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Chemical Code: 128501
DP Barcode: D217449, D217456, D217463

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

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

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

Chief Chem (for A.A.)

Thru: Betsy Behl, Acting Chief
Environmental Fate & Ground Water Branch/EFED (H7507C)

B. Behl

Attached, please find the EFGWB review of...

Common Name:	Sulfosate (glyphosate trimesium)	Trade name:	Touchdown
Company Name:	Zeneca Ag Products		
ID #:	010182-00324, 5F04554, 5H05727		
Purpose:	To review data and labels to support the new use of sulfosate on Pome fruit and wheat.		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	330,230,250		2.0 days

STATUS OF STUDIES IN THIS PACKAGE:

**STATUS OF DATA REQUIREMENTS
ADDRESSED IN THIS PACKAGE:**

Guideline #	MRID	Status ¹

Guideline #	Status ²

¹Study Status Codes: A=Acceptable U=Upgradeable C=Ancillary I=Invalid.
²Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved W=Waived.

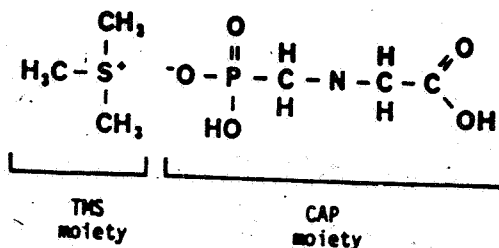
1. CHEMICAL:

Common Name: Sulfosate

Chemical Name: Trimethylsulfonium carboxymethyl aminomethylphosphonate;

Type of product: Herbicide

Chemical Structure:



Physical/Chemical Properties

Molecular formula: C₆H₁₅NO₅PS.

Molecular weight: 244.23.

Physical state: Liquid.

Specific gravity: 1.27 g/cm³.

Boiling point: 110 C at 760 Torr.

Vapor pressure: <4 x 10⁻⁷ Torr at 25 C.

Molar water solubility: (pure active) 17.6 X 10⁶g

2. TEST MATERIAL:

N/A

3. STUDY/ACTION TYPE:

To review data to support the proposed new registration for use of Touchdown (6 lbs ai/gallon sulfosate) on Pome fruit (apple, crabapple, loquat, pear, and quince) and wheat (grain, bran, forage, shorts and straw).

4. STUDY IDENTIFICATION:

1) Directions for use and a Touchdown Environmental Fate Bibliography.

5. REVIEWED BY:

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

Kevin L. Poff
Date: 4/14/97

6. APPROVED BY:

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

Akiva Abramovitch (for A.A.)
Date: 4/14/97

7. CONCLUSIONS:

1) The EFGWB has previously evaluated (9/22/87) the potential for

off site exposure of Sulfosate (now called Glyphosate-trimesium) and has determined that there is a low potential for impact to non-target plants or water resources under most conditions. Therefore the addition of the use of glyphosate trimesium on Pome fruit including apple, crabapple, loquat, pear, and quince; and wheat including grain, bran, forage, shorts and straw presents an incrementally low risk to the environment.

2) The maximum use rate as stated on the submitted Touchdown label for the use of sulfosate on bearing tree fruit orchards and nonbearing crops is 5 1/3 pints (4 lbs/ai/acre/year).

ENVIRONMENTAL FATE ASSESSMENT

Sulfosate is comprised of two moieties: trimethylsulfonium cation (TMS) and carboxymethylaminomethylphosphate 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 for sulfosate. However, sulfosate (CAP moiety) appears to be readily degraded by soil microbes ($t_{1/2}$ = 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 ($t_{1/2}$ = 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 an indeterminately low Henry's law constant, sorption to soil, and lack of volatilization in laboratory studies, volatilization 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:

Based on the available data, the new registration for use on the Pome fruit (apple, crabapple, loquat, pear, and quince) and wheat (grain, bran, forage, shorts and straw) would not present a risk to ground and surface water.

SUMMARY OF DATA REQUIREMENTS: (Glyphosate Trimesium)

The summary of data requirements to support uses of glyphosate-trimesium (sulfosate) on terrestrial food crop and terrestrial nonfood sites is as follows:

Satisfied:

-**Hydrolysis (161-1).** Stable at pH 5, 7, and 9 at 25°C; EFGWB #4119, 4120 3/1/84 (originally reviewed 8/18/83).

- **Photodegradation in water (161-2).** Carboxymethylaminomethylphosphonate (CAP) anion; 14.6 days, 77.9 and 41.6 days at pH 5, 7, and 9 respectively. Photoproducts were phosphoric acid and aminomethylphosphonic acid. The trimethylsulfonium (TMS) cation was stable at pH 5 and 7, but degraded in 31.7 days at pH 9; EFGWB #4119, 4120 3/1/84.

-**Photodegradation in soil (161-3).** The (CAP) anion degraded with an initial rapid phase of 12 days in which 34% of applied degraded followed by a slower phase in which only 6% degraded. The degradate isolated was aminomethylphosphonic acid (AMPA). The TMS cation was stable; EFGWB # 6147, 6148, 1/21/86 Acc #258400, EFGWB # 60707-60708, 70214-70215, 3/27/87 (no MRID).

-**Aerobic Soil Metabolism (162-1).** The TMS moiety has a half-life of 3 days in soil with CO₂ being the major degradate. The CAP portion of the molecule degraded with a half-life of 2 to 3 days with CO₂ as the major degradate. EFGWB # 6483-6486, Acc #260670, 6/30/86, EFGWB # 70716-17, 6/26/87. However, the calculated half-life was based on parent TMS and not total extractable TMS as well. Therefore, a more realistic half-life for the TMS moiety may be on the order of 2 to 3 weeks. (EFGWB review of 6/30/86 indicated that 66% of the radiolabeled TMS was converted to CO₂ within 28 days; also see 70760-61, 9/22/87).

-**Anaerobic Soil Metabolism (162-2).** The CAP moiety degraded with 43% of the applied being converted to CO₂ at day 66. EFGWB #70716-17, Acc #40214008-9. Half-life of cation is 2 months based on CO₂ 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).** Freundlich K ads values for parent in four separate soils were 9-21, desorption values were 4-9. In a soil column (aged 3 day) residues applied to 2 soils did not move below 6 cm. EFGWB # 70760-61, 9/22/87. The parent also showed low mobility in a soil TLC study (1/17/86).

-Terrestrial Field Dissipation (164-1). TMS, and CAP dissipated with calculated half-lives of 6 and 12 days, respectively, in the 0- to 3-inch depth of unvegetated sandy loam soil in California treated with a single application of sulfosate at 4 lb ai/A. TMS and CMP did leach to the 3- to 6-inch soil depth, but were not detected below the 6-inch soil depth. (MRID #41235906)

TMS and CAP dissipated with half-lives of 5 and 6 days, respectively, in the 0- to 3-inch depth of unvegetated sandy loam soil in Mississippi treated with a single application of sulfosate at 4 lb ai/A. TMS and CAP were not detected below the 3-inch soil depth, except for one sampling interval in which TMS was near the detection limit. (MRID #41235907)

TMS and CAP dissipated with calculated half-lives of 10 and 4 days, respectively, from the 0- to 3-inch depth of unvegetated loamy sand soil in Georgia that was treated with a single application of sulfosate at 4 lb ai/A. In general, TMS and CMP were not detected below the 3-inch soil depth. EFGWB #'s 90-0680-0681, -0594-0595, -0784, 91-0755, -0361 (9/25/91).

Frozen storage stability (MRID #42937702) studies were reviewed and indicate Sulfosate (Trimethylsulfonium carboxymethyl aminomethylphosphonate) residues were stable in soil stored frozen (-20 C) for 2 years.

Waived:

Fish Accumulation (165-3). (EFGWB #4119, 4120, 3/1/84) based on sulfosates high water sol./low Kow.

9. BACKGROUND :

Touchdown is a nonselective foliar systemic herbicide used to control a broad spectrum of emerged weeds. Touchdown controls most grass and broadleaf weeds - both annual and perennial. Touchdown may be used in bearing pecan, walnut, beech nut, Brazil nut, butternut, cashew, chestnut, chinquapin, filbert, hickory nut and Macadamia nut groves; in certain noncrop areas around the farm, and in nonbearing groves, orchards, or vineyards up to 1 year of harvest to control unwanted vegetation. Touchdown is formulated as a liquid concentrate which contains 6 pounds of ai per gallon. Touchdown requires a 6-hour rain-free period after application. Rain occurring within 6 hours of application may reduce weed control.

In general, glyphosate trimesium (sulfosate) is a nonselective systemic herbicide developed for postemergence weed control on terrestrial food crop and terrestrial nonfood sites. Sulfosate is comprised of two moieties: trimethylsulfonium cation (TMS) and carboxymethylaminomethylphosphate anion (CMP). Sulfosate is applied at 0.44 to 4.1 lb ai/A using either spray, wiper, or hand-directed spot application procedures. It is generally applied with a surfactant.

10. DISCUSSION:

See recommendations above.

11. COMPLETION OF ONE-LINER:

Attached.

12. CBI INDEX:

N/A

Zeneca Inc.
Agricultural Products
Wilmington, Delaware 19897

TOUCHDOWN® Herbicide
Application for Amended Registration for Use on apples, crabapples, loquat, pear,
quince, and wheat

SECTION J: Environmental Fate

All data requirements have been satisfied through previous submissions. A complete list of data citations can be found in the attached bibliography.

NOTE: All inquiries concerning this document should be directed to:

Becky Rhodes
Registration & Regulatory Affairs Dept.
Agricultural Products
Zeneca Inc.
Wilmington, DE 19897
Telephone: (615) 982-9076

TOUCHDOWN BIBLIOGRAPHY

STUDY TYPE	GUIDE REF. NO.	STUDY AUTHOR(S) AND REPORT TITLE	REPORT NUMBER	REPORT DATE	SUBMISSION DATE	MRID NUMBER
HYDROLYSIS	161-1	HYDROLYSIS AND PHOTOLYSIS DEGRADATION STUDIES OF SC-0224	WRC 88-83	81-AUG-88	21-MAR-88	00131694
PHOTODEGRADATION IN WATER	161-2	PHOTOLYSIS OF SC-0224 IN WATER	RRC 88-22	18-APR-88	24-JUNE-88	00131294
PHOTODEGRADATION ON SOIL	161-3	THE PHOTODEGRADATION OF SC-0224 APPLIED TO SOIL	WRC 88-09	14-DEC-88	06-JUNE-88	00154274
		ADDENDUM TO STUDY: THE PHOTODEGRADATION OF SC-0224 APPLIED TO SOIL	WRC 88-09	18-JUL-86	31-DEC-86	40046204
		ADDENDUM TO STUDY: SC-0224 4-JC FIELD DISSIPATION AND RUN-OFF STUDIES		28-OCT-86	31-DEC-86	40046205
AEROBIC SOIL METABOLISM	162-1	METABOLISM OF SC-0224 IN SOIL: FATE OF THE CARBOXYMETHYLAMINOMETHYLPHOSPHONATE MOIETY	MRC 85-11	20-DEC-86	13-JAN-86	260967
		METABOLISM OF SC-0224 IN SOIL: FATE OF THE TRIMETHYLSULFONIUM MOIETY	MRC 85-10	20-DEC-85	13-JAN-86	260967
		METABOLISM OF THE SC-0224 TRIMETHYLSULFONIUM CATION IN SOIL - PROJECT 148198 (INTERIM REPORT)	MIR-14-05-88	14-MAY-88	24-OCT-83	132370
		METABOLISM OF THE SC-0224 CARBOXYMETHYLAMINOMETHYLPHOSPHONATE ANION IN SOIL-INTERIM REPORT NO. 1 - PROJECT 148198	MIR-25-8-83	25-AUG-88	24-OCT-83	251545
ANAEROBIC SOIL METABOLISM	162-2	SC-0224 ANAEROBIC SOIL METABOLISM STUDY: FATE OF THE CARBOXYMETHYLAMINOMETHYLPHOSPHONIC ACID MOIETY	WRC 87-18	03-APR-87	20-MAY-87	40214009
		SC-0224 ANAEROBIC SOIL METABOLISM STUDY: FATE OF THE TRIMETHYLSULFONIUM MOIETY	WRC 87-19	03-APR-87	20-MAY-87	40214008
		ADDENDUM I: SC-0224 - ANAEROBIC SOIL METABOLISM STUDY: FATE OF THE TRIMETHYLSULFONIUM MOIETY	WRC 87-19	23-JUL-87	24-JUL-87	40277803
LEACHING & ADSORPTION/DESORPTION	163-1	SC-0224 AGED SOIL MOBILITY STUDY	WRC-86-02	13-JUN-86	20-JUNE-86	1660665
		SC-0224 - SOIL MOBILITY STUDIES (INTERIM REPORT)	PROJECT 148198		18-MAR-88	249804
		[14C-CATION] SC-0224 SOIL LEACHING AND ADSORPTION/DESORPTION	WRC 87-23	06-JUL-87	24-JUL-87	40277801
		SC-0224 COMPUTER MODEL INVESTIGATION OF THE LEACHING POTENTIAL OF TMS CATION INTERIM REPORT	PMS-870713	13-JUL-87	24-JUL-87	40277802
		[14C-CATION] SC-0224 SOIL LEACHING AND ADSORPTION/DESORPTION	WRC-87-23R	01-SEP-87		40326201
		SC-0224 (41C) ENVIRONMENTAL RUN-OFF STUDY	A-27187	15-NOV-82	21-MAR-88	126607

TOUCHDOWN BIBLIOGRAPHY

STUDY TYPE	GUIDE REF. NO.	STUDY AUTHOR(S) AND REPORT TITLE	REPORT NUMBER	REPORT DATE	SUBMISSION DATE	MRID NUMBER
SOIL FIELD DISSIPATION	164-1	SULFOSATE - FIELD DISSIPATION STUDY FOR TERRESTRIAL USE-CA	RRC 87-23	09-MAR-87	09-MAR-87	40179002
		SULFOSATE - FIELD DISSIPATION STUDY FOR TERRESTRIAL USE-MS	RRC 87-21	09-MAR-87	16-ARP-87	40179001
		ADDENDUM TO STUDY: SC-0224 4-LC FIELD DISSIPATION AND RUN-OFF STUDIES	0224-88-SD-01	28-OCT-86	31-DEC-86	40046205
		TOUCHDOWN 4-LC-E FIELD SOIL DISSIPATION STUDY FOLLOWING TREATMENT FOR VEGETATION CONTROL	WRC 89-37	23-FEB-88	28-JUL-89	41235906
		ICIA-0224 FIELD DISSIPATION STUDY FOR TERRESTRIAL USES, CALIFORNIA 1987-1988	WRC 89-40	05-MAY-89	28-JUL-89	41235907
		ICIA-0224 - FIELD DISSIPATION STUDY FOR TERRESTRIAL USES, MISSISSIPPI, 1987-1988	WRC 89-40	15-MAY-89	28-JUL-89	41209921
		ICIA-0224 - FIELD DISSIPATION STUDY FOR TERRESTRIAL USES, GEORGIA 1987-1988	WRC 89-23	MAY-89	SEPT-93	42987701
		GLYPHOSATE-TRIMESUM: RESPONSE TO THE ENVIRONMENTAL FATE REVIEW OF TERRESTRIAL FIELD DISSIPATION DATA SUPPORTING PP NOS. 1H5606, AND 1F3950 (GRAPES), OF3860 (SOYBEANS), AND OF3890 (CITRUS).	RRC86-61	MAY-86	SEPT-88	42987702
		FROZEN STORAGE STABILITY OF TOUCHDOWN IN SOIL	RRC86-61	MAY-86	DEC-86	40046208
		FROZEN STORAGE STABILITY OF TOUCHDOWN IN SOIL	WRC 89-23,-37,-40	1-MAY-89		42987701
CONFINED ROTATION CROPS	165-1	[14C-ANION]ICIA0224 - CONFINED ACCUMULATION STUDIES ON ROTATIONAL CROPS	WRC 89-25	26-JUL-89	28-JUL-89	41209920
		[14C-CATION]ICIA0224 - CONFINED ACCUMULATION STUDIES ON ROTATIONAL CROPS	WRC 89-26	25-JUL-89	28-JUL-89	41209922
		TOXICOLOGY DATA OVERVIEW AND SUMMARY FOR SC-0224 CONCENTRATE APPLICATION FOR REGISTRATION FOR NONCROP USES		04-NOV-88	17-NOV-88	40893701
		TOXICOLOGY REGISTRATION DATA SUMMARY AND OVERVIEW FOR PETITION FOR TOLERANCE ON CORN		01-JUL-89	28-JUL-89	41209901

Environmental Fate Review Dated 4/14/97

Page _____ is not included in this copy.

Pages 10 through 37 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) _____.
 - The document is not responsive to the request.
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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 October 12, 1994

[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer:	Section Head: <i>K.P.</i>	Date: <i>4/19/97</i>
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(USDA)

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

Log Kow : -5

pKa: @ °C

Henry's : E Atm. M3/Mol (Measured)

Solubility in ...

Water	E	ppm	@20.0	°C	Comments
Acetone	E	ppm	@	°C	very soluble
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)

[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)

[V]		CATION	ANION
[]	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
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
SULFOSATE

Last Update on October 12, 1994

[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

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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SULFOSATE

Last Update on October 12, 1994

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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 October 12, 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, T_{1/2} for (+) in loam was 192 days in one study but in another was < 1 month based on CO₂ evolution.

T_{1/2} 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