

US EPA ARCHIVE DOCUMENT

DATA EVALUATION RECORD

STUDY 9

CHEM 059101 Chlorpyrifos \$164-1

FORMULATION--12--EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID 40395201

Fontaine, D., J. Wetters, J. Weseloh, et al. 1987. Field dissipation and leaching of chlorpyrifos. Laboratory Project ID: GHC-1957. Unpublished study prepared by Dow Chemical USA, Agricultural Chemistry R&D Laboratories. 115 p.

DIRECT REVIEW TIME = 6.0

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CONCLUSIONS:

Field Dissipation - Terrestrial

This study is scientifically sound and provides supplemental information towards the registration of chlorpyrifos. This study does not fulfill EPA Data Requirements for Registering Pesticides because no pretreatment samples were taken to confirm that the test sites were not contaminated with the test substance prior to the study, freezer storage stability data were not provided, and field test data were incomplete.

SUMMARY OF DATA BY REVIEWER:

Chlorpyrifos dissipated with a half-life of 28-57 days in field plots (planted to corn) of silt loam soil in Geneseo, Illinois, sandy clay loam soil in Midland, Michigan, and loam soil in Davis, California that were treated with chlorpyrifos (Lorsban 4E HF, 4 lb/gal EC) at 3.0 lb ai/A in May, 1986. The registrant-calculated half-lives were 56, 33, and 46 days at the IL, MI, and CA sites, respectively.

At the IL site in the 0- to 6-inch layer of soil, chlorpyrifos declined from an average of 0.72 ppm (maximum 1.0 ppm) at 7 days posttreatment to <0.05 ppm (detection limit) by 112 days. At lower soil depths (up to 18 inches), chlorpyrifos was only detected in one sample immediately post-treatment and was not detected at any other sampling interval (up to 365 days posttreatment). In the 0- to 6-inch soil depth, the degradate . . .

3,5,6-trichloro-2-pyridinol

...reached a maximum of 0.07 ppm (average concentration) on day 56 post-treatment and declined to <0.05 ppm by day 112; 3,5,6-trichloro-2-pyridinol was not detected at lower soil depths. At all soil depths, concentrations of the degradate . . .

2-methoxy-3,5,6-trichloropyridine

...were ≤ 0.01 ppm during the study.

At the MI site in the 0- to 6-inch layer of soil, chlorpyrifos declined from an average of 1.1 ppm (maximum 1.8 ppm) immediately posttreatment to <0.05 ppm by 365 days. In the 6- to 12-inch soil depth, chlorpyrifos ranged from <0.05 to 0.28 ppm and was <0.05 ppm in the 12- to 18-inch soil depth. In the 0- to 6-inch soil layer,...

3,5,6-trichloro-2-pyridinol

...reached a maximum of 0.27 ppm on day 29 posttreatment and declined to <0.05 ppm by day 57; 3,5,6-trichloro-2-pyridinol was not detected at lower soil depths. At all soil depths,...

2-methoxy-3,5,6-trichloropyridine

...was ≤ 0.02 ppm during the study (study duration 365 days).

At the CA site in the 0- to 6-inch layer of soil, chlorpyrifos declined from an average of 1.4 ppm (maximum 2.0 ppm) immediately posttreatment to <0.05 ppm by 460 days. Chlorpyrifos concentrations were ≤ 0.09 ppm at the 6- to 12-inch soil depth and <0.05 ppm at the 12- to 18-inch soil depth. In the 0- to 6-inch soil layer,...

3,5,6-trichloro-2-pyridinol

...reached a maximum of 0.70 ppm on day 28 posttreatment and declined to 0.06 ppm by 460 days. In the 6- to 12-inch soil depth, 3,5,6-trichloro-2-pyridinol ranged from <0.05 to 0.12 ppm and was ≤ 0.05 ppm in the 12- to 18-inch soil depth. At all soil depths,...

2-methoxy-3,5,6-trichloropyridine

...was ≤ 0.03 ppm during the study (study duration 460 days).

DISCUSSION:

General

1. The length of time soil samples were stored frozen prior to analysis was not reported and storage stability data were not provided.
2. No pretreatment samples were taken; however, control plots were maintained at each of the sites.
3. The depth to the water table was not reported.

Illinois Site

From May to December 1986 and March to May 1987, rainfall totaled 37.5 inches, and, during this same period, air temperatures ranged from 3 to 95°F. From May to October 1986, soil temperatures (3-inch depth) ranged from 27 to 78°F.

Michigan Site

From May to November 1986 and April to May 1987, rainfall totaled 32.5 inches, and, during this same period, air temperatures ranged from 22 to 93°F. Soil temperatures were not reported.

California Site

From May 1986 to May 1987, rainfall plus irrigation totaled 19.8 inches, air temperatures ranged from 26 to 103°F, and soil temperatures (10-cm depth) ranged from 41 to 95°F. Meteorological data were collected for 1 year; however, the study duration was 460 days.

MATERIALS AND METHODS

MATERIALS AND METHODS:

Chlorpyrifos (Lorsban 4E HF, 4 lb/gallon EC, Dow Chemical USA) was applied at 3.0 lb ai/A to field plots of silt loam soil (upper 12 inches; 26% sand, 52% silt, 22% clay, 3.1% organic matter, pH 5.7, CEC 13.5 meq/100 g) located in Geneseo, Illinois (plot size 50 x 200 feet, 0-2% slope), sandy clay loam soil (upper 6 inches; 52% sand, 18% silt, 30% clay, 1.6% organic matter, pH 7.7, CEC 13.0 meq/100 g) located in Midland, Michigan (plot size 10 x 120 feet, 0-2% slope), and loam soil (upper 6 inches; 34% sand, 42% silt, 24% clay, 0.91% organic matter, pH 7.8, CEC 18.5 meq/100 g) located in Davis, California (plot size 50 x 100 feet, 0-2% slope) in May, 1986. Plots were cultivated (tilled or disked) to a depth of 2-4 inches immediately posttreatment and planted to field corn. The plots were treated with additional pesticides as described in Table 1. At each site, an untreated plot (uncharacterized) was maintained as a control. Soil samples were taken at intervals between 0 and 365 days (IL and MI sites) or 460 days (CA site) posttreatment. Soil samples were taken using soil probes (1-inch diameter) to a maximum depth of 18 inches and were stored frozen until analysis.

Soil samples were sieved (No. 4 or 6) or milled prior to extraction. For the determination of chlorpyrifos, soil samples were analyzed using Dow Chemical Method ACR 77.7. Each sample was extracted with acetone, and the extract was analyzed by GC with flame-photometric detection. For the determination of the degradate 3,5,6-trichloro-2-pyridinol, soil samples were analyzed using Dow Chemical Method ACR 84.4. Soil samples were heated at 130°C in methanolic sodium hydroxide for 30 minutes; this step yields total pyridinol as all "free" 3,5,6-trichloro-2-pyridinol and pyridinol resulting from the hydrolysis of chlorpyrifos is converted to the sodium salt. The extract was filtered, diluted, and the methanol was evaporated off. The sample was acidified (agent not described) and applied to a Sep-Pak C-18 column. The sample was eluted with methanol into benzene, then partitioned with sodium bicarbonate; the benzene phase was discarded. The sodium bicarbonate phase was acidified and partitioned with benzene. The benzene phase was derivatized with N,O-bis(trimethylsilyl)acetamide (BSA) to form the pyridinol trimethylsilyl derivative which was quantified by GC with electron-capture detection. Actual 3,5,6-trichloro-2-pyridinol was determined by the difference between the total pyridinol (as the pyridinol trimethylsilyl derivative) found and the pyridinol equivalents from chlorpyrifos found. For the determination of the degradate 2-methoxy-3,5,6-trichloropyridine, soil samples were analyzed using Dow Chemical Method ACR 86.4. Soil samples were extracted with hexane following the addition of water and concentrated phosphoric acid:water (1:1). The hexane extract was analyzed by GC with electron-capture detection. The detection limit for chlorpyrifos and 3,5,6-trichloro-2-pyridinol in soil was 0.05 ppm and for 2-methoxy-3,5,6-trichloropyridine was 0.01 ppm. Recovery from fortified soil samples ranged from 56 to 122% of the applied for chlorpyrifos, 43 to 116% for 3,5,6-trichloro-2-pyridinol, and 56 to 119% for 2-methoxy-3,5,6-trichloropyridine.

Table 1. Additional pesticides applied to the test sites.^a

Site	Pesticide	Rate	Date applied	Date treated with chlorpyrifos
Geneseo, Illinois	Ammonia	175 lb ai/A	4/10/86 and 4/6/87	5/8/86
	N.Serve 24	0.5 lb ai/A	4/10/86 and 4/6/87	
	Duel 8E	2.0 lb ai/A	5/7/86	
	Atrazine 4L	0.75 lb ai/A	5/7/86	
	Bladex 4L	1.25 lb ai/A	5/7/86	
	Lasso 4E	3.0 lb ai/A	4/87	
	Bladex 4L	1.0 lb ai/A	4/87	
	Atrazine 4L	1.5 lb ai/A	4/87	
Midland, Michigan	Tandem	0.5 lb ai/A	5/28/86	5/12/86
	Atrazine	1.5 lb ai/A	5/28/86	
	CoC	1 qt/A	5/28/86	
Davis, California	Lasso 4E	3 qt/A	5/29/86	5/31/86

^a Information obtained from the Materials and Methods section of the original document.

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Pages 7 through 21 are not included.

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