1 HB file

Shaughnessy No.: 081901

Date Out of EAB: AUG 1 1986

To: Henry Jacoby
Product Manager #21
Registration Division (TS-767)

From: Emil Regelman, Supervisory Chemist
Review Section #3
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached, please find the EAB review of...

Reg./File # : 50534-7

Chemical Name: CHLOROTHALONIL

Type Product : FUNGICIDE

Product Name : BRAVO

Company Name : SDS BIOTECH CORP.

Purpose : Addendum to a Standard

ACTION CODE: 660

EAB #(s) : 6073

Date Received: 10/24/85

TAIS Code: 44

Date Completed: 7/31/86

Total Reviewing Time: 2 days

Monitoring study requested: ____

Monitoring study voluntarily: ____

Deferrals to:

____ Ecological Effects Branch

____ Residue Chemistry Branch

____ Toxicology Branch

/

CASWELL NO.:

—TO BE USED FOR REVIEW OF STUDIES PPA ONLY—

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

(HED PROVIDE)
PACK No.: 10/24/85
12305

CHEMICAL NAME: CHLOROTHALONIL

(RD PROVIDE)
SHAUGNESSY NO. 081901

Identifying Number	Action Code	Reference Number	Record Number	Study Guideline or Narrative Description	Reg. Std. Review Submission Criteria (SEE BELOW)	Accession Number	(RSERB Provide) MRID Number	(HED/BUD/TSS Complete) Review Results: Acceptable (A)/ Unacceptable(U)
50534-7	660	12	160902	163-1	2	259753		

PRODUCT MANAGER (PM) or REVIEW MANAGER (RM) AND NUMBER: JACOBY 21

PM/RM TEAM MEMBER AND NUMBER: NOLES 21 557-1900

DATE RECEIVED (EPA): 10/16/85

RD BRANCH CHIEF INITIALS: T.C.A.

CHECK APPLICABLE BOX:

- ☐ Adverse 6(a)(2) Data (405,406)
- ☐ Suspect Data (415,416)
- ☐ IBT Data (485,486)
- ☐ Groundwater Data (495,496)
- ☐ Data Waiver Request (Reregistration) (650,651)
- ☐ Formulation Data and Labeling (Reregistration) (655,656)
- ☑ Generic Data (Reregistration) (660,661)
- ☐ Special Review Data (870,871)

RH

NUMBER OF INDIVIDUAL STUDIES SUBMITTED: 1

RELATED ACTIONS:

INSTRUCTIONS: Review data for reregistration acceptability purposes.

TO BE COMPLETED BY RSERB

DATE SENT TO HED/BUD/TSS: 10-24-85

PRIORITY NUMBER: 50

PROJECTED RETURN DATE: 12-20-85

DATE RETURNED TO RD (HED/BUD/TSS PROVIDE):

REVIEWS SENT TO:

☐ SIS ☐ TB ☐ RCB ☑ EAB ☐ EEB RD: ☐ TSS BUD: ☐ EAB ☐ SSB

TYPE OF REVIEW	NUMBER OF ACTIONS: Reregistration	Special Review	Other
Toxicology			
Ecological Effects			
~~Residue Chemistry~~			
Exposure Assessment	✓		
Product Chemistry			
Efficacy			
Precautionary Labeling/Acute Tox.			
Science Support			
Economic Analysis			

FOR DATA SUBMITTED UNDER A REGISTRATION STANDARD: Review Submission Criteria

Policy Note #31

1 = data which meet 6(a)(2) or meet 3(c)(2)(B) flagging criteria

2 = data of particular concern

3 = data necessary to determine tiered testing requirements

NOTE TO TSS: Return 1 Copy To RSERB

INCLUDE AN ORIGINAL AND FOUR (4) COPIES OF THIS COMPLETED FORM FOR EACH BRANCH CHECKED FOR REVIEW.

1. CHEMICAL: Common name:

Chlorothalonil

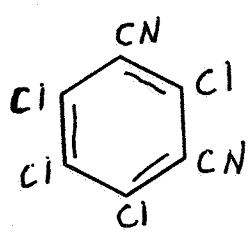
Chemical name:

2,4,5,6-Tetrachloro-1,3-benzenedicarbonitrile

Trade name(s):

Bravo, Clortosip, Daconil 2787, Exotherm Termil

Structure:



Formulations:

51.8% D, 2.5-11.25% G, 90% P/T, 75% WP, 20% Impr. and 4.17, 4.5, and 12.5 FlC.

Physical/Chemical properties:

Physical state: Odorless, white crystalline solid[a]
Empirical formula: $C_8Cl_4N_2$[b]
Molecular weight: 265.89[b]
Melting point: 245-247°C[b]
Vapor pressure: <0.01 mm Hg at 40°C[b]
Boiling point: 350°C at 760 mm Hg[b]
Stability: Stable to UV light; Thermally stable under normal storage conditions[a]

Corrosivity: Noncorrosive[a]
Solubility: 0.6 ppm in water at room temperature; Soluble in organic solvents at 25°C (w/w): xylene 8%, cyclohexane 3%, acetone 2%, kerosene <1%[b].

[a] Farm Chemicals Handbook. 1986. Ed. R.T. Meister. Meister Publishing Co., Willoughy, OH.

[b] The Merck Index. 9th ed. 1976. Ed. M. Windholz. Merck & Co., Inc., Rahway, NJ.

2. TEST MATERIAL:

See individual studies.

3. STUDY/ACTION TYPE:

Addendum to a Standard.

4. STUDY IDENTIFICATION:

The following studies are new submittals:

Capps, T.M. 1982. Adsorption and desorption of chlorothalonil to soils. Document No. 555-4EF-81-0216-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753. (No MRID)

Nelsen, T.R. 1985. An aged soil leaching study with ^{14}C-chlorothalonil (2,4,5,6-tetrachloroisophthalonitrile). Document No. 720-3EF-85-0001001. SDS Biotech Corporation, Painesville, OH. Acc. No. 259753. (No MRID)

Szalkowski, M.B. 1981. Determination of vapor pressure of 2,4,5,6tetrachloroisophthalonitrile (chlorothalonil, DS-2787). Document No. 416-3EI-800162-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753. (No MRID)

5. REVIEWED BY:

Hudson Boyd
Chemist
EAB/HED/OPP

Signature: Hudson L Boyd

Date: 7/31/86

6. APPROVED BY:

Emil Regelman
Supervisory Chemist
Review Section #3, EAB/HED/OPP

Signature: E Regelman

Date: AUG 1 1986

7. CONCLUSIONS:

7.1 Mobility/Leaching

Aged residues of chlorothalonil as judged by column leaching studies are slightly mobile in sandy loam, silt loam, and clay loam soils and mobile in sand soils. The degradates 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851), 2-hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525), and 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701) are mobile in all four soils; 3-cyano-2,5,6-plus 3-cyano-2,4,5-trichlorobenzamide (SDS-47524/3 are mobile in sandy loam, silt loam, and sand soils.

Unaged chlorothalonil is only slightly mobile in silty clay, silt, and sandy soil as shown by Freundlich K_{ads} values of 26, 29, and 20, respectively. Less than 4% of the adsorbed pesticide was desorbed from silty clay loam and less than 7% from the silty soil upon each of two dilutions. In contrast, the Freundlich K_{ads} value for sand soil was shown to be 3, and up to about 28% was desorbed upon dilution, indicating a fairly high mobility in sand.

These studies fulfill the EPA requirements for leaching (adsorption/desorption) and for mobility of aged residues of chlorothalonil in soils, per Sec. 163-1.

7.2 Volatility

With a vapor pressure of 5.72×10^{-7} @ 25°C (Szalkowski, 1981, Study 2 attached) and LD_{50} of > 10,000 mg/kg (Farm chemicals Handbook) chlorothalonil is unlikely to cause adverse effects on man or the environmental through vaporization. By providing data on vapor pressure the registrant has fulfilled EPA Guidelines requirements for volatility studies on chlorothalonil per Sec. 163-2,3.

8. RECOMMENDATIONS:

8.1 Accept the data from the column leaching and adsorption/desorption studies for the requirements of Subdivision N, Sec. 163-1.

8.2 Accept the data from the vapor pressure study in conjunction with published data on toxicity in fulfillment of the requirements of Subdivision N, Sec. 163-2,3.

9. BACKGROUND:

A. Introduction

Information on Previously Reviewed Studies

The agency has issued the Chlorothalonil Registration Standard.

A previous addendum was finalized November 26, 1985.

B. Directions for Use

Chlorothalonil is a broad spectrum nonsystemic protectant fungicide registered for use on various field and vegetable crop, orchard crop, greenhouse, ornamental (including turf), terrestrial nonfood, and industrial sites (incorporated into paints and stains). Chlorothalonil is also used as a cotton seed treatment. Of the chlorothilonil used in the United States, ~ 88% is applied to field and vegetable crops, with ~ 66% of this applied to peanuts. Application rates range from 0.75 to 12.25 lb ai/A. Chlorothalonil may be formulated with carbaryl, sulfur, dicofol, dinocap, diazinon, fenaminosulf, and aromatic petroleum derivatives. Single active ingredient formulations of chlorothalonil consist of 51.8% D, 2.5-11.25% G, 90% P/T, 75% WP, 20% Impr, and 4.17, 4.5, and 12.5% FlC. Chlorothalonil may be applied using ground equipment, aircraft, or irrigation equipment. Applicators need not be certified or under the direct supervision of applicators certified to apply chlorothalonil.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

See attached reviews of individual studies.

11. COMPLETION OF ONE-LINER:

One liner amended.

12. CBI APPENDIX:

All data discussed here are considered CBI by the registrant and must be treated as such.

ORIGINAL SIGNED BY HUDSON L. BOYD

DYNAMAC CORPORATION

CHLOROTHALONIL

Final Report

Task 1: Review and Evaluation of Individual Studies

Task 2: Environmental Fate and Exposure Assessment

Contract No. 68-02-4250

JULY 24, 1986

Submitted to:
Environmental Protection Agency
Arlington, VA 22202

Submitted by:
Dynamac Corporation
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

TABLE OF CONTENTS

Chlorothalonil

INTRODUCTION

Chlorothalonil is a broad spectrum nonsystemic protectant fungicide registered for use on various field and vegetable crop, orchard crop, greenhouse, ornamental (including turf), terrestrial nonfood, and industrial sites (incorporated into paints and stains). Chlorothalonil is also used as a cotton seed treatment. Of the chlorothalonil used in the United States ~88% is applied to field and vegetable crops, with ~66% of this applied to peanuts. Applicacation rates range from 0.75 to 12.25 lb ai/A. Chlorothalonil may be formulated with carbaryl, sulfur, dicofol, dinocap, diazinon, fenaminosulf, and aromatic petroleum derivatives. Single active ingredient formulations of chlorothalonil consist of 51.8% D, 2.5-11.25% G, 90% P/T, 75% WP, 20% Impr, and 4.17, 4.5, and 12.5% FlC. Chlorothalonil may be applied using ground equipment, aircraft, or irrigation equipment.

CASE GS0097 CHLOROTHALONIL STUDY 1 PM 400 08/03/82

CHEM 081901 Chlorothalonil

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01
Nelsen, T.R. 1985. An aged soil leaching study with ^{14}C-chlorothalonil (2,4,5,6-tetrachloroisophthalonitrile). Document No. 720-3EF-85-0001-001 SDS Biotech Corporation, Painesville, OH. Acc. No. 259753.

SUBST. CLASS = S.

DIRECT RVW TIME = 10 (MH) START-DATE END DATE

REVIEWED BY: K. Patten
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: H. Boyd
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7463

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

1. This study is scientifically valid.

2. Aged [^{14}C]Chlorothalonil (radiochemical purity 98.1%) was slightly mobile in sandy loam, silt loam, and clay loam soils, and mobile in sand soil based on soil column studies. The [^{14}C]chlorothalonil degradates (7-14 day aging), 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851), 2-hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525), and 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701), were mobile in all four soils; 3-cyano-2,5,6- plus 3-cyano-2,4,5-trichlorobenzamide (SDS-47524/3) were mobile in the sandy loam, silt loam, and sand soils.

3. This study partially fulfills EPA Data Requirements for Registering Pesticides by providing information on the mobility of aged chlorothalonil in soil.

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MATERIALS AND METHODS:

Uniformly ring-labeled [^{14}C]chlorothalonil (radiochemical purity 98.1 ± 1%, specific activity 66.52 mCi/mM) was added at 10 ppm to sandy loam, silt loam, clay loam, and sand soils (Table 1). The soils were mixed, moistened, and incubated in the dark at 25 ± 1°C. After 7-14 days of incubation, the soils were sampled and analyzed. The soil was extracted twice with acetone:0.3 N HCl (80:20), and the acetone extracts were further extracted with diethyl ether. The unextracted soils, the extracted soils, and the extracts were analyzed for total radioactivity using LSC. The extracts were analyzed for chlorothalonil and its degradates using HPLC.

The treated, aged soils were transferred to the top of glass columns (1.9 cm inside diameter) containing the appropriate untreated soil; ~6 cm of treated soil were added to the 30-cm untreated soil columns. The untreated columns were saturated with water before the treated soil was added. Each soil type was replicated. The columns were leached with distilled water (~19.7 inches) until 144 ml of leachate was collected. To speed leaching, positive air pressure was applied to the top of the sandy loam soil columns, and a vacuum was applied to the eluting end (via side-arm flask) of the clay loam soil columns. After leaching, the columns were divided into six 6-cm segments and analyzed for total radioactivity and specific compounds as described. Soil segments and leachate containing >1% of the applied [^{14}C]residues were also analyzed for chlorothalonil and its degradates. The leachates were acidified, extracted three times with diethyl ether, and analyzed by HPLC.

REPORTED RESULTS:

Following 7 days of incubation, chlorothalonil comprised 31.3 and 49.2% of the radioactive residues recovered in the sandy loam and silt loam soils, respectively. Following 14 days of incubation, chlorothalonil comprised 39.3 and 30.7% of the [^{14}C]residues in the clay loam and sand soils, respectively. The degradates 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851), 2-hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525), 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701), 3-cyano-2,5,6- plus 3-cyano-2,4,5-trichlorobenzamide (SDS-47524/3), 3-cyano-2,4,5,6-tetrachlorobenzamide (SDS-19221), and polar compounds were identified in the aged soils (Tables 2, 3, 4, and 5).

Chlorothalonil was slightly mobile in the sandy loam, silt loam, and clay loam soil columns, leaching to a depth 12-18 cm below the treated soil layer (Tables 2, 3, and 4). The degradates SDS-46851, SDS-47525, and SDS-3701 were leached through all three soils. SDS-19221 leached through the sandy loam and silt loam soils but was not detected in the leachate of the clay loam soil. SDS-47524/3 were not detected in the leachate of the sandy loam, silt loam, and clay loam soils. Chlorothalonil and all its degradates (SDS-46851, SDS-47525, SDS-3701, SDS-47524, and SDS-19221) were mobile in the sand soil (Table 5).

DISCUSSION:

1. Leaching through the sandy loam soil was speeded using positive air pressure and through the clay loam soil using a vacuum. These procedures reduce the exchange time and may increase mobility.

2. The study was concerned with aged chlorothalonil only.

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Table 1. Soil characteristics.

Soil texture	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)
	%					
Sandy loam	58.4	22.4	19.2	3.5	6.0	12.0-12.6
Silt loam	8.4	76.4	15.2	0.9	6.9	8.4-10.4
Clay loam	22.4	38.4	39.2	2.4	6.1	10.2-11.3
Sand	92.4	0.4	7.2	0.5	6.8	1.3-1.4

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Table 2. [^{14}C]Chlorothalonil and its degradates (% of applied) in aged (7-day) sandy loam soil treated at 10 ppm, and in leached sandy loam soil columns treated with the aged soil.

Sampling depth (cm)	SDS compound					Chlorothalonil	Soil bound	Polar
	46851[a]	47525[b]	3701[c]	47524[d]	19221[e]			
				Aged soil prior to leaching				
--	1.9	5.3	12.1	5.7	3.2	31.3	23.1	13.4
				Postleaching				
0-6	0.7	1.2	5.7	7.7	1.7	17.9	23.6	9.7
6-12	0.2	0.5	4.3	1.8	0.7	0.9	2.0	1.2
12-18	0.2	0.1	2.0	0.2	0.1	0.1	0.6	0.4
18-24	0.2	0.2	0.6	0.1	0.1	ND[f]	0.4	0.2
24-30	0.1	0.2	0.2	ND	0.2	ND	0.2	0.2
Leachate	5.5	0.9	0.4	ND	0.1	ND	--	1.2

a 3-Carboxy-2,5,6-trichlorobenzamide (SDS-46851).

b 2-Hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525).

c 4-Hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701).

d 3-Cyano-2,5,6-trichlorobenzamide (SDS-47524) plus its isomer, 3-cyano-2,4,5-trichlorobenzamide (SDS-47523).

e 3-Cyano-2,4,5,6-tetrachlorobenzamide (SDS-19221).

f Not detected; detection limit was 0.1% of the recovered.

Table 3. [^{14}C]Chlorothalonil and its degradates (% of applied) in aged (7-day) silt loam soil treated at 10 ppm, and in leached silt loam soil columns treated with the aged soil.

Sampling depth (cm)	SDS compound					Chlorothalonil	Soil bound	Polar
	46851[a]	47525[b]	3701[c]	47524[d]	19221[e]			
				Aged soil prior to leaching				
--	0.7	1.3	16.4	0.6	1.9	49.2	21.8	4.5
				Postleaching				
0-6	ND[f]	0.7	3.2	0.7	0.8	45.8	19.0	3.4
6-12	ND	0.1	1.5	0.5	0.7	0.8	0.4	0.2
12-18	ND	ND	1.2	0.3	0.6	0.3	0.2	0.2
18-24	ND	ND	1.2	ND	ND	ND	0.1	ND
24-30	ND	ND	1.8	ND	ND	ND	ND	ND
30-36	ND	ND	2.5	ND	ND	ND	ND	ND
Leachate	2.6	1.2	6.3	ND	0.1	ND	--	3.8

a 3-Carboxy-2,5,6-trichlorobenzamide (SDS-46851).

b 2-Hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525).

c 4-Hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701).

d 3-Cyano-2,5,6-trichlorobenzamide (SDS-47524) plus its isomer, 3-cyano-2,4,5-trichlorobenzamide (SDS-47523).

e 3-Cyano-2,4,5,6-tetrachlorobenzamide (SDS-19221).

f Not detected; detection limit was 0.1% of the recovered.

Table 4. [^{14}C]Chlorothalonil and its degradates (% of applied) in aged (14-day) clay loam soil treated at 10 ppm, and in leached clay loam soil columns treated with the aged soil.

Sampling depth (cm)	SDS compound					Chlorothalonil	Soil bound	Polar
	46851[a]	47525[b]	3701[c]	47524[d]	19221[e]			
				Aged soil prior to leaching				
--	1.1	3.1	5.4	0.6	2.8	39.3	32.6	12.9
				Postleaching				
0-6	ND[f]	1.5	4.7	2.1	2.1	38.4	28.7	10.1
6-12	ND	0.2	2.2	0.2	0.3	0.5	0.8	0.3
12-18	ND	0.2	0.1	ND	0.2	ND	0.1	ND
Leachate	1.7	0.7	7.0	ND	ND	ND	--	0.6

[a] 3-Carboxy-2,5,6-trichlorobenzamide (SDS-46851).

[b] 2-Hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525).

[c] 4-Hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701).

[d] 3-Cyano-2,5,6-trichlorobenzamide (SDS-47524) plus its isomer, 3-cyano-2,4,5-trichlorobenzamide (SDS-47523).

[e] 3-Cyano-2,4,5,6-tetrachlorobenzamide (SDS-19221).

[f] Not detected; detection limit was 0.1% of the recovered.

Table 5. [^{14}C]Chlorothalonil and its degradates (% of applied) in aged (13-day) sand soil treated at 10 ppm, and in leached sand soil columns treated with the aged soil.

Sampling depth (cm)	SDS compound					Chlorothalonil	Soil bound	Polar
	46851[a]	47525[b]	3701[c]	47524[d]	19221[e]			
			Aged soil prior to leaching					
--	ND[f]	1.8	36.7	1.7	2.4	30.7	16.6	6.3
			Postleaching					
0-6	ND	ND	5.1	0.4	0.7	11.3	10.6	3.5
6-12	ND	0.1	2.6	0.5	0.5	3.1	2.5	0.7
12-18	ND	ND	1.4	0.4	0.4	1.0	0.6	0.4
18-24	ND	ND	1.3	ND	0.6	0.7	0.7	0.3
24-30	ND	ND	2.1	0.1	0.6	0.5	0.5	0.2
30-36	ND	ND	2.3	0.1	0.4	0.8	0.6	0.3
Leachate	1.5	0.5	29.6	0.4	0.5	0.5	--	1.7

a 3-Carboxy-2,5,6-trichlorobenzamide (SDS-46851).

b 2-Hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525).

c 4-Hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701).

d 3-Cyano-2,5,6-trichlorobenzamide (SDS-47524) plus its isomer, 3-cyano-2,4,5-trichlorobenzamide (SDS-47523).

e 3-Cyano-2,4,5,6-tetrachlorobenzamide (SDS-19221).

f Not detected; detection limit was 0.1% of the recovered.

CASE GS0097 CHLOROTHALONIL STUDY 2 PM 400 08/03/82

CHEM 081901 Chlorothalonil

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Szalkowski, M.B. 1981. Determination of vapor pressure of 2,4,5,6-tetra-chloroisophthalonitrile (chlorothalonil, DS-2787). Document No. 416-3EI-80-0162-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753.

SUBST. CLASS = S.

DIRECT RVW TIME = 10 (MH) START-DATE END DATE

REVIEWED BY: L. Binari
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: H. Boyd
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7463

SIGNATURE: DATE:

CONCLUSIONS:

Ancillary Studies - Vapor Pressure

1. This study is scientifically valid.

2. The vapor pressure of chlorothalonil is 5.72×10^{-7} torr at 25°C, 2.65×10^{-6} torr at 35°C, and 4.49×10^{-5} torr at 45°C.

MATERIALS AND METHODS:

Five milliliters of a 100 µg/ml solution of chlorothalonil (99.7% pure, Diamond Shamrock Corp.) in toluene was coated on the inner walls of glass serum bottles and the toluene removed by vacuum. The bottles were sealed, flushed with nitrogen gas, and equilibrated for 7-19 days at 25, 35, or 45°C. Chlorothalonil in the headspace was quantitated using GC. Triplicate samples were prepared at each temperature and analyzed in duplicate. The vapor pressure was calculated using the ideal gas equation.

REPORTED RESULTS:

The vapor pressure of chlorothalonil was found to be $5.72 \times 10^{-7} \pm 2.36 \times 10^{-7}$ torr at 25°C, $2.65 \times 10^{-6} \pm 1.20 \times 10^{-6}$ torr at 35°C, and $4.49 \times 10^{-5} \pm 2.41 \times 10^{-5}$ torr at 45°C. The vapor pressure increased an order of magnitude with each 10°C increase in temperature.

DISCUSSION:

None.

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CASE GS0097 CHLOROTHALONIL STUDY 3 PM 400 08/03/82

CHEM 081901 Chlorothalonil

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01
Capps, T.M. 1982. Adsorption and desorption of chlorothalonil to soils. Document No. 555-4EF-81-0216-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753.

SUBST. CLASS = S.

DIRECT RVW TIME = (MH) START-DATE END DATE

REVIEWED BY: K. Patten
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: H. Boyd
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7463

SIGNATURE: DATE:

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

1. This study is scientifically valid.

2. [^{14}C]Chlorothalonil (radiochemical purity >97%) was mobile in silty clay loam, silt loam, and sandy loam soils, and very mobile in sand soil. Freundlich K_{ads} values were 26 for a silty clay loam soil, 29 for a silt soil, 20 for a sandy loam soil, and 3 for a sand soil equilibrated with 0.1-0.5 ppm of [^{14}C]chlorothalonil (radiochemical purity >97%) in a 1:4 soil: 0.03 N calcium sulfate slurry. The soils had been sieved through 250 µ (silty clay loam and silt soils) and 590 µ (sandy loam and sand soils) screens prior to use. Between 1.8 and 28.4% of the adsorbed chlorothalonil was desorbed from the soils.

3. This study partially fulfills EPA Data Requirements for Registering Pesticides by providing information on the adsorption and desorption of chlorothalonil in four soils.

MATERIALS AND METHODS:

Air-dried silty clay loam and silt soils were sieved through a 250 µ screen, and air-dried sand and sandy loam soils were sieved through a 590 µ screen (soils characterized in Table 1). Ring-labeled [^{14}C]chlorothalonil (radiochemical purity >97%, specific activity 375,564 dpm/µg) dissolved in 0.03 N calcium sulfate was added to the soils at 0.1, 0.2, 0.4, and 0.5 µg/ml, producing a 1:4 soil:calcium sulfate solution slurry. There were three replicates per treatment. The samples were sealed in screw-cap glass culture tubes, hand shaken, and then incubated in a shaker bath at 25°C for an equilibration period established by preliminary studies: 1 hour for the silty clay loam and silt soils, 8 hours for the sandy loam soil, and 24 hours for the sand soil. Following equilibration, the slurries were centrifuged and the supernatants were sampled.

Immediately after adsorption, the 4.0 ml of supernatant were replaced with 4.0 ml of untreated 0.03 N calcium sulfate. The slurries were reequilibrated and sampled as described. The desorption was repeated once.

The supernatants from the adsorption and two desorption phases were analyzed for total radioactivity using LSC.

REPORTED RESULTS:

Chlorothalonil was mobile to very mobile in the four soils studied. Freundlich K_{ads} values were 26 for the silty clay loam soil, 29 for the silt soil, 20 for the sandy loam soil, and 3 for the sand soil; 1/n values were 0.79, 0.83, 0.94, and 0.75, respectively.

Between 1.8 and 3.2% of the adsorbed was desorbed during each dilution from the silty clay loam and silt soils, 4.2-6.6% was desorbed from the sandy loam soil, and 9.5-28.4% was desorbed from the sand soil (Table 2).

DISCUSSION:

1. The soils were sieved through unusually fine screens, which would remove the larger sand grains. Sand contributes little to the adsorptive properties of a soil, so the improper sieving would increase the adsorptive properties of the soil. However, since four diverse textures were evaluated, this study can be considered useful in providing the necessary information on the mobility of unaged chlorothalonil.

2. The study was concerned with unaged chlorothalonil only.

Table 1. Soil characteristics.

Soil texture	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)
	%					
Silty clay loam	6.0	64.0	30.0	3.2	6.6	24.9
Silt	9.0	83.0	8.0	0.8	7.6	10.2
Sandy loam	64.6	29.4	6.0	3.4	5.9	11.8
Sand	96.0	--	4.0	0.6	6.6	1.6

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Table 2. Adsorption and desorption of [^{14}C]chlorothalonil.

	Adsorption (ppm)		First desorption (ppm)		Second desorption (ppm)	
Initial concentration (ppm)	Concentration in solution	Adsorbed on soil	Concentration in solution	Desorbed from soil	Concentration in solution	Desorbed from soil
			Silty clay loam			
0.518	0.037	1.926	0.027	0.0353(1.8)[a]	0.027	0.0547(2.8)
0.425	0.031	1.578	0.024	0.0338(2.1)	0.023	0.0456(2.9)
0.205	0.012	0.772	0.009	0.0140(1.8)	0.010	0.0192(2.5)
0.101	0.005	0.385	0.005	0.0088(2.3)	0.005	0.0088(2.3)
			Silt			
0.518	0.043	1.901	0.030	0.0344(1.8)	0.030	0.0602(2.3)
0.425	0.028	1.587	0.023	0.0337(2.1)	0.023	0.0467(2.9)
0.205	0.012	0.770	0.010	0.0148(1.9)	0.010	0.0186(2.4)
0.101	0.006	0.379	0.005	0.0070(1.8)	0.005	0.0095(2.5)
			Sandy loam			
0.518	0.081	1.748	0.059	0.0734(4.2)	0.058	0.1159(6.6)
0.425	0.058	1.466	0.047	0.0699(4.8)	0.047	0.0949(6.5)
0.205	0.028	0.707	0.023	0.0341(4.8)	0.022	0.0438(6.2)
0.101	0.014	0.347	0.011	0.0170(4.9)	0.010	0.0186(5.4)
			Sand			
0.518	0.245	1.091	0.154	0.1257(11.5)	0.154	0.3096(28.4)
0.425	0.201	0.895	0.123	0.0907(10.1)	0.123	0.2454(27.4)
0.205	0.083	0.486	0.055	0.0517(10.6)	0.054	0.1077(22.2)
0.101	0.037	0.256	0.025	0.0244(9.5)	0.024	0.0484(18.9)

[a] % of adsorbed [^{14}C]chlorothalonil desorbed with each dilution.

EXECUTIVE SUMMARY

The data summarized here are scientifically valid data that have been reviewed in this report but do not fulfill data requirements unless noted in the Recommendations section of this report.

Freundlich K_{ads} values were 26 for a silty clay loam soil, 29 for a silt soil, 20 for a sandy loam soil, and 3 for a sand soil equilibrated with 0.10-.5 ppm of [^{14}C]chlorothalonil (radiochemical purity >97%) in a 1:4 soil:0.03 N calcium sulfate slurry (Capps, No MRID). The soils had been sieved through 250 μ silty clay loam and silt soils) and 590 μ (sandy loam and sand soils) screens prior to use. Between 1.8 and 28.4% of the absorbed chlorothalonil was desorbed from the soils.

Aged [^{14}C]chlorothalonil (radiochemical purity 98.1%) was slightly mobile in sandy loam, silt loam, and clay loam soils, and mobile in sand soil based on soil column studies (Nelsen, No MRID). The [^{14}C]chlorothalonil degradates (7-14 day aging) 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851), 2-hydroxy-5-cyano-3,4,6-trichlorobenzamide (SDS-47525), and 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701), were mobile in all four soils; 3-cyano-2,5,6- plus 3-cyano-2,4,5-trichlorobenzamide (SDS-47524/3) were mobile in the sandy loam, silt loam, and sand soils.

RECOMMENDATIONS

Available data are insufficient to fully assess the environmental fate and transport of, and the potential exposure of humans and nontarget organisms to chlorothalonil. The submission of data relevant to registration requirements (Subdivision N) for terrestrial food crop and aquatic nonfood use sites is summarized below:

Hydrolysis studies: No data were submitted for this addendum; however, based on data submitted for the Chlorothalonil Registration Standard and the Chlorothalonil Addendum dated October 23, 1985, all data requirements have been fulfilled.

Photodegradation studies in water: No data were submitted for this addendum; however, all data are required.

Photodegradation studies on soil: No data were submitted for this addendum; however, all data are required.

Photodegradation studies in air: No data were submitted for this addendum; however, all data are required.

Aerobic soil metabolism studies: No data were submitted for this addendum; however, based on data submitted for the Chlorothalonil Registration Standard, all data requirements have been fulfilled.

Anaerobic soil metabolism studies: No data were submitted for this addendum. Based on anaerobic aquatic metabolism data submitted for this addendum, all data requirements have been fulfilled.

Anaerobic aquatic metabolism studies: No data were submitted for this addendum; however, based on data submitted for the Chlorothalonil Addendum dated October 23, 1985, all data requirements have been fulfilled.

Aerobic aquatic metabolism studies: No data were submitted for this addendum; however, all data are required depending upon the results from the specialized aquatic uses studies.

Leaching and adsorption/desorption studies: Two studies were submitted for this addendum. One study (Capps, No MRID) partially fulfills data requirements by providing information on the adsorption and desorption of chlorothalonil in four soils. The second study (Nelsen, No MRID) partially fulfills data requirements by providing information on the mobility of aged chlorothalonil in soil.

The Agency is concerned about the contamination of ground water by chlorothalonil and its metabolites. Data required for the evaluation of the potential for contamination of ground water are being required on an accelerated basis.

Laboratory volatility studies: No data were submitted for this addendum; however, vapor pressure data may be considered in determining whether volatility studies are required.

Field volatility studies: No data were submitted for this addendum. The data requirement is deferred pending conclusions relative to the laboratory volatility requirement.

Terrestrial field dissipation studies: No data were submitted for this addendum. Based on data submitted in the Chlorothalonil Registration Standard, an additional study is needed providing terrestrial field dissipation data for chlorothalonil at one additional site for the WP formulation (utilizing the highest rate recommended and the greatest number of multiple applications) and at two additional sites for the D, P/T, Impr, and FlC formulations.

Aquatic field dissipation studies: No data were submitted for this addendum; however, all data may be required depending upon the results from the specialized aquatic use studies.

Forestry dissipation studies: No data were submitted for this addendum; however, no data are required because currently chlorothalonil has no registered forestry uses.

Dissipation studies for combination products and tank mix uses: No data were submitted for this addendum; however, no data are required because data requirements for combination products and tank mix uses are currently not being imposed.

Long-term field dissipation studies: No data were submitted for this addendum. The data requirements for the long-term field dissipation studies will be based on the results of the field dissipation studies utilizing the highest rate recommended and the greatest number of multiple applications.

Confined accumulation studies on rotational crops: No data were submitted for this addendum. Based on data submitted for the Chlorothalonil Registration Standard, all data requirements have been fulfilled.

Field accumulation studies on rotational crops: No data were submitted for this addendum; however, based on confined accumulation studies submitted for the Chlorothalonil Registration Standard, all data are required.

Accumulation studies on irrigated crops: No data were submitted for this addendum; however, no data are required because water containing chlorothalonil residues is not expected to be used to irrigate crops.

Laboratory studies of pesticide accumulation in fish: No data were submitted for this addendum; however, all data may be required depending upon the octanol/water partition coefficient data.

Field accumulation studies on aquatic nontarget organisms: No data were submitted for this addendum; however, all data may be required depending upon the results from the specialized aquatic uses studies.

Reentry studies: No data were submitted for this addendum. The Agency is imposing a 24 hour reentry interval pending the receipt and evaluation of reentry data.

Specialized aquatic use studies: No data were submitted for this addendum. For antifouling paints on ships and related protective or preservative uses, a laboratory study employing nonradioisotopic analytical techniques is required for the determination of movement of residues from treated surfaces into water. When any movement is detected, the data requirements for aquatic noncrop uses apply.

Ancillary studies: One vapor pressure determination study was reviewed (Szalkowski, No MRID).

REFERENCES

Capps, T.M. 1982. Adsorption and desorption of chlorothalonil to soils. Document No. 555-4EF-81-0216-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753. (No MRID)

Nelsen, T.R. 1985. An aged soil leaching study with ^{14}C-chlorothalonil (2,4,5,6-tetrachloroisophthalonitrile). Document No. 720-3EF-85-0001-001 SDS Biotech Corporation, Painesville, OH. Acc. No. 259753. (No MRID)

Szalkowski, M.B. 1981. Determination of vapor pressure of 2,4,5,6-tetrachloroisophthalonitrile (chlorothalonil, DS-2787). Document No. 416-3EI-80-0162-001. Diamond Shamrock Corporation, Painesville, OH. Acc. No. 259753. (No MRID)