Date Out: 1-13-94

Chemical Code: 029001
DP Barcode: D189692

ENVIRONMENTALFATE AND GROUND WATER BRANCH

Review Action

To: Linda Propst, PM #73
Special Review and Reregistration Division (7508W)

From: Elizabeth Behl, Section Head
Ground Water Technology Section
Environmental Fate & Ground Water Branch/EFED (7507C)

Thru: Henry Jacoby, Chief
Environmental Fate & Ground Water Branch/EFED (7507C)

1/13/94

Attached, please find the EFGWB review of...

Common Name:	1,3-Dichloropropene	**Trade name:**	Telone II
Company Name:	DowElanco		
ID #:	029001		
Purpose:	Review final report for small-scale retrospective ground-water monitoring study in Scotts Bluff County, Nebraska		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Nematicide	627	93-0556	4 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status [1]
166-2	426971-01	C

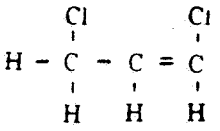
STATUS OF DATA REQUIREMENTS ADDRESSED IN THIS PACKAGE:

Guideline #	Status [2]
166-2	S

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

1. CHEMICAL: Dichloropropene (Telone II)

Chemical name: 1,3-Dichloropropene
Common name: Telone II; 1,3-D
Structure:



2. TEST MATERIAL:

Not Applicable.

3. STUDY/ACTION TYPE:

Review final report on small-scale retrospective ground-water monitoring study in Scotts Bluff County, Nebraska.

4. STUDY IDENTIFICATION:

Title: Small-Scale Retrospective Ground-Water Monitoring Study for Telone Soil Fumigants: Final Report on Study Site in Scotts Bluff County, Nebraska

Author(s): James A. Knutson, Heidi E. Dixon-White, and David G. Petty

Submitted for:
DowElanco
North American Environmental Chemistry Laboratory
9410 N. Zionsville Road
Indianapolis, IN 46268

Identifying No.: 029001
DP Barcode: D189692
Date Sent to EFED: 03/30/93

5. REVIEWED BY:

Estella Waldman Signature: Estella Waldman
Hydrologist
OPP/EFED/EFGWB/Ground-Water Section Date: 1/3/94

6. APPROVED BY:

Elizabeth Behl Signature: _____
Section Head
OPP/EFED EFGWB/Ground-Water Section Date: 1/3/94

2 3

7. CONCLUSIONS:

The final report for a small-scale retrospective monitoring study conducted for Telone brand soil fumigants in Scotts Bluff County, Nebraska was submitted by DowElanco. An interim report for this study was submitted and reviewed in DP Barcode D167714 (10/08/91).

The Nebraska study was begun in October 1989 and terminated in September 1992. Concentrations of 1,3-D (total of both isomers) ranged from up to 3.86 ppb in the ground water from one well (B-3) using a detection limit of 0.05 ppb. In July 1991, both 1,3-D isomers were also detected in a different well (A-2) at concentrations up to 0.11 ppb, and at levels below the detection limit in well A-1. One of the Telone degradates, 3-chloroallyl alcohol, was also detected in ground water. The cis-isomer was found in wells A-2, B-3, C-5, and C-6; the trans-isomer was detected in well C-6. Concentrations of all of the isomers were less than the detection limit.

Concentrations of 1,2-D in ground water ranged up to 0.09 ppb. One sample yielded a 1,2-D concentration of 2.15 ppb which was not confirmed by the duplicate sample from the same well.

The submitted report indicates that the detections in ground water on the study site in Nebraska are due to the normal field use of Telone. However, many questions still remain unanswered about the environmental fate of this chemical in the field and the consequences with respect to human health.

The registrant is preparing to conduct a small-scale prospective monitoring study in southern Florida that will be initiated in 1994. This study will be used to fulfill both State of Florida and EPA requirements for ground-water monitoring for 1,3-D in warm climates. Since 1,3-D use is widespread, the Ground Water Technology Section is concerned that the results from the Florida study will not be adequate for 1,3-D regulation and mitigation in cooler climates. For this reason, the GWTS recommends that a different prospective study be conducted in a northern climate.

8. RECOMMENDATIONS:

The Ground Water Section recommends that DowElanco conduct at least one small-scale ground-water monitoring study for 1,3-D (Telone) and its degradates in a northern climate. The submitted study shows that the normal field use of 1,3-D can contaminate ground water in Nebraska. It is important to clearly establish the potential for 1,3-D to migrate to ground water as a result of normal field use in cool

climates in order to adequately regulate this compound. This will help to ensure appropriate mitigation measures with respect to human health.

A protocol for the small-scale ground-water monitoring study for 1,3-D in a northern climate should be submitted to the Agency for approval as soon as possible.

9. BACKGROUND:

Telone II is a broad-spectrum soil fumigant and nematicide, mainly used as a preplant fumigant by chisel injection for nematode control. According to the 1986 Guidance Document for reregistration of this product, the predominant use of Telone II is on vegetables, field crops, citrus, and fruit and nut trees. Application rates are generally high and range from 38.3 lb ai/acre (field crops and vegetables) to 1000 lb ai/acre (citrus, fruit, and nut trees).

Telone II is composed of 94 percent by weight 1,3-Dichloropropene which exists in two isomeric forms: cis-1,3-D and trans-1,3-D; generally present in a 50:50 ratio. Two degradates of this compound are found including 3-chloroallyl alcohol and 3-chloroacrylic acid.

Laboratory information indicates that 1,3-D is a very mobile compound with Kd's ranging from 0.23 (loamy sand) to 1.09 (clay). Laboratory half-lives for 1,3-D range up to 9.1 days for the anaerobic soil metabolism, up to 37 days for aerobic soil metabolism, and 13.5 days for hydrolysis. Hydrolysis studies done at pH 5.5 with varying temperatures illustrate that the half-life of 1,3-D can be extremely variable:

temperature (°C)	half-life (days)
2	90-100
15	11-13
29	2

The above data indicate that decreasing temperatures combined with low pH lengthen the half-life of the compound.

1,2-Dichloropropane (1,2-D) is present in current Telone formulations in trace quantities of less than 0.1% by weight. 1,2-D is similar to 1,3-D in structure but there are differences in their environmental properties. 1,2-D possesses a higher affinity for the vapor phase over either soil organic matter or water than does 1,3-D; and 1,2-D is less prone to degradation in soil than 1,3-D.

The EPA has categorized the active ingredient (1,3-D) as a B1 oncogen and a B2 carcinogen. The impurity 1,2-D, has been classified as a Group B2 carcinogen. 1,3-D does not yet have an MCL or HAL, but informal discussions with Office of Water representatives indicate that it will be very low. The MCL for 1,2-D is 5 ppb. There are two degradates of 1,3-D: 3-chloroallyl alcohol and 3-chloroacrylic acid.

1,3-D has been detected in ground water in four states in the U.S. (New York, Nebraska, Florida, and California), and in The Netherlands. Concentrations of 1,3-D in ground-water from normal field use in the U.S. ranged up to 270 ppb. In Riverside, California, illegal use of Telone in 1986 and 1987 resulted in six detections in one irrigation well ranging from 6.8 - 31 ppb. In The Netherlands, detections of 1,3-D were found in ground water under potato and flower bulb fields with concentrations ranging up to 2.5 ppb. 1,2-D has been detected in the ground water in California, Connecticut, Florida, Hawaii, Massachusetts, Maryland, Nebraska, New York, Oregon, and Washington.

The EPA determined that the registrant must evaluate the impact on ground water occurring from registered 1,3-D use by conducting retrospective ground-water monitoring studies at several different locations (EAB #6572; 6/23/86). Six monitoring sites were tentatively approved by the EPA (EFGWB #90565; 6/6/89). The sites were located in Jackson County, Florida; Grant County, Washington; Merced County, California; Monterey County, California; Wayne County, North Carolina; and Scotts Bluff County, Nebraska (EFGWB #90774, 12/21/89). Monitoring complications caused the site in Florida to be put on hold. Additional monitoring in Hawaii was also put on hold pending the results of monitoring at the other sites (EFGWB #90778, 12/27/89).

10. <u>DISCUSSION:</u>

The EPA requested that DowElanco conduct five small-scale retrospective monitoring studies for Telone brand soil fumigants (Telone II and Telone C-17) in varied environments with different use patterns. The Nebraska study (reviewed in this document) was begun in October 1989 and terminated in September 1992. Concentrations of 1,3-D (both isomers) ranged up to 3.86 ppb in ground water using a detection limit of 0.05 ppb for the volatiles in water. The detection limit for the acids and alcohols in water was 1.0 ppb except for "problem samples" which had detection limits from 1.5 to 5.0 ppb.

A description of the site including soil information, hydrogeology, application dates, rainfall and irrigation, and well locations can be found in DP Barcode D167714. A

5 &

site map excerpted from the submitted report (Figure 1) illustrates the locations of the well clusters, piezometers, and the water table elevation in July 1991.

From June 1990 through September 1990, approximately 23 inches of irrigation were applied to the test site. Depth to ground water ranged from approximately 12 to 18 feet below the surface during the duration of the study. From September 1989 to July 1991, water table elevation measurements were taken from the monitoring wells on the site. After July 1991, piezometers were installed around the field at the request of EFGWB to obtain a better picture of ground-water flow.

During the period when only three measurements were used to determine the water table, little variation in the water table was seen across the field. One could speculate, as the registrant has done, that the flow direction was towards the southwest and then shifted to the northeast. The data, however, show little variation from well to well during each sampling round, especially over the distances between wells that were at least 500 feet (see Figure 1). After the installation of the piezometers, the ground-water flow direction was shown to be the southwest until near the end of the study. Considering the ground-water flow direction described above, all wells were basically upgradient with respect to ground-water flow for much of this study.

RESULTS:

Ground Water

Ground-water samples were analyzed for both isomers of 1,3-D, the degradates 3-chloroallyl alcohol and 3-chloroacrylic acid, and the impurity 1,2-D. An equipment failure occurred in September and October 1990 and no 1,3-D analyses were made for the volatiles (1,2-D and 1,3-D) during these months. Because of method development, analysis of the acid did not occur until May 1990. No analyses were done for the acid in August 1990 or after March 1991. No analyses were performed for 1,2-D in March, September or October 1990.

From January 1990 to August 1990, the combined 1,3-D cis- and trans-isomers were detected in one well (B-3, shallow well) at concentrations ranging up to 3.86 ppb. An equipment failure made sample analysis impossible in September and October 1990. The trans-isomer was again detected in ground water from a different well (A-2, deep well) in July 1991 at concentrations up to 0.11 ppb, twenty months after the Telone application. In another well (A-1, shallow well), trace levels of 1,3-D were detected in July 1991. No detections were noted after that time.

6 7

One of the Telone degradates, 3-chloroallyl alcohol, was also detected in ground water. The cis-isomer was found in wells A2 (deep well), B3 (shallow well), C5 (shallow well), and C6 (deep well) in March, May, and June 1991, and in April 1992. The trans-isomer was detected in well C6 (deep well) in January and February 1992. Concentrations of both the cis- and trans-isomers were below the detection limit.

1,2-D residues were reported in ground-water samples below the detection limit during several months of the study. In the July 1991 sample, 1,2-D concentrations ranged from 0.06 to 0.09 ppb. In April 1992, 2.15 ppb of 1,2-D was detected in one sample; a duplicate sample showed no residues.

The submitted report states that strong wind gusts were present during the January 1990 sampling round, and that the field scientist speculated "that surface materials may have contaminated the well." The possibility of contamination from the surface always exists. However, considering that none of the other wells were contaminated during this particular round, it seems an unlikely reason for the detections in ground water on this site.

The registrant also states that Telone was applied to the field northeast of the test plot about five weeks before the test application. In July 1990, another Telone application was made to a field northwest of the study site. As the submitted report states, it is possible that the Telone detections in ground water were linked to these applications considering the proximity of the wells to those other fields. However, these other applications may not completely explain the results from this study.

New Paradigm

The recommendations that are stated in this review are designed to be consistent with the Office of Pesticide Program's "New Paradigm" for ecological risk management (c.f. Linda Fisher's memorandum of Oct. 1992 and the "Implementation Paper for the New Paradigm" in an August 25, 1993 memorandum from Douglas D. Campt, Director, Office of Pesticide Programs to Victor J. Kimm, Acting Assistant Administrator). Under the New Paradigm, risk managers are to "rely heavily on risk mitigation when data indicate that one or more of the levels of concern (LOCs) have been exceeded." The LOC is exceeded if the pesticide Koc is less than 500, the soil degradation half-life is greater than 2 weeks, and a "risk based trigger is exceeded. If it is unclear that the impact of mitigation measures will result in a significant improvement in protection of ground-water resources, monitoring may be required to insure its effectiveness." As demonstrated in this review, Telone

exceeds the LOCs for persistence and mobility. Although a health-based trigger has not yet been established for Telone, preliminary information indicates that Telone detections in ground water may exceed this trigger.

For the purposes of Telone registration, small-scale prospective ground-water studies were required to determine the circumstances under which the chemical might leach to ground water. This step is important in identifying mitigation measures specific to Telone's use area that are also tailored to its environmental fate characteristics. The retrospective ground-water studies conducted by DowElanco partially, but not entirely, accomplished this goal because of problems with study design, limited ground-water samples, and inconclusive reasons for the results.

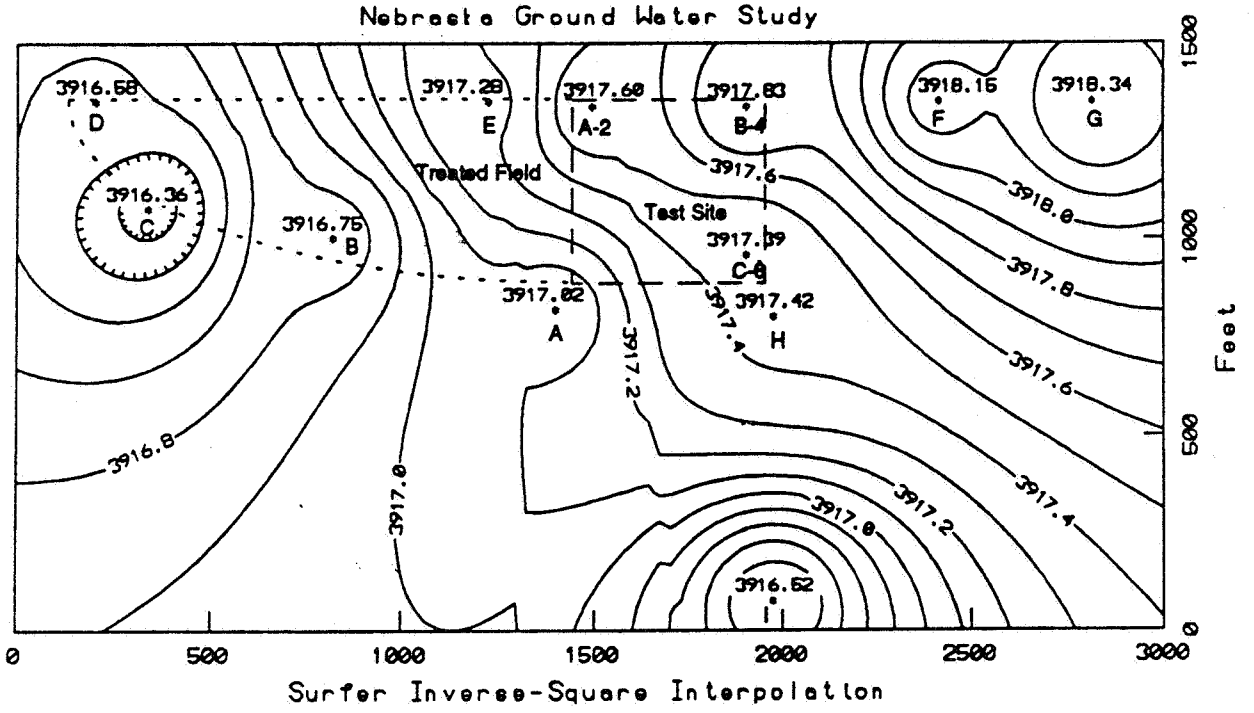
The retrospective studies for Telone were conducted in a variety of environments because the use area of Telone is large. It is still important to establish Telone leaching patterns in a variety of climates, and especially in areas where use is high. A prospective study is expected to begin in Florida sometime in 1994; this study will hopefully satisfy any concerns for Telone leaching in warm climates. Another concern is the leaching potential of Telone in cool climates, such as that in Nebraska where detections were reported in ground water. In order to properly regulate Telone from a ground-water perspective, it is important to incorporate any necessary mitigation measures for these cooler climates. The Ground Water Technology Section requests that DowElanco conduct a prospective study which will conclusively demonstrate the leaching potential of Telone in cool climates.

Figure 1

Appendix G Water Table Elevation Maps

Water Table Elevation Map - July 1991

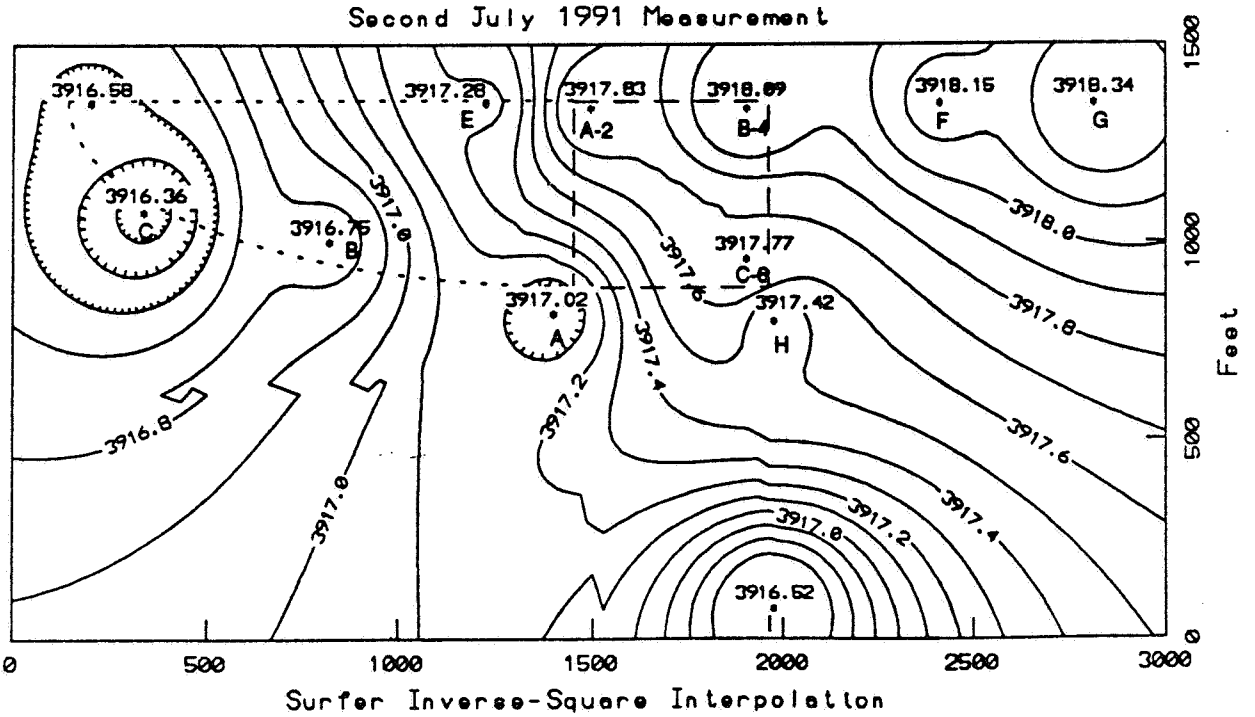
Nebraska Ground Water Study



Surfer Inverse-Square Interpolation

Water Table Elevation Map - July 1991

Second July 1991 Measurement



Surfer Inverse-Square Interpolation

9 48

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
DICHLOROPROPENE
Last Update on January 3, 1994
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer: EW	Section Head: GB	Date: 1/5/94

Common Name:DICHLOROPROPENE
Smiles Code:ClC=CCCl
PC Code # : 29001 CAS #:542-75-6 Caswell #:

Chem. Name :1,3-DICHLOROPROPENE

Action Type:NEMATICIDE; FUNGICIDE; INSECTICIDE; HERBICIDE

Trade Names:1,3-D; TELONE II
(Formul'tn):SINGLE ACTIVE INGREDIENT, 94% RTU
Physical State: COLORLESS/PALE YELLOW LIQUID

Use Patterns (% Usage) :SOIL FUMIGANT, APPLIED PRIOR TO PLANTING TERRESTRIAL-FOOD :AND NON-FOOD USE SITES.

Empirical Form: $C_3H_4Cl_2$
Molecular Wgt.: 110.97 Vapor Pressure: 27.30E Torr
Melting Point : NA °C Boiling Point: 104 °C
Log Kow : pKa: @ °C
Henry's : 1.80E -3 Atm. M3/Mol (Measured) 1.59E -3 (calc'd)

Solubility in ...				Comments
Water	2.50E 3	ppm	@20.0 °C	
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 5.0:13.5 DAYS AT 20 C
[V] pH 7.0:13.5 DAYS AT 20 C
[V] pH 9.0:13.5 DAYS AT 20 C
[ ] pH :pH5.5, 2 C, 90-100 DAYS
[ ] pH : " 15 C, 11-13 DAYS
[ ] pH : " 29 C, 2 DAYS

10 H

Environmental Fate & Effects Division
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Photolysis (161-2, -3, -4)
[ ] Water:
[ ] :
[ ] :
[ ] :

[V] Soil :RAPID, although study not required due to soil incorporation
[V] Air :Stable in air.

Aerobic Soil Metabolism (162-1)

	SOIL	%OM	C	pH	T1/2DA
[S]	SPIER SL	11.6	15	?	22
[ ]	SPIER SL	11.1	15	?	37
[ ]	HAREN SL	3.6	15	5.0	22
[ ]	BOGERCIE SL	3.6	20	5.6	25
[ ]	CLAY	1.1	20	6.8	3
[ ]	CLAY	1.8	20	7.2	8

Anaerobic Soil Metabolism (162-2)

	SOIL	TEMP	T 1/2
[V]	SILT CLAY LOAM	15 C	9.1 DA
[ ]	" " "	25 C	2.4 DA
[ ]	SANDY LOAM	15 C	7.7 DA
[ ]	" "	25 C	2.4
[ ]			
[ ]			

Anaerobic Aquatic Metabolism (162-3)
[S] AT pH 6.9-7.5, T1/2=20 DAYS
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aerobic Aquatic Metabolism (162-4)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
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Soil Partition Coefficient (Kd) (163-1)
[V] LOAMY SAND 0.23
[V] SAND 0.32
[V] CLAY 0.42 AND 1.09
[ ] AVG MAX Koc VALUES WERE 20 FOR
[ ] SAND, 25 FOR LOAMY SAND, AND
[ ] 41 AND 42 FOR TWO CLAY SOILS

Soil Rf Factors (163-1)
[V] IN 30 CM COLUMNS OF SAND,
[ ] LOAMY SAND, AND FLA. CLAY,
[ ] LEACHED WITH >25" WATER, 1.9-
[ ] 4.6% APPL RADIO. REMAINED IN
[ ] SOILS AND 70-84% WAS IN
[ ] LEACHATE. (unaged)

[V] Aged residues were very mobile 25.6-32.0% of applied in leach ate.

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[V] 25% of applied volatilized within 14 days posttreatment.
[S] 11% of applied volatilized within 8 days posttreatment.

Terrestrial Field Dissipation (164-1)
[V] 1,3-D APPLIED AT 342 LB AIA DECLINED FROM A MAX OF 130,000
[ ] PPB IN .30-.45 M LAYER, IMMEDIATELY AFTER TREATMENT, TO
[ ] <10 PPB (DETECTION LIMIT) IN ANY SOIL LAYER AT 71 DAYS; THIS
[ ] WAS IN A FIELD PLOT OF SAND SOIL IN CALIFORNIA.
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aquatic Dissipation (164-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Forestry Dissipation (164-3)
[ ]
[ ]

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Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[ ]
[ ]

Accumulation in Rotational Crops, Field (165-2)
[ ]
[ ]

Accumulation in Irrigated Crops (165-3)
[ ]
[ ]

Bioaccumulation in Fish (165-4)
[ ]
[ ]

Bioaccumulation in Non-Target Organisms (165-5)
[ ]
[ ]

Ground Water Monitoring, Prospective (166-1)
[ ] Study requested in 1991. Protocol not submitted as of 12/93 but
[ ] anticipate submission early in 1994.
[ ]
[ ]

Ground Water Monitoring, Small Scale Retrospective (166-2)
[ ] Five studies completed. Residues up to 3.86 ppb reported
[ ] in ground water at Nebraska site; degradates in four wells.
[ ] Residues below detection limit at Washington site. No detections
[ ] at two CA sites but few samples collected.

Ground Water Monitoring, Large Scale Retrospective (166-3)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Miscellaneous Data (158.75)
[ ] Detections of 1,3-D in ground water in New York, Florida, and
[ ] California range from 0.279 to 270 PPB.
[ ]

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Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

Surface Water Monitoring (167-2)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Droplet Spectrum (201-1)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

None detected in leached column studies
3-chloroallyl alcohol, in field dissipation studies, declined from max of 410 ppb in the .66-.81 M layer at 7 days post-treatment to <10 ppb in any soil layer at 71 days.
Propionic acid and an unknown (contg. an alcohol of carboxyl)

Two metabolites: 3-chloroallyl alcohol (c-OH, t-OH)
3-chloroacrylic acid (c-CAA, t-CAA)

Comments

In anaerobic studies, 1,3-D has an affinity for the water phase over the organic phase.
1,3-D exposed to 275 W GE sunlamp degraded; T 1/2 = .5 to 3.3 DA.
Wells 65-1200 feet in So. Cal. had no 1,3-D or chloroallyl alc..
Wells in Suffolk Co.(NY) had detectable 1,3-D and 1,2-D 68 days after fumigation of field with 140 L/HA; conc peaked at 83 days and persisted for 138 days.
Despite 7000 gal spill in Calif, 1,3-D decreased to <100 ppm in 0-12"depth 5.5 mos later, and was never found in wells nearby.

References: EPA REVIEWS
Writer : PJH, KLP, EW