

CE

029001

Date Out EAB: JUN 23 1986

To: G. Werdig
Product Manager 50
Registration Division (TS-767)

From: Samuel M. Creeger, Chief
Environmental Chemistry Review Section 1
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached please find the environmental fate review of:

Reg./File No.: _____

Chemical: 1,3-Dichloropropene (1,3-D)

Type Product: Nematicide

Product Name: _____

Company Name: DOW

Submission Purpose: GWDCI

ACTION CODE: 495

EAB # 6572

TAIS (level II) Days

4.0

Date In: 4/29/86
Date Completed: JUN 23 1986

Deferrals To:

_____Ecological Effects Branch

_____Residue Chemistry Branch

_____Toxicology Branch

Monitoring study requested by EAB: ☐

Monitoring study voluntarily conducted by registrant: ☐

REGISTRATION DIVISION DATA REVIEW RECORD

Confidential Business Information - Does Not Contain National Security Information (E.O. 12065)

15610

15995 4/29/86

1. CHEMICAL NAME 1,3-Dichloropropene		4. ACCESSION NUMBER 255012		TO BE COMPLETED BY PM	
2. IDENTIFYING NUMBER 029001		3. ACTION CODE 495		5. RECORD NUMBER 172,648	
				6. REFERENCE NUMBER	
				7. DATE RECEIVED (EPA)	
				8. STATUTORY DUE DATE 100 Days	
				9. PRODUCT MANAGER (PM) G. M. Adair, Lewis	
				10. PM TEAM NUMBER 50	

14. CHECK IF APPLICABLE

☐ Public Health/Quarantine

☐ Substitute Chemical

☐ Seasonal Concern

☐ Minor Use

☐ Part of IPM

☐ Review Requires Less Than 4 Hours

AH

TO BE COMPLETED BY PCB

11. DATE SENT TO HED/TSS
4-29-86

12. PRIORITY NUMBER
20

13. PROJECTED RETURN DATE
6-27-86

15. INSTRUCTIONS TO REVIEWER

A. HED ☐ Total Assessment - 3(c)(5)

☐ Incremental Risk Assessment - 3(c)(7) and/or E.L. Johnson memo of May 12, 1977.

B. SPRD (Send Copy of Form to SPRD PM)

☐ Chemical Undergoing Active RPAR Review

☐ Chemical Undergoing Active Registration Standards Review

C. ☐ BFSD

D. ☐ TSS/RD

E. ☐ Other

F. INSTRUCTIONS

Review of groundwater

16. RELATED ACTIONS

Record # 134,477

17. 3(c)(1)(D)

- ☐ Use Any or All Available Information ☐ Use Only Attached Data
☐ Use Only the Attached Data for Formulation and Any or All
☐ Available Information on the Technical or Manufacturing Chemical.

18. REVIEWS SENT TO

☐ TB

☐ RCB

☐ EEB

☐ EFB

☐ EF

☐ CH

☐ PL

☐ BFS

19. To	TYPE OF REVIEW	NUMBER OF ACTIONS							MNR. USE	Other
		Registration	Petition	EUP	SLN	Sec. 18	Inert			
HED	TOXICOLOGY									
	ECOLOGICAL EFFECTS									
	RESIDUE CHEMISTRY									
	ENVIRONMENTAL DATA Sam Cooper									
RD/TSS	CHEMISTRY									
	EFFICACY									
	PRECAUTIONARY LABELING									
	ECONOMIC ANALYSIS									

Label Submitted
Application
ned

21. ☐ Confidential
Statement of
Formula

22. ☐ Representative
Labels Showing
Accepted Uses
Attached

23. Date Returned to RD
(to be completed by
HED)

24. Include an Original and
Copies of This Comple
for Each Branch Check
Review.

INTRODUCTION

All studies required under the GWDCI for 1,3-Dichloropropene (1,3-D) have been submitted. All studies are useful for the purposes of the screen. However, before the Photolysis in Air and Anaerobic Aquatic Metabolism studies can be fully accepted, the registrant should supply missing information as is discussed below and under each study.

DISCUSSION/CONCLUSION

EAB concludes that 1,3-Dichloropropene has the potential to reach ground water when used agriculturally, because of the Field Dissipation studies and the finding of 1,3-D in ground water in Suffolk Co., N.Y. The chemical is flagged.

The chart below compares the data from environmental fate studies for 1,3-D to environmental fate parameters believed to be characteristic of leaching pesticides (Cohen, et al., 1984).

Therefore EAB concludes:

- ° Before full acceptance of the Photolysis in Air study (161-4), the registrant should supply information on the nature of the degradate(s) formed upon photolysis.
- ° Before full acceptance of the Anaerobic Aquatic Metabolism study (162-3), the registrant should supply information on the nature of the degradate(s) formed in the anaerobic aquatic study, their pattern of formation and decline.
- ° In neither of the 2 field studies (164-1) supplied was the leaching front of 1,3-D defined. EAB concludes that at high enough injection rates in sandy, coarse-textured soils of low percentage organic matter, 1,3-D will move and persist at depths of 8 feet. (See the following screen).

The registrant can accept EAB's conclusion that 1,3-D under certain conditions is a leacher and will contaminate ground water or the registrant can conduct a ground-water monitoring study at several different use rates and monitor for 1,3-D, 1,2-D and Chloroallyl alcohol (CAA) in the soil atmosphere and ground water. The depth of the leaching front at each application rate would be defined. The patterns of decline of 1,3-D and 1,2-D would be defined, as well as, the pattern of formation and decline of CAA.

1,3-Dichloropropene (1,3-D)				Triggers
Hydrolysis				
	pH	°C	tl/2	Half-life greater than 25 weeks.
	5.5	2	90-100 days	
	5.5	15	11-13	
	5.5	29	2	
Hydrolysis experiments run at a pH of 7.5 show the same results. Chloroallyl alcohol is expected to be the main hydrolytic product.				

1,3-D	Triggers												
<u>1,2-D</u> <p>1,2-D is an impurity in the D-D mixture of which 1,3-D is a major component. It degraded at pH 5.5 at 13°C, with a half-life of 70 days. Since ground-water temperatures are normally between 9-17°C, 1,3-D would be expected to degrade more quickly than 1,2-D which would be expected to persist in ground water.</p> <p>The above data are from a peer-reviewed article. The article did not clarify, <u>if the study was carried out in the dark, if the study was conducted with sterile water.</u></p> <p>A second hydrolysis study was performed.</p> <table><tr><th>pH</th><th>°C</th><th>t1/2</th></tr><tr><td>5,7,9</td><td>10</td><td>51 days</td></tr><tr><td>"</td><td>20</td><td>10-13 days</td></tr><tr><td>"</td><td>30</td><td>3-5 days</td></tr></table> <p>The chloroallyl alcohol (CAA) reached maximum concentrations of 32, 72, 78% at 10, 20, 30°C, respectively. The alcohol appeared to be stable to further hydrolysis. Hydrolysis is a major breakdown mechanism for 1,3-D. The 2 studies confirm one another. Hydrolysis of 1,3-D is pH independent and temperature dependent. Decreased temperature increases half-life of 1,3-D, considerably. At temperatures associated with ground water, 1,3-D may persist with a half-life of 50 days. This study was conducted with sterile water and under dark conditions.</p>	pH	°C	t1/2	5,7,9	10	51 days	"	20	10-13 days	"	30	3-5 days	
pH	°C	t1/2											
5,7,9	10	51 days											
"	20	10-13 days											
"	30	3-5 days											
Air Photolysis	1,3-D degraded rapidly in air (enclosed in a Pyrex chamber) exposed to a 275 W GE sunlamp, t1/2 = 0.5-3.3 days. No breakdown products were identified. As humidity increased in the chamber, the t1/2 decreased. Hydrolysis reactions in the vapor appear to increase.												
Aqueous Photolysis	No study was submitted. Half-life greater than 1 week. Study may be waived, because 1,3-D is subsurface injected at the time of application.												
Soil Photolysis	No study was submitted. Study may be waived, because 1,3-D is subsurface injected at the time of application.												

1,3-D		Triggers			
Aerobic Soil Metabolism	Soil type	%OM	°C	pH	tl/2 days
	Spier SL	11.6	15	?	22 ←
	Spier SL	11.1	15	?	37 ←
	Haren SL	3.6	15	5.0	22 ←
	Haren SL	3.6	20	5.6	25 ←
	Bogercie SL	14.8	20	3.9	20 ←
	Clay Soils				
	1	5.5	15	7.4	23
	2	1.1	20	6.8	3 ←
	3	1.7	20	7.2	3.5
	4	2.6	20	7.6	7.5
	5	1.8	20	7.2	8.0 ←
	6	1.8	20	7.1	5.0
	<p>Chloroallyl alcohol (CAA) is the main breakdown product. It degrades rapidly with a tl/2 = 1-2 days at 15°C, tl/2 = 19 hours at 29°C, tl/2 = 142 hours at 2°C.</p> <p>Within 4 weeks, approximately 100% 1,3-D has degraded in clay soils, while 60% degrades in sandy soils. There is 100% degradation in 12 weeks in a sandy soil. Dissipation is more rapid in clay soils than in sandy soils.</p> <p>In sandy soils, 1,3-D has a tl/2 = 24 days at 15-20°C. In clay soils, 1,3-D has a tl/2 = 1 week at 20°C.</p> <p>Temperature increases affect both compounds' rates of disappearance, shortening their half-lives. Temperature decreases lengthen their half-lives.</p> <p>These data are taken from a peer-reviewed journal article.</p>				
Anaerobic Aquatic	<p>Under anaerobic conditions, 1,3-D degraded with a tl/2 = 20 days, at pH 6.9-7.5. Chloroallyl alcohol (CAA) was the only degrade under these conditions. The pattern of degradation of CAA was not reported.</p> <p>Aqueous solutions of 1,3-D were mixed with soil in 0.5, 1.0, 2.0, 3.0 soil:solution ratios. The soil solutions were covered with foil and incubated at an unspecified temperature for 66 days. The sampling intervals were unspecified. Aqueous samples were saturated with Al₂(SO₄)₃ to increase efficiency of extraction. The aqueous solutions were extracted with organic solvent, concentrated, and analyzed for organics with an FID. CAA was not specifically analyzed for. The breakdown of 1,3-D in soil solutions proceeded more rapidly than in solutions without soil.</p> <p>The 20-day half-life does not appear significantly different from the half-lives for 1,3-D under hydrolysis and aerobic soil metabolism conditions.</p>				

1,3-D		Triggers			
Anaerobic Soil Metabolism	No study submitted.				
Leaching/ Mobility	Soil type	Depth cm	%OM	BDg/ml	K ml/g
	Humic sand	0	5.0	1.3	0.70
	"	20	5.0	1.5	0.70
	"	50	1.0	1.55	0.14
	"	100	0.5	1.6	0.07
	Sandy loam	0	3.0	1.2	0.30
	"	20	3.0	1.4	0.30
	"	50	2.0	1.45	0.20
	"	100	0.5	1.50	0.05
	These data were taken from a peer-reviewed journal article.				
Field Dissipation	1,3-D was injected at 220-250 l/ha = lbs/A at 9-19 cm below the surface in the Netherlands. Soils were sampled down to 35 cm depths, up to 16 days post-treatment from 5 points in each plot. Samples were stored at 2°C until analyzed. 1,3-D moved out of or dissipated from the 0-10 cm depth, but increased in concentration deeper in the soil. The 15 cm depth contained the highest concentration of 1,3-D in all of the studies at the end of a 2 week period. No samples were taken at the time of treatment. Samples were only taken to 35 cm. The depth of the leaching front <u>was not defined</u> . No degradates were analyzed for; their pattern of formation and decline was not established. This study indicates the rapid movement of 1,3-D at typical use rates to 14 inches at high levels in 2 weeks time.				
	Soil type	Depth cm	%OM	[1,3-D] ppm soil atm.	Days after injection
	sandy humic	35	5.0	0.4-2.9	14
	sandy humic	35	14.0	0.2-0.4	16
	peat	25-30	95.0	0.1-ND	13
	sandy loam	30	2.0	1.8-10.6	13
	sandy humic	15	5.0	5.0-10.0	14
	sandy humic	15	14.0	6.0-7.5	16
	peat	15	95.0	3.5	13
	sandy loam	15	2.0	5.0-9.0	13

1,3-D

Triggers

In a second study, 1,3-D was injected down to 3 feet in soil in California (Delano) at up to 1872 l/ha. Soil atmosphere samples were taken down to 8 feet in the soil. At Delano several treatment rates of 1,3-D were applied: 1638 l/ha, 1310 l/ha injected at 81 cm each; 982 l/ha + 327.6 l/ha, 1310 l/ha + 327.6 l/ha injected at 81cm and 25 cm depths, respectively. At the end of 2 weeks, at 8 feet, the concentration of 1,3-D was 0.5 ppm, 0.30 ppm, 0.51 ppm, and 0.40 ppm, for each application rate, respectively. (See chart below). The concentration of 1,3-D was distributed approximately evenly from 0-8 feet in the soil profile. Therefore, a 0.5-0.9 ppm band of 1,3-D exists in the soil atmosphere at 0-8 feet for the 1638 l/ha injection at 81 cm.

Site	Days after injection	[1,3-D] ppm at 8 feet	Appl. rate (l/ha)	Injection depth (cm)
Delano	14	0.5	1638	81
"	14	0.3	1310	81
"	14	0.5	1310 + 328	81 + 25
"	14	0.4	982 + 328	81 + 25

At these high injection rates, 1,3-D moves rapidly enough that it diffuses downward in the vapor phase before complete decomposition can occur. Under cool enough temperatures the vapor may condense to the aqueous phase and leaching may occur. Typical ground-water temperatures approximate 9-17°C.

Ground-water Monitoring

Several deep wells 65-1200 feet were sampled and analyzed for 1,3-D (54) and chloroallyl alcohol (8). Neither was found in any of the samples taken and analyzed. This study took place in Southern California.

A second study was conducted in Suffolk Co., N.Y. in potato fields. The soil type was a silt loam with 3-4% organic matter, a shallow water table of 3-4 meters, moderately well-drained with a gravel substrata. 1,3-D was applied at 94 and 140 l/ha; it was injected by sweep shank at 8-12 cm into the soil. Four wells were installed for each plot treated with a different concentration of 1,3-D: 1 upstream, 3 downstream of the ground-water flow. Soil temperature was 10°C at the time of injection. Background samples of the ground water showed neither 1,3-D nor 1,2-D. No upstream samples contained 1,3-D or 1,2-D. Both 1,3-D and 1,2-D were found in 1 downstream well's water 68 days after fumigation. The concentration peaked at 83 days and remained detectable for 138 days after fumigation. This plot was treated with 140 l/ha. The plot treated with 94 l/ha showed no contamination in the ground water. A total of 32.1 cm of rain fell shortly after fumigation.

Note: An increase in the water content in soils, decreases 1,3-D adsorption. Also, as the temperature decreases with rain, more 1,3-D moves into the water phase, but a saturated soil is less likely to remove the 1,3-D from the aqueous phase. The distribution coefficient between soil and gas ($K_{s/g}$) for 1,3-D decreases with an increase in moisture content in soil. The distribution coefficient between aqueous and vapor phases ($K_{w/g}$) for 1,3-D increases as temperature decreases. Solubility of 1,3-D in water also increases with a decrease in temperature.

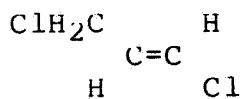
One can conclude from this study that a soil at 10°C, low %OM, sandy and coarse-textured, with a shallow water table plus a high rainfall event after injection of the fumigant produces the ideal field conditions for ground-water contamination by 1,3-D and 1,2-D. The combination of a decrease in temperature and an increase in moisture content in the soils after a rain, affects the distribution of 1,3-D between the water/vapor and soil/vapor phases to enhance leaching.

Product
Chemistry

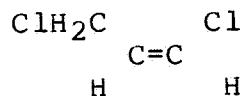
Solubility: 2000 ppm at 20°C

Partition coefficient for water/gas: 18 & 26 for cis and trans isomers, respectively.

Note: Solubility increases with a decrease in temperature. water solubility increases 1.27 fold at 2°C vs. 20°C.



trans



cis

Catherine Eiden
Section # 1
EAB