Date Out: OCT 17 1994

Chemical Code:128501
DP Barcode:D195551,D195552,D195553,D195554

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Robert Taylor, PM #25
Registration Division (H7505C)

From: Akiva Abramovitch, Section Head
Chemistry Review Section 3
Environmental Fate & Ground Water Branch/EFED (H7507C)

For A.A.

Thru: Henry Jacoby, Chief
Henry Jacoby 10/14/94
Environmental Fate & Ground Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of...

Common Name:	Sulfosate	Trade name:	Touchdown
Company Name:	Zeneca		
ID #:	1H05606,1H05606,1F03950,0F03860		
Purpose:	To review storage stability data to support 164-1 studies.		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	231,251	94-0009	2.0 days

STATUS OF STUDIES IN THIS PACKAGE: REQUIREMENTS

Guideline #	MRID	Status[1]
storage/sta.	42937702	A

STATUS OF DATA ADDRESSED IN THIS PACKAGE:

Guideline #	Status[1]

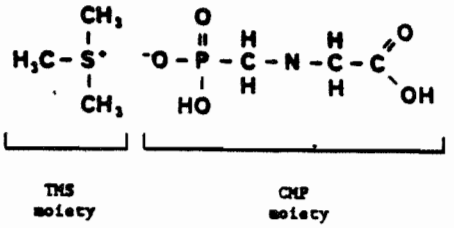
1

1. CHEMICAL:
Common Name: Sulfosate

Chemical Name: Trimethylsulfonium carboxymethyl aminomethylphosphonate;

Type of product: Herbicide

Chemical Structure:



Physical/Chemical Properties
Molecular formula: $C_6H_{15}NO_5PS$.
Molecular weight: 244.23.
Physical state: Liquid.
Specific gravity: 1.27 g/cm^3.
Boiling point: 110 C at 760 Torr.
Vapor pressure: <4 x 10^{-7} Torr at 25 C.

2. TEST MATERIAL:

See attached DER.

3. STUDY/ACTION TYPE:

To review a Frozen Storage Stability study in response to a previously reviewed terrestrial field dissipation study.

4. STUDY IDENTIFICATION:

(1) MRID No:42937701
Rhodes M.E. May, 1989, Glyphosate-trimesium: Response to the Environmental Fate Review of Terrestrial Field Dissipation Data Supporting Pesticide Nos. 1H5606 and 1F3950 (Grapes), OF3860 (Soybeans), and OF3890 (Citrus). Addendum to Previously Reported Studies (MRID #41235906, 41209921, and 41235907) Performing Laboratory, Zeneca Inc. Western Research Center 1200 South 47th Street Richmond, CA 94804-0023. Laboratory ID WRC 89-23, -37, -40.

(2) MRID No:42937702
G. W. Schwab, May 21, 1986. Frozen Storage Stability of TOUCHDOWN in Soil. Performing Laboratory Stauffer Chemical Company Richmond Research Center Physical/Environmental Section 1200 South 47th Street Richmond, CA 94804. Laboratory ID RRC 86-61.

5. REVIEWED BY:

Kevin L. Poff, Chemist
Environmental Chemistry Review Section #3
Environmental Fate and Groundwater Branch/EFED

Date: OCT 11 1994

6. APPROVED BY:

Akiva Abramovitch, Ph.D., Chemist
Environmental Chemistry Review Section #3
Environmental Fate and Groundwater Branch/EFED

For AA

Date: OCT 11 1994

7. CONCLUSIONS:

Ancillary Study - Frozen Storage Stability

1. Study MRID #42937702 is acceptable and may be used to support the previously reviewed terrestrial field (164-1) dissipation studies for sulfosate (Trimethylsulfonium carboxymethyl aminomethylphosphonate)

2. Sulfosate (Trimethylsulfonium carboxymethyl aminomethylphosphonate) residues were stable in soil stored frozen (-20 C) for 2 years. The residues that were tested were TMS (trimethylsulfonium cation), CMP (carboxymethyl aminomethyl phosphonate), and AMPA (aminomethyl phosphonic acid). Based on the information provided by this study, soil samples containing sulfosate residues may be stored frozen for up to 2 years prior to analysis.

ENVIRONMENTAL FATE ASSESSMENT

Sulfosate is comprised of two moieties: trimethylsulfonium cation (TMS) and carboxymethlaminomethylphosphate anion (CAP). In general, the available field data indicate sulfosate (TMS, CAP and the AMPA metabolite formed from CAP) adsorbs fairly strongly to soil and would not be expected to move vertically below the 6 inch soil layer.

The data indicate that although there is some photochemical decomposition, chemical decomposition in general is not a significant pathway of degradation of sulfosate. However, sulfosate (CAP moiety) appears to be readily degraded by soil microbes (t1/2= 48 to 72 hrs.) to aminomethyl phosphonic acid (AMPA), which is degraded further to CO_2, although at a slower rate than for parent sulfosate. In addition, the TMS moiety appears to biodegrade fairly rapidly (t1/2= 72 hrs.) to CO_2 as well.

Even though sulfosate is highly water soluble it appears that parent sulfosate (TMS, CAP) and the AMPA degradate have a low potential to move to ground water due to fairly fast microbial degradation and the adsorptive characteristics as demonstrated in the laboratory and field studies. Laboratory batch equilibrium studies of parent sulfosate in four separate soils indicated a moderate adsorption giving Freundlich K (ads) values of 9-21, desorption values were 4-9. In a soil column (aged 3 day) residues applied to 2 separate soils did not move below 6 cm. Parent sulfosate also showed low mobility in a supplemental soil TLC study. However, sulfosate does have a limited potential to contaminate surface waters. If a runoff event were to occur

shortly after application, parent sulfosate would readily wash from the application area and could be transported to local surface waters. In surface water, sulfosate may either photodegrade or persist for sometime, depending on light sensitization and water pH.

Based on the low vapor pressure of sulfosate, volatilization from soils will not be an important dissipation mechanism. The low octanol/water coefficient suggests that sulfosate will have a low tendency to accumulate in fish.

8. RECOMMENDATIONS:

Inform the registrant that together the frozen storage stability study MRID #42937702, with the terrestrial field dissipation studies MRID #41235906, MRID #41235907, and MRID #41209921 completely satisfy the terrestrial field dissipation (164-1) data requirement for sulfosate.

Satisfied:

-Hydrolysis (161-1). Stable at pH 5, 7, and 9 at 25°C. EFGWB #4119, 4120 3/1/84
-Photodegradation in water (161-2). pH 5, cation stable; anion 14.6 days, pH 7, cation stable; anion 77.9 days, pH 9, cation 31.7 days; anion 41.6 days.
EFGWB #4119, 4120 3/1/84.
-Photodegradation in soil (161-3). Cation stable, anion 382 hours; EFGWB # 6147, 6148, 1/21/86. EFGWB # 60707-60708,70214-70215, 3/27/87.
-Aerobic Soil Metabolism (162-1). Sandy loam, cation 49 hours, anion 13 hours. EFGWB # 6483-6486, 6/30/86: EFGWB # 70716-17, 6/26/87. However, EFGWB # 70760-61 indicates an aerobic half-life of 2-3 wks for both cation and anion.
-Anaerobic Soil Metabolism (162-2). Half-life of cation is 2 months based on CO_2 evolution. Anion exhibited a half-life similar to that of the aerobic metabolism study of 2-3 wks. EFGWB # 70760-61, 9/22/87.
-Leaching/Adsorption/Desorption (163-1). K_d values were 3-9; < 1% of the applied radiolabeled material was eluted w/ 20 inches of water. EFGWB # 70760-61, 9/22/87.
- Terrestrial Field Dissipation (164-1). The half-life of the cation (TMS) in three different studies was 5, 6, and 10 days. The half-life of the anion (CMP) was 4, 6, and 12 days. In general sulfosate residues were not detected below 3 inches. EFGWB #'s 90-0680-0681,-0594-0595,-0784,91-0755,-0361 reviewed on 9/25/91.

Waived:

Fish Accumulation (165-3).

Reserved:

Ground Water Monitoring
166-1. Small Prospect.

9. BACKGROUND :

Frozen storage stability data was submitted as a response to previously reviewed terrestrial field dissipation (164-1) studies. (90-0680-0681,-0594-0595,-0784,91-0755,-0361 reviewed on 9/25/91) At that time the terrestrial field dissipation studies did not satisfy the data requirement because of a lack of storage stability data.

10. DISCUSSION:
See attached DER.

11. COMPLETION OF ONE-LINER:
Attached.

12. CBI INDEX:
Not Applicable.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SULFOSATE
Last Update on October 12, 1994
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer:	Section Head:	Date:

Common Name:SULFOSATE
Smiles Code:
PC Code # :128501 CAS #:81591-81-3 Caswell #:

Chem. Name :TRIMETHYLSULFONIUM CARBOXYMETHYLAMINOMETHYL-PHOSPHONATE

Action Type:Herbicide

Trade Names:TOUCHDOWN
(Formul'tn):
Physical State:

Use Patterns (% Usage) :NONSELECTIVE SYSTEMIC HERBICIDE FOR POSTEMERGENCE WEED CONTROL

Empirical Form: $C_3H_7NPO_5^- + SC_3H_9$
Molecular Wgt.: 245.23 Vapor Pressure: 4.00E -7 Torr
Melting Point : °C Boiling Point: 110C@1Atm°C
Log Kow : -5 pKa: @ °C
Henry's : E Atm. M3/Mol (Measured)

Solubility in....				Comments
Water	E	ppm	@20.0 °C	very soluble
Acetone	E	ppm	@ °C	
Acetonitrile	E	ppm	@ °C	
Benzene	E	ppm	@ °C	
Chloroform	E	ppm	@ °C	
Ethanol	E	ppm	@ °C	
Methanol	E	ppm	@ °C	
Toluene	E	ppm	@ °C	
Xylene	E	ppm	@ °C	
	E	ppm	@ °C	
	E	ppm	@ °C	

Hydrolysis (161-1)
[V] pH 5.0:STABLE 25C
[V] pH 7.0:STABLE 25C
[V] pH 9.0:STABLE 25C
[ ] pH :
[ ] pH :
[ ] pH :

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Photolysis (161-2, -3, -4)
[V] Water:pH5 CAT. STABLE; AN. 14.6DA
[V] :pH7 CAT. STABLE; AN. 77.9DA
[V] :pH9 CAT. 31.7DA; AN. 41.6DA
[ ] :

[V] Soil :+ STABLE; ANION 382 HR
[ ] Air :

Aerobic Soil Metabolism (162-1)

	SOIL	pH	%OM	(+)	(-)
[V]	SdLm	5.6	1.1	49 HRS	13HR
[ ]	LOAM	6.9	1.9	300 "	16 "
[ ]	SAND	6.7	2.5	29 "	33 "
[ ]	LOAM	5.7	6.2		19 "
[ ]					
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Anaerobic Soil Metabolism (162-2)
[V] T1/2 FOR (+) MOIETY=2 MONTHS
[ ] BASED ON CO2 EVOLUTION
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Anaerobic Aquatic Metabolism (162-3)
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Aerobic Aquatic Metabolism (162-4)
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Soil Partition Coefficient (Kd) (163-1)

		Kd VALUES FOR TMS MOIETY:				
[ ]		Sd	Si	Cl	%OM	pH	Kd
[V]		88	9	3	0.6	7.9	6.72
[V]		44	43	13	1.4	6.6	3.67
[V]		14	56	30	4.4	5.3	8.08
[V]				52	2.1	5.1	8.96

Soil Rf Factors (163-1)

		CATION	ANION
[V]			
[ ]	SdLm	.06	.20
[ ]	Lm	.01	.16
[ ]	Sd	.09	.08
[ ]	Lm	0.0	.16
[ ]			

Laboratory Volatility (163-2)
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[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)

[V]	FIELD STUDIES CONDUCTED IN VA, CA, IO, FL; APPL 6 LBS AIA:			
[ ]	STATE	CAP(-)	TMS(+)	AMPA (CAP DEGRADATE)
[ ]	VA	<7 DAYS	NON-DETECT.	VARIABLE
[ ]	CA, IO, FL	23-26 DAYS	30-50 DAYS	83-92 DAYS
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Aquatic Dissipation (164-2)
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Forestry Dissipation (164-3)
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Environmental Fate & Effects Division
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SULFOSATE
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Long-Term Soil Dissipation (164-5)
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Accumulation in Rotational Crops, Confined (165-1)
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Accumulation in Rotational Crops, Field (165-2)
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Accumulation in Irrigated Crops (165-3)
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Bioaccumulation in Fish (165-4)
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Bioaccumulation in Non-Target Organisms (165-5)
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Ground Water Monitoring, Prospective (166-1)
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Ground Water Monitoring, Small Scale Retrospective (166-2)
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Ground Water Monitoring, Large Scale Retrospective (166-3)
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Ground Water Monitoring, Miscellaneous Data (158.75)
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Environmental Fate & Effects Division
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Field Runoff (167-1)
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Surface Water Monitoring (167-2)
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Spray Drift, Droplet Spectrum (201-1)
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Spray Drift, Field Evaluation (202-1)
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Degradation Products

Aminomethylphosphonic acid (anion deg. from photolysis)

CO2 is major degradate of TMS moiety in aerobic soil study.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SULFOSATE
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Comments

Sulfosate consists of an N-(Phosphonomethyl) glycine anion and a trimethylsulfonium cation. The anion degrades to aminomethylphosphonic acid (AMPA) via photolysis (aqueous and soil).
There are discrepancies in the aerobic metabolism data; in addn. to that shown, T1/2 for (+) in loam was 192 days in one study but in another was < 1 month based on CO2 evolution.
T1/2 for (-) on soil was 382 hours, but (+) was stable.
In an anaerobic soil study, in 66 days 43% of radioactive (-) moiety was recovered as CO2.
Frozen storage stability studies indicate sulfosate residues were stable in soil stored frozen (-20C) for up to 2 years.

References: EPA REVIEWS
Writer : PJH

DATA EVALUATION RECORD
DER 1

SHAUGHNESSY No.128501
COMMON NAME: Sulfosate
CHEMICAL NAME: Trimethylsulfonium carboxymethyl aminomethylphosphonate
FORMULATION:Touchdown 4 LC
DATA REQUIREMENT: N/A

MRID No: 42937702
G. W. Schwab, May 21, 1986. Frozen Storage Stability of TOUCHDOWN in Soil. Performing Laboratory Stauffer Chemical Company Richmond Research Center Physical/Environmental Section 1200 South 47th Street Richmond, CA 94804. Laboratory ID RRC 86-61.

REVIEWED BY: Kevin L. Poff
Chemist EFGWB/EFED
Signature:
Date:

APPROVED BY: Akiva Abramovitch, Ph.D.
Chemist EFGWB/EFED
Signature:
Date:

CONCLUSIONS:

Ancillary Study - Frozen Storage Stability

1. Freezer storage stability studies are not specifically required by Subdivision N guidelines.

2. Sulfosate (Trimethylsulfonium carboxymethyl aminomethylphosphonate) residues were stable in soil stored frozen (-20 C) for 2 years. The residues that were tested were TMS (trimethylsulfonium cation), CMP (carboxymethyl aminomethyl phosphonate), and AMPA (aminomethyl phosphonic acid). Based on the information provided by this study, soil samples containing sulfosate residues may be stored frozen for up to 2 years prior to analysis.

MATERIALS AND METHODS:

Samples of a St Johns Fine Sand from Sanford FL (0.5% OM, pH 5.4), a sandy loam from Orange Cove CA (2.2% OM, pH 6.9), and a silty clay loam from Leland MS (6.0% OM), were treated with Touchdown 4-LC applied in water via mechanical sprayers at a rate equivalent to 6.0 lbs ai/A. Homogenized samples of soils were then stored in plastic bags at -20C. Untreated controls and controls fortified with known amounts of Touchdown were run with each set of field treated samples to determine recovery rates.

RESULTS:

TMS (trimethylsulfonium cation), CMP (carboxymethyl aminomethyl phosphonate), and AMPA (aminomethyl phosphonic acid) were stable in soil stored frozen (-20 C) for 2 years. Untreated controls and controls fortified with known amounts of Touchdown were run with each set of field treated samples to determine recovery rates. Recoveries for AMPA ranged from 66 to 103%, with a median value of 93%. Recoveries for CMP ranged from 62 to 129% with a median value of 95%. TMS recoveries ranged from 76 to 103% with a median value of 90%.

DISCUSSION:

1. Storage stability studies were conducted on soils other than those taken from the original terrestrial field dissipation sites, however, due to the consistency of the results of the three test soils no further storage stability data will be required.

Environmental Fate Review Dated 10/14/94

Page ____ is not included in this copy.

Pages 14 through 44 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

__✓__ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SULFOSATE
Last Update on January 10, 1994
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LOGOUT	Reviewer:	Section Head:	Date:

Common Name:SULFOSATE
Smiles Code:
PC Code # :128501 CAS #:81591-81-3 Caswell #:

Chem. Name :TRIMETHYLSULFONIUM CARBOXYMETHYLAMINOMETHYL-PHOSPHONATE

Action Type:Herbicide

Trade Names:TOUCHDOWN
(Formul'tn):
Physical State:

Use :NONSELECTIVE SYSTEMIC HERBICIDE FOR POSTEMERGENCE WEED
Patterns :CONTROL
(% Usage) :
:

Empirical Form: $C_3H_7NPO_5^- + SC_3H_9$
Molecular Wgt.: 245.23 Vapor Pressure: 4.00E -7 Torr
Melting Point : °C Boiling Point: 110C@1Atm°C
Log Kow : -5 pKa: @ °C
Henry's : E Atm. M3/Mol (Measured)

Solubility in ...					Comments
Water	E	ppm	@20.0	°C	very soluble
Acetone	E	ppm	@	°C	
Acetonitrile	E	ppm	@	°C	
Benzene	E	ppm	@	°C	
Chloroform	E	ppm	@	°C	
Ethanol	E	ppm	@	°C	
Methanol	E	ppm	@	°C	
Toluene	E	ppm	@	°C	
Xylene	E	ppm	@	°C	
	E	ppm	@	°C	
	E	ppm	@	°C	

Hydrolysis (161-1)
[V] pH 5.0:STABLE 25C
[V] pH 7.0:STABLE 25C
[V] pH 9.0:STABLE 25C
[ ] pH :
[ ] pH :
[ ] pH :

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Photolysis (161-2, -3, -4)
[V] Water:pH5 CAT. STABLE; AN. 14.6DA
[V] :pH7 CAT. STABLE; AN. 77.9DA
[V] :pH9 CAT. 31.7DA; AN. 41.6DA
[ ] :

[V] Soil :+ STABLE; ANION 382 HR
[ ] Air :

Aerobic Soil Metabolism (162-1)

	SOIL	pH	%OM	(+)	(-)
[V]	SOIL	pH	%OM	(+)	(-)
[ ]	SdLm	5.6	1.1	49 HRS	13HR
[ ]	LOAM	6.9	1.9	300 "	16 "
[ ]	SAND	6.7	2.5	29 "	33 "
[ ]	LOAM	5.7	6.2		19 "
[ ]					
[ ]					

Anaerobic Soil Metabolism (162-2)
[V] T1/2 FOR (+) MOIETY=2 MONTHS
[ ] BASED ON CO2 EVOLUTION
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Anaerobic Aquatic Metabolism (162-3)
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Aerobic Aquatic Metabolism (162-4)
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Soil Partition Coefficient (Kd) (163-1)

[ ] Kd VALUES FOR TMS MOIETY:

	Sd	Si	Cl	%OM	pH	Kd
[V]	88	9	3	0.6	7.9	6.72
[V]	44	43	13	1.4	6.6	3.67
[V]	14	56	30	4.4	5.3	8.08
[V]			52	2.1	5.1	8.96

Soil Rf Factors (163-1)

		CATION	ANION
[V]			
[ ]	SdLm	.06	.20
[ ]	Lm	.01	.16
[ ]	Sd	.09	.08
[ ]	Lm	0.0	.16
[ ]			

Laboratory Volatility (163-2)

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Field Volatility (163-3)

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Terrestrial Field Dissipation (164-1)

[V] FIELD STUDIES CONDUCTED IN VA, CA, IO, FL; APPL 6 LBS AIA:

	STATE	CAP(-)	TMS(+)	AMPA (CAP DEGRADATE)
[ ]	VA	<7 DAYS	NON-DETECT.	VARIABLE
[ ]	CA, IO, FL	23-26 DAYS	30-50 DAYS	83-92 DAYS

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Aquatic Dissipation (164-2)

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Forestry Dissipation (164-3)

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Environmental Fate & Effects Division
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Long-Term Soil Dissipation (164-5)
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Accumulation in Rotational Crops, Confined (165-1)
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Accumulation in Rotational Crops, Field (165-2)
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Accumulation in Irrigated Crops (165-3)
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Bioaccumulation in Fish (165-4)
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Bioaccumulation in Non-Target Organisms (165-5)
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Ground Water Monitoring, Prospective (166-1)
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Ground Water Monitoring, Small Scale Retrospective (166-2)
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Ground Water Monitoring, Large Scale Retrospective (166-3)
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Ground Water Monitoring, Miscellaneous Data (158.75)
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Field Runoff (167-1)
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Surface Water Monitoring (167-2)
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Spray Drift, Droplet Spectrum (201-1)
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Spray Drift, Field Evaluation (202-1)
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Degradation Products

Aminomethylphosphonic acid (anion deg. from photolysis)

CO2 is major degradate of TMS moiety in aerobic soil study.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SULFOSATE
Last Update on January 10, 1994
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Comments

Sulfosate consists of an N-(Phosphonomethyl) glycine anion and a trimethylsulfonium cation. The anion degrades to aminomethylphosphonic acid (AMPA) via photolysis (aqueous and soil).
There are discrepancies in the aerobic metabolism data; in addn. to that shown, T1/2 for (+) in loam was 192 days in one study but in another was < 1 month based on CO2 evolution.
T1/2 for (-) on soil was 382 hours, but (+) was stable.
In an anaerobic soil study, in 66 days 43% of radioactive (-) moiety was recovered as CO2.

References: EPA REVIEWS
Writer : PJH