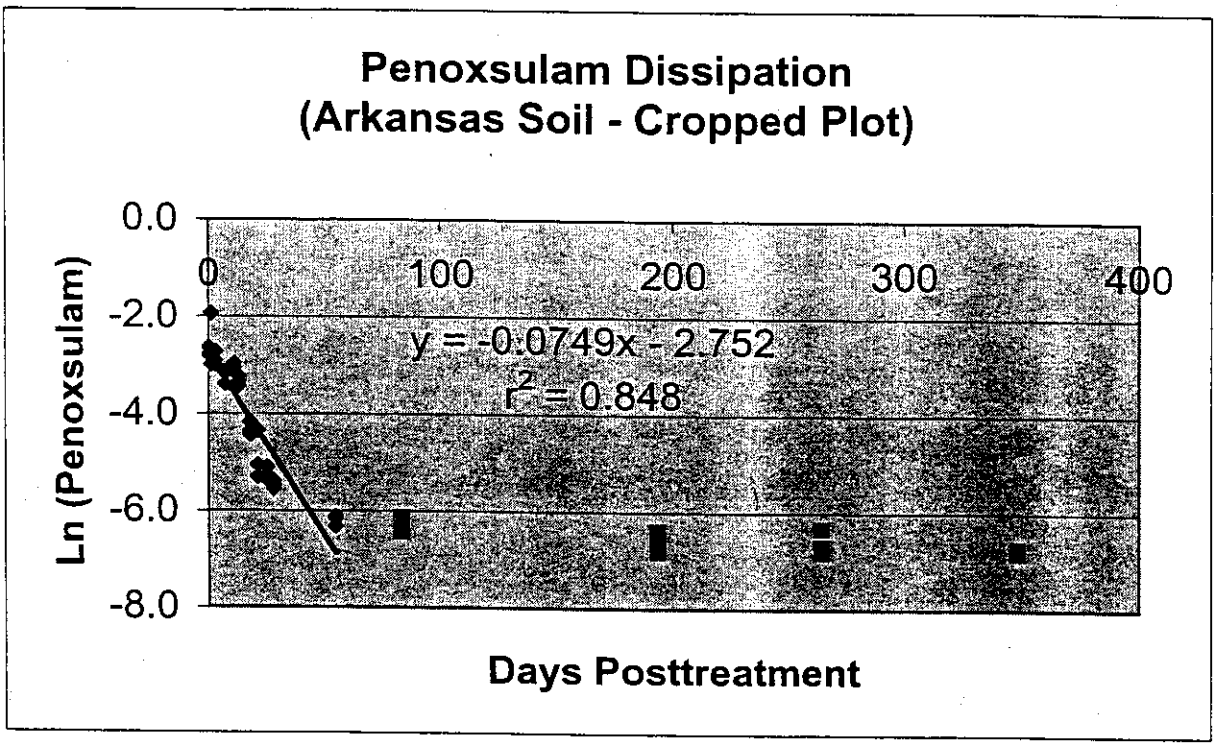
Chemical Name	Penoxsulam	**Arkansas Soil (0- to 3-inch depth)**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = **9.3**

* Half-life based on 0- to 55-day posttreatment data poin

Days Posttreatment	Penoxsulam (ug/g)	Ln (Penoxsulam)
0	0.0617	-2.7855
0	0.0605	-2.8051
0	0.0712	-2.6423
1	0.0681	-2.6868
1	0.1451	-1.9303
1	0.0500	-2.9957
3	0.0499	-2.9977
3	0.0549	-2.9022
3	0.0655	-2.7257
7	0.0430	-3.1466
7	0.0334	-3.3992
7	0.0423	-3.1630
11	0.0518	-2.9604
11	0.0469	-3.0597
11	0.0436	-3.1327
13	0.0395	-3.2315
13	0.0320	-3.4420
13	0.0353	-3.3439
18	0.0154	-4.1734
18	0.0129	-4.3505
18	0.0119	-4.4312
21	0.0050	-5.2983
21	0.0064	-5.0515
21	0.0131	-4.3351
25	0.0047	-5.3602
25	0.0061	-5.0995
25	0.0051	-5.2785
28	0.0046	-5.3817
28	0.0043	-5.4608
28	0.0039	-5.5468
55	0.0022	-6.1193
55	0.0021	-6.1658
55	0.0018	-6.3200
83	0.0016	-6.4378
83	0.0022	-6.1193
83	0.0018	-6.3200
193	0.0017	-6.3771
193	0.0011	-6.8124
193	0.0013	-6.6454
264	0.0018	-6.3200
264	0.0013	-6.6846
264	0.0011	-6.8124
349	0.0011	-6.8124
349	0.0012	-6.7254
349	0.0012	-6.7254

Data obtained from Appendix H, Table 1, pp. 565-579 of the study report.
* Some replicate values may be reviewer-calculated means of multiple analyses.

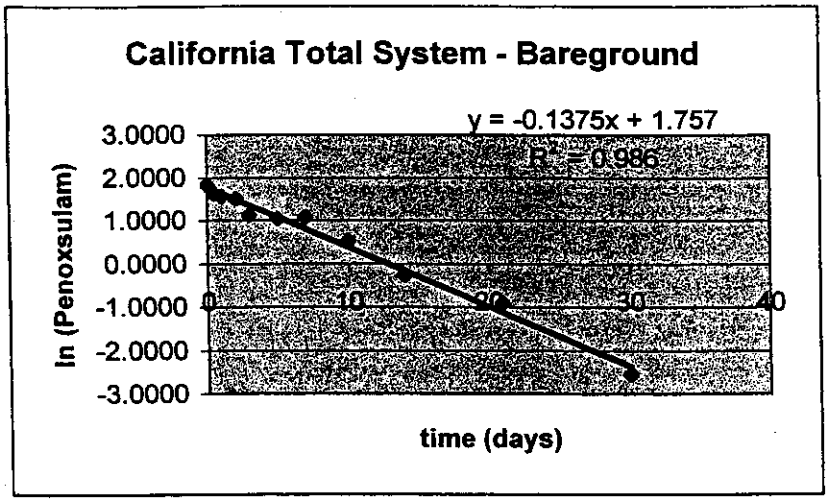


Chemical Name	Penoxsulam	**California Total System**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 5.0

Days Posttreatment	Penoxsulam (g/plot)	(Penoxsulam)
0	6.167	1.8192
0.5	5.013	1.6120
1	4.747	1.5575
2	4.447	1.4921
3	3.050	1.1151
5	2.789	1.0255
7	2.927	1.0740
10	1.668	0.5113
14	0.759	-0.2754
21	0.400	-0.9168
30	0.079	-2.5408

Data obtained from Table 20, p. 97 of the study report.

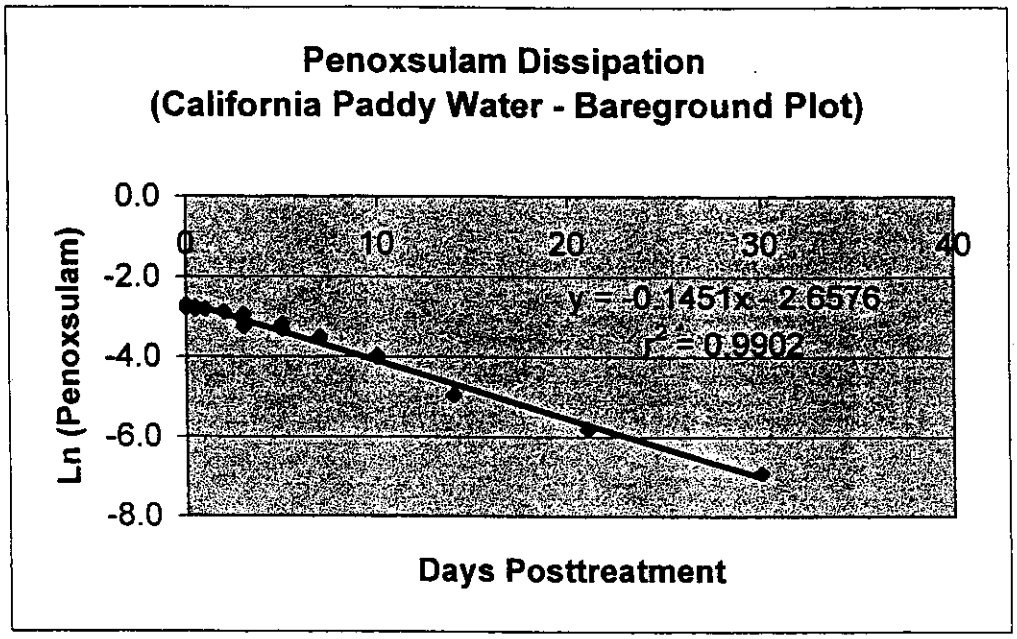


Chemical Name	Penoxsulam	**California Paddy Water**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = **4.8** * Half-life based on all data points.

Days Posttreatment	Penoxsulam (ug/mL)	Ln (Penoxsulam)
0	0.061	-2.7969
0	0.067	-2.7031
0	0.063	-2.7646
0.5	0.059	-2.8302
0.5	0.060	-2.8134
0.5	0.063	-2.7646
1	0.060	-2.8134
1	0.059	-2.8302
1	0.059	-2.8302
2	0.055	-2.9004
2	0.056	-2.8824
2	0.056	-2.8824
3	0.053	-2.9375
3	0.045	-3.1011
3	0.039	-3.2442
5	0.041	-3.1942
5	0.041	-3.1942
5	0.036	-3.3242
7	0.029	-3.5405
7	0.030	-3.5066
7	0.030	-3.5066
10	0.019	-3.9633
10	0.018	-4.0174
10	0.018	-4.0174
14	0.007	-4.9618
14	0.007	-4.9618
14	0.007	-4.9618
21	0.003	-5.8091
21	0.003	-5.8091
21	0.003	-5.8091
30	0.001	-6.9078
30	0.001	-6.9078
30	0.001	-6.9078

Data obtained from Appendix G, Table 5, pp. 561-563 of the study report.
* Some replicate values may be calculated means of multiple analyses.

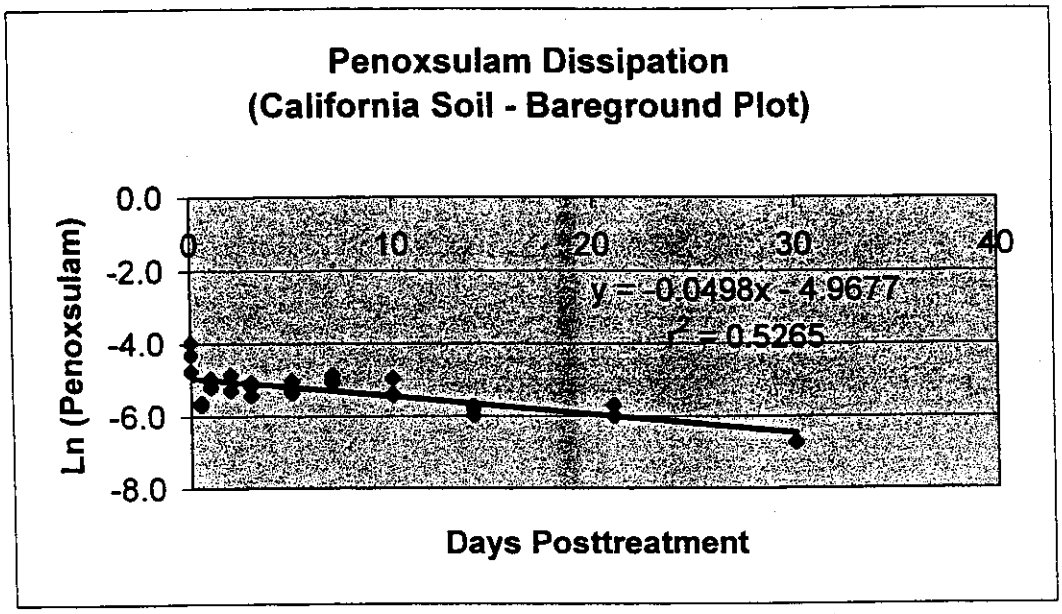

Penoxsulam Dissipation
(California Paddy Water - Bareground Plot)
Ln (Penoxsulam)
0.0
-2.0
-4.0
-6.0
-8.0
0
10
20
30
40
y = -0.1451x - 2.6576
r² = 0.9902
Days Posttreatment

Chemical Name	Penoxsulam	**California Soil (0- to 3-inch depth)**
PC Code	119031	**Bareground Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 13.9 * Half-life based on all data points.

Days Posttreatment	Penoxsulam (ug/g)	Ln (Penoxsulam)
0	0.0185	-3.9900
0	0.0084	-4.7795
0	0.0134	-4.3125
0.5	0.0035	-5.6550
0.5	0.0036	-5.6408
0.5	0.0033	-5.7138
1	0.0066	-5.0207
1	0.0070	-4.9618
1	0.0054	-5.2214
2	0.0050	-5.2983
2	0.0077	-4.8665
2	0.0051	-5.2785
3	0.0062	-5.0832
3	0.0056	-5.1850
3	0.0043	-5.4491
5	0.0046	-5.3817
5	0.0052	-5.2688
5	0.0065	-5.0360
7	0.0076	-4.8796
7	0.0065	-5.0360
7	0.0061	-5.0995
10	0.0070	-4.9618
10	0.0044	-5.4376
10	0.0045	-5.4037
14	0.0030	-5.8091
14	0.0033	-5.7291
14	0.0025	-5.9915
21	0.0024	-6.0323
21	0.0025	-6.0117
21	0.0033	-5.7138
30	0.0012	-6.7254

Data obtained from Appendix H, Table 1, pp. 572-579 of the study report.
* Some replicate values may be calculated means of multiple analyses.

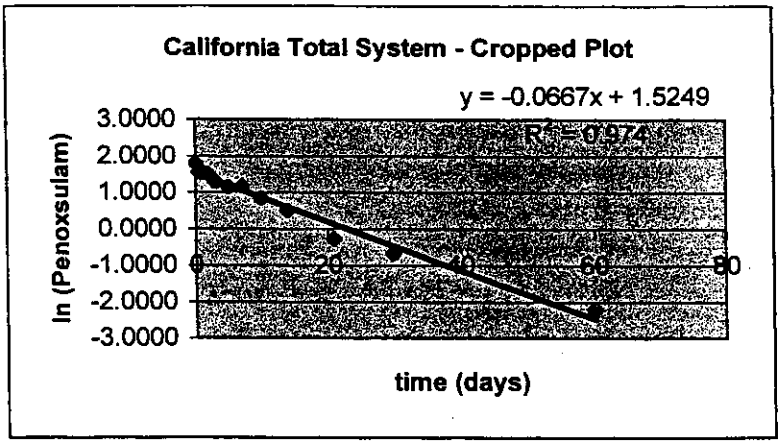

Penoxsulam Dissipation
(California Soil - Bareground Plot)
Ln (Penoxsulam)
0.0
-2.0
-4.0
-6.0
-8.0
0
10
20
30
40
y = -0.0498x - 4.9677
r² = 0.5265
Days Posttreatment

Chemical Name	Penoxsulam	**California Total System**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 10.4

Days Posttreatment	Penoxsulam (g/plot)	(Penoxsulam)
0	5.990	1.7902
0.5	4.656	1.5382
1	4.652	1.5374
2	4.440	1.4907
3	3.604	1.2820
5	3.123	1.1386
7	3.153	1.1484
10	2.279	0.8239
14	1.639	0.4941
21	0.749	-0.2889
30	0.502	-0.6900
60	0.110	-2.2091
90	0.055	-2.8986
185	0.043	-3.1583
288	0.019	-3.9686

Data obtained from Table 20, p. 97 of the study report.

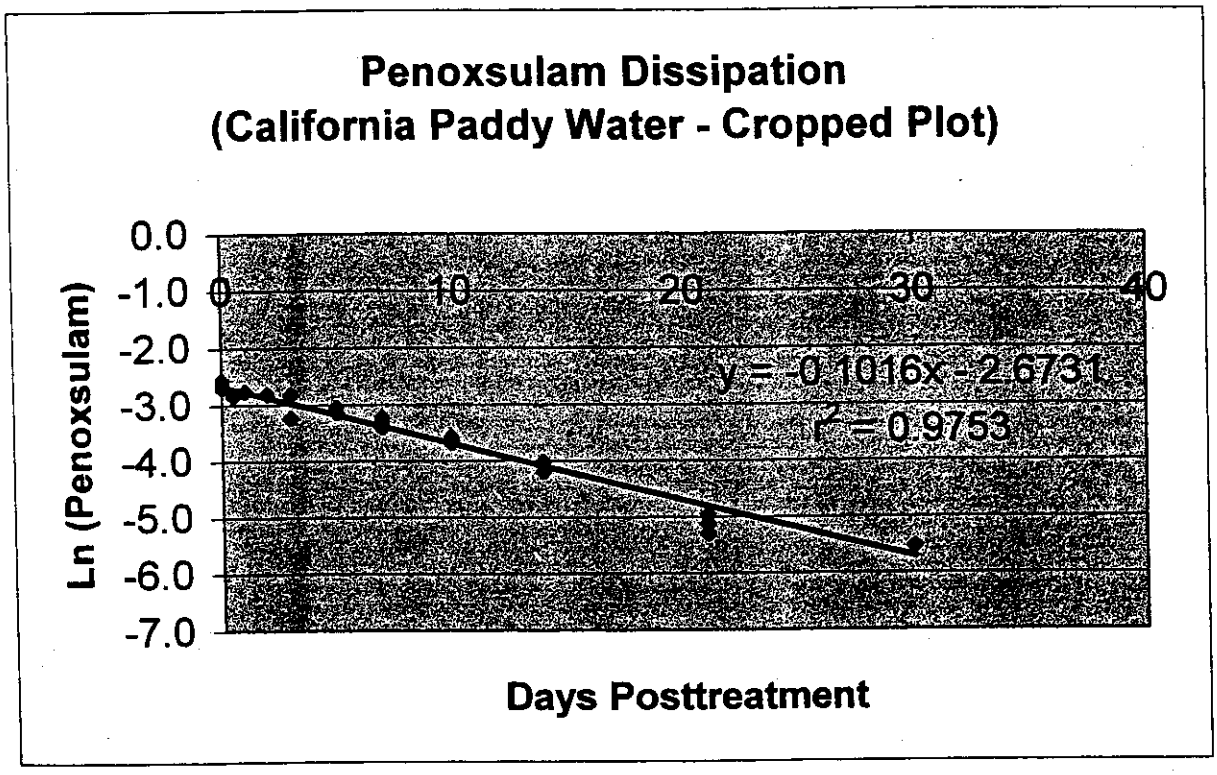


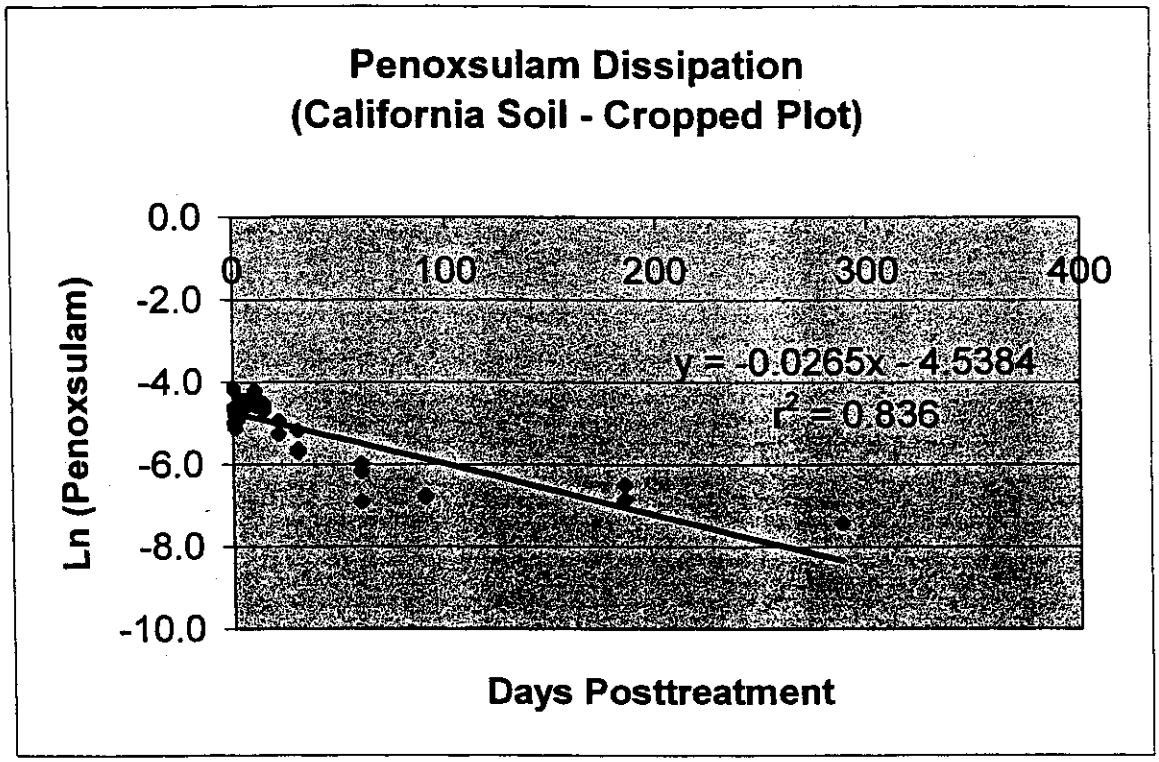
Chemical Name	Penoxsulam	**California Paddy Water**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = **6.8** * Half-life based on all data points.

Days Posttreatment	Penoxsulam (ug/mL)	Ln (Penoxsulam)
0	0.067	-2.7031
0	0.076	-2.5770
0	0.072	-2.6311
0.5	0.059	-2.8302
0.5	0.058	-2.8473
0.5	0.060	-2.8134
1	0.063	-2.7646
1	0.062	-2.7806
1	0.063	-2.7646
2	0.060	-2.8134
2	0.059	-2.8302
2	0.059	-2.8302
3	0.039	-3.2442
3	0.059	-2.8302
3	0.059	-2.8302
5	0.043	-3.1466
5	0.047	-3.0576
5	0.043	-3.1466
7	0.033	-3.4112
7	0.039	-3.2442
7	0.035	-3.3524
10	0.026	-3.6497
10	0.025	-3.6889
10	0.028	-3.5756
14	0.018	-4.0174
14	0.015	-4.1997
14	0.015	-4.1997
21	0.006	-5.1160
21	0.007	-4.9618
21	0.005	-5.2983
30	0.004	-5.5215
30	0.004	-5.5215
30	0.004	-5.5215

Data obtained from Appendix G, Table 5, pp. 561-563 of the study report.
* Some replicate values may be calculated means of multiple analyses.


Penoxsulam Dissipation
(California Paddy Water - Cropped Plot)
Ln (Penoxsulam)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
0
10
20
30
40
y = -0.1016x - 2.6731
r² = 0.9753
Days Posttreatment


Penoxsulam Dissipation
(California Soil - Cropped Plot)
Ln (Penoxsulam)
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
0
100
200
300
400
y = -0.0265x - 4.5384
r² = 0.836
Days Posttreatment

Chemical Name	Penoxsulam	**California Soil (0- to 3-inch depth)**
PC Code	119031	**Cropped Plot**
MRID	45830804	
Guideline No.	164-2	

Half-life (days) = 26.2

Days Posttreatment	Penoxsulam (ug/g)	Ln (Penoxsulam)
0	0.0153	-4.1799
0	0.0160	-4.1352
0	0.0097	-4.6356
0.5	0.0092	-4.6886
0.5	0.0066	-5.0207
0.5	0.0069	-4.9762
1	0.0081	-4.8159
1	0.0059	-5.1328
1	0.0065	-5.0360
2	0.0089	-4.7217
2	0.0072	-4.9337
2	0.0081	-4.8159
3	0.0101	-4.5952
3	0.0119	-4.4312
3	0.0102	-4.5854
5	0.0102	-4.5854
5	0.0115	-4.4654
5	0.0106	-4.5469
7	0.0109	-4.5190
7	0.0115	-4.4654
7	0.0104	-4.5659
10	0.0148	-4.2131
10	0.0104	-4.5659
10	0.0127	-4.3662
14	0.0101	-4.5952
14	0.0090	-4.7105
14	0.0108	-4.5282
21	0.0071	-4.9477
21	0.0052	-5.2591
21	0.0051	-5.2785
30	0.0056	-5.1850
30	0.0035	-5.6550
30	0.0033	-5.7138
60	0.0021	-6.1658
60	0.0010	-6.9078
60	0.0025	-5.9915
90	0.0011	-6.8124
90	0.0012	-6.7680
90	0.0011	-6.8124
185	0.0011	-6.8590
185	0.0015	-6.5023
288	0.0006	-7.4186

Data obtained from Appendix H, Table 1, pp. 565-579 in the study report.

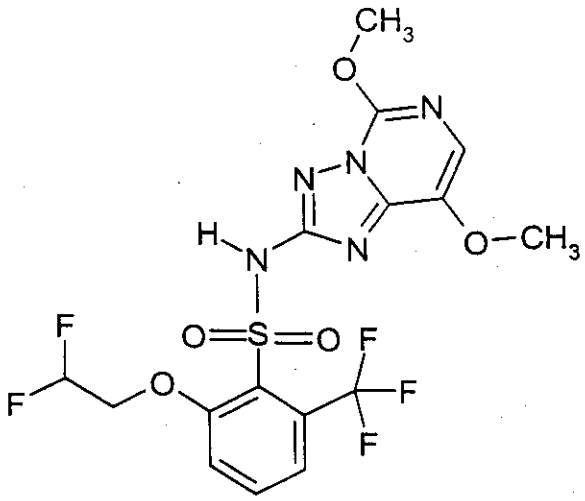
Attachment 2

Structures of Parent and Transformation Products

Penoxsulam

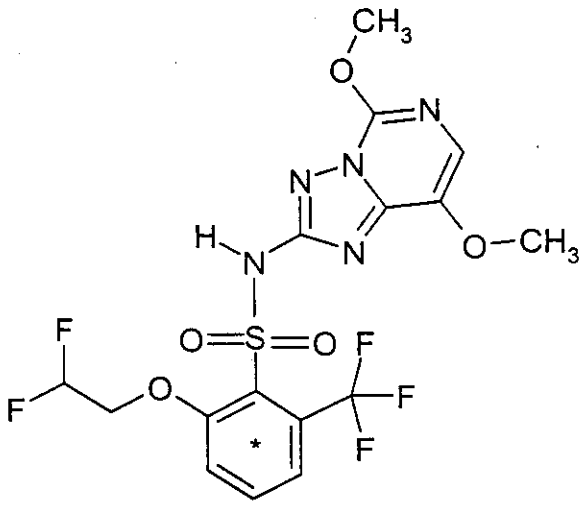
IUPAC name:	3-(2,2-Difluoroethoxy)-N-(5,8-dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-□,□,□-trifluorotoluene-2-sulfonamide
CAS name:	2-(2,2-Difluoroethoxy)-N-(5,8-dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide
CAS No:	219714-96-2

Unlabeled

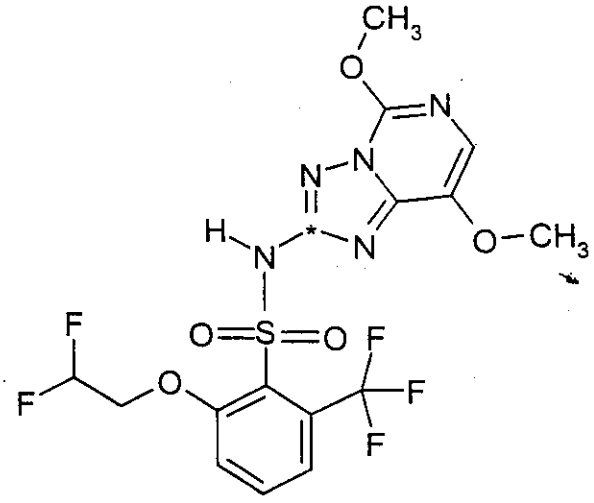


60

[Phenyl-U-^{14}C] label



[Triazolopyrimidine-2-^{14}C] label

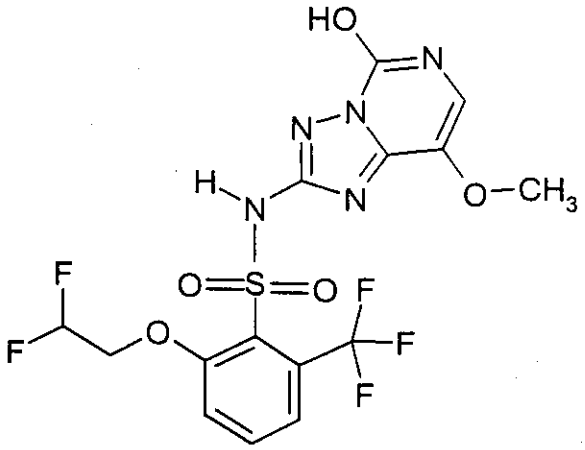


* Position of the radiolabel.

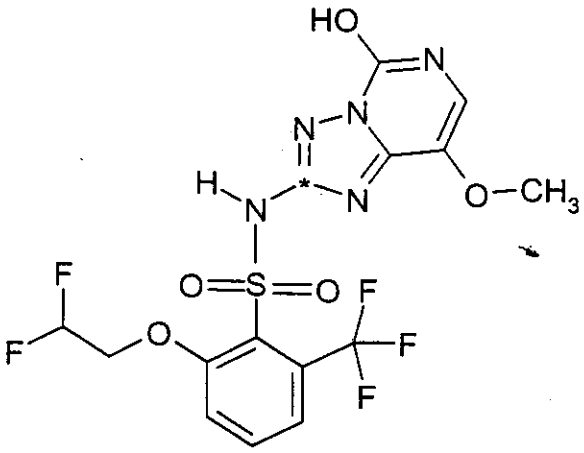
5-OH-XDE-638

IUPAC name: 6-(2,2-Difluoroethoxy)-N-(5,6-dihydro-8-methoxy-5-oxo-s-triazolo[1,5-c]pyrimidin-2-yl)-□,□,□-trifluoro-o-toluenesulfonamide
CAS name: (2,2-Difluoroethoxy)-N-(5,6-dihydro-8-methoxy-5-oxo[1,2,4]triazolo[1,5-c]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide
CAS No: NA

Unlabeled



[Triazolopyrimidine-2-^{14}C] label



* Position of the radiolabel.

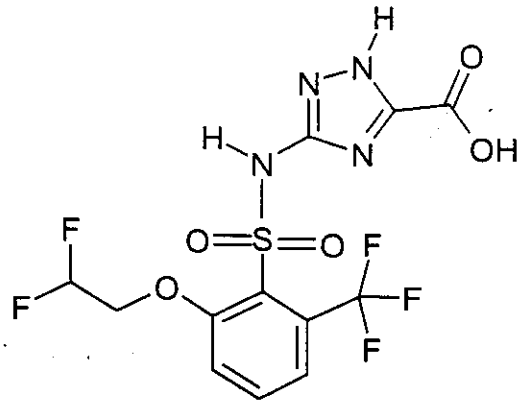
BSTCA

IUPAC name: 3-[6-(2,2-Difluoroethoxy)-□,□,□-(trifluoro-o-toluenesulfonamido]-s-triazole-5-carboxylic acid

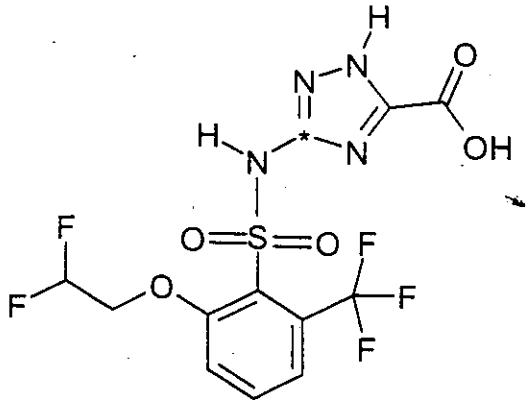
CAS name: 3-[[[2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)phenyl]-sulfonyl]amino]-1H-1,2,4-triazole-5-carboxylic acid

CAS No: NA

Unlabeled



[Triazolopyrimidine-2-^{14}C] label

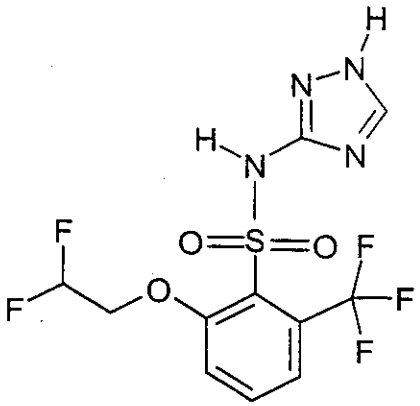


* Position of the radiolabel.

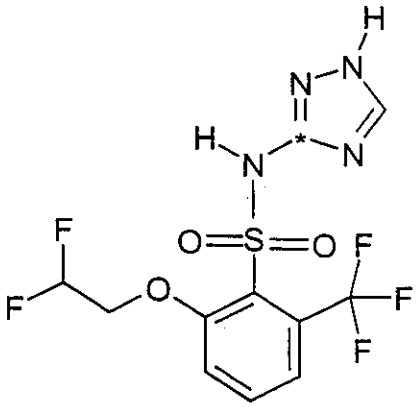
BST

IUPAC name: 6-(2,2-Difluoroethoxy)-□,□,□-trifluoro-N-s-triazol-3-yl-o-toluenesulfonamide
CAS name: 2-(2,2-Difluoroethoxy)-N-1H-1,2,4-triazole-3-yl-6-(trifluoromethyl)benzenesulfonamide
CAS No: NA

Unlabeled



[Triazolopyrimidine-2-^{14}C] label

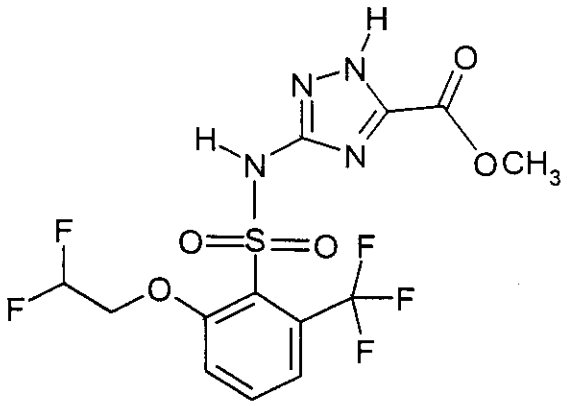


* Position of the radiolabel.

604

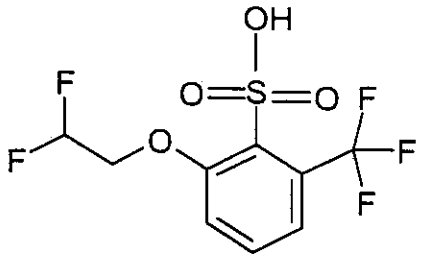
BSTCA-methyl

IUPAC name: Methyl 3-[6-(2,2-difluoroethoxy)-□,□,□-trifluoro-o-toluenesulfonamido]-s-triazole-5-carboxylate
CAS name: Methyl 3-[[[2-(2,2-difluoroethoxy)-6-(trifluoromethyl)phenyl]sulfonyl]amino]-1H-1,2,4-triazole-5-carboxylate
CAS No: NA



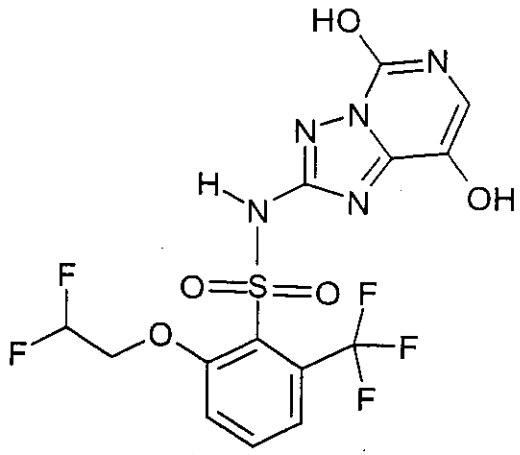
BSA

IUPAC name: 6-(2,2-Difluoroethoxy)-□,□,□-trifluoro-o-toluenesulfonic acid
CAS name: 2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)benzenesulfonic acid
CAS No: NA



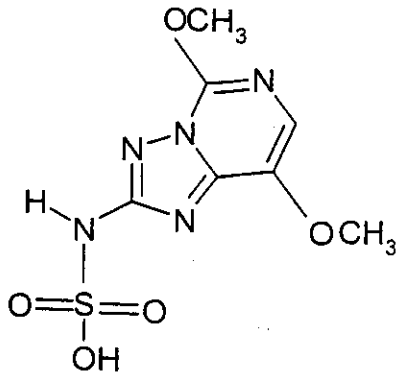
5,8-diOH

IUPAC name: NA
CAS name: 2-(2,2-Difluoroethoxy)-6-trifluoromethyl-N-(5,8-dihydroxy-[1,2,4]triazolo[1,5-c]pyrimidin-2-yl)benzenesulfonamide
CAS No: NA



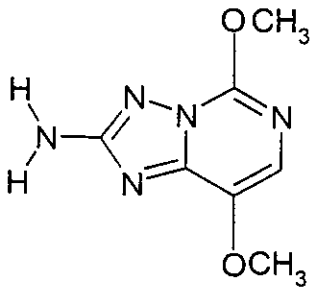
TPSA

IUPAC name: NA
CAS name: 5,8-Dimethoxy[1,2,4]triazolo-[1,5-c]pyrimidin-2-yl-sulfamic acid
CAS No: NA



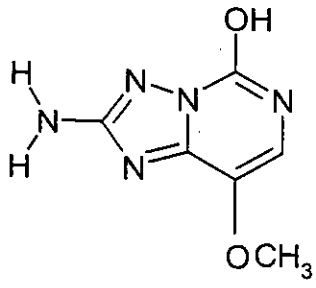
2-Amino TP

IUPAC name: 2-Amino-5,8-dimethoxy-s-triazolo[1,5-c]pyrimidine
CAS name: 5,8-Dimethoxy[1,2,4]triazolo[1,5-c]pyrimidin-2-amine
CAS No: NA



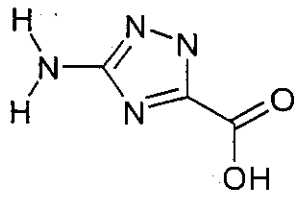
5-OH, 2-Amino TP

IUPAC name: NA
CAS name: 8-Methoxy[1,2,4]triazolo-[1,5-c]pyrimidin-5-ol-2-amine
CAS No: NA



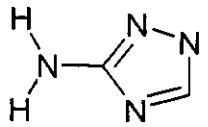
2-Amino TCA

IUPAC name: NA
CAS name: 2-Amino-1,3,4-triazole-5-carboxylic acid
CAS No: NA



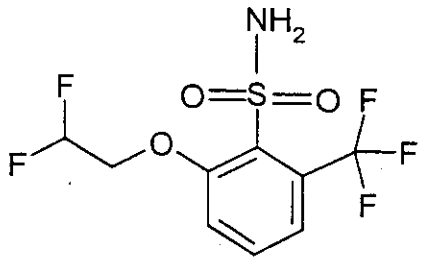
2-Amino-1,3,4-triazole

IUPAC name: NA
CAS name: 2-Amino-1,3,4-triazole
CAS No: NA



Sulfonamide

IUPAC name: 2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)-benzenesulfonamide
CAS name: 2-(2,2-Difluoroethoxy)-6-(trifluoromethyl)-benzenesulfonamide
CAS No: NA



Sulfonylformamidine

IUPAC name: 2-(2,2-Difluoroethoxy)-N-[(E)iminomethyl-6-(trifluoromethyl)benzenesulfonamide
CAS name: 2-(2,2-Difluoroethoxy)-N-(iminomethyl-6-(trifluoromethyl)-benzenesulfonamide
CAS No: NA