

DATA EVALUATION RECORD

STUDY 4

PC No. 029001 1,3-Dichloropropene (In-Line) §163-3

CAS No. 542-75-6

DP Barcode D267814, D267853

FORMULATION-12-EMULSIFIABLE CONCENTRATE

STUDY ID 45112901

Knuteson, J. A. and S. C. Dolder. 2000. Field volatility of 1,3-dichloropropene and chloropicrin from shallow drip irrigation application of Telone C-35 (InLine) to strawberry beds covered with VIF tarp. Laboratory Study ID 980070.01. Unpublished study performed by Paragon Research Services, Fresno, CA (in-life phase); Global Environmental Chemistry Laboratory, Dow AgroSciences LLC, Indianapolis, IN (analytical phase); and submitted by Dow AgroSciences LLC, Indianapolis, IN.

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There have been changes to contractor's DER	
There have not been changes to contractor's DER	



CONCLUSIONS

This study is considered scientifically valid. However, the study does not meet Subdivision N Guidelines for the fulfillment of EPA data requirements on field volatility because the test substance was not added to the soil at the highest recommended label rate for a single application.

ABSTRACT

Mobility - Field Volatility

The volatilization of 1,3-dichloropropene (*cis/trans*-1,3-dichloropropene; Telone C-35 E.C.; In-Line; 59.2% as 1,3-dichloropropene and 32.6% as chloropicrin by weight) under field conditions was studied on sandy loam soil in Monterey County, California. 1,3-Dichloropropene was applied at a rate equivalent to a broadcast rate of approximately 24.5 gal/A to a 9.4-acre drip-irrigated strawberry field. The drip lines were placed 0 to 1 inch below the soil surface, and the bed tops and sides were covered with a tarp described as virtually impermeable to 1,3-dichloropropene. Volatilized 1,3-dichloropropene was collected near the center of the treated plot at 15, 33, 55, 90, and 150 cm above the bed top, and at 30 and 90 m (1.5 m height) from the perimeter of the treated plot on all four sides of the plot. Air samples were collected through 19 days posttreatment. Soil gas was sampled once per day to a depth of 36 inches, and was a maximum 26.3 $\mu\text{g/mL}$ in a treated bed at a depth of 18 inches 8 days posttreatment. Volatilization was measured using the aerodynamic flux method (flux density using 33- and 90-cm sampling heights at plot center).

Volatilization of 1,3-dichloropropene exhibited pronounced diurnal fluctuation, with daytime period flux rates much greater than nighttime period flux rates. Volatilization decreased from 51.9 $\text{mg/m}^2\text{hr}$ on the afternoon of the application day to 3.7-22.1 $\text{mg/m}^2\text{hr}$ by 7 days, 3.2-13.2 $\text{mg/m}^2\text{hr}$ by 9 days, 1.7-7.6 $\text{mg/m}^2\text{hr}$ at 11-13 days, and 0.5-1.3 $\text{mg/m}^2\text{hr}$ at 19 days posttreatment. At the plot center at a height of 33 cm, 1,3-dichloropropene was a maximum of 120.24-188.77 $\mu\text{g/m}^3$ on the application day, decreased to 76.73-108.37 $\mu\text{g/m}^3$ by 5 days, 38.88-64.84 $\mu\text{g/m}^3$ by 7-8 days, 11.00-15.46 $\mu\text{g/m}^3$ at 14-15 days, and 3.28-6.14 $\mu\text{g/m}^3$ at 19 days posttreatment. At the plot center at a height of 90 cm, 1,3-dichloropropene was a maximum of 72.63-116.88 $\mu\text{g/m}^3$ at 1 day, decreased to 45.91-54.78 $\mu\text{g/m}^3$ by 5 days, 7.80-11.90 $\mu\text{g/m}^3$ by 12 days, and 2.23-3.90 $\mu\text{g/m}^3$ at 18-19 days posttreatment. The total mass of 1,3-dichloropropene lost from the soil was 28.9% of the applied (157.7 kg). Soil gas concentration of 1,3-dichloropropene was a maximum of 26.275 $\mu\text{g/mL}$ at 8.2 days posttreatment (18-inch depth).

During the study, average daily temperatures ranged from 7.72 to 26.48°C and wind speed (33-cm height) ranged from 0.69 to 4.95 m/second.

MATERIALS AND METHODS

1,3-Dichloropropene¹ (*cis/trans*-1,3-dichloropropene; Telone C-35; In-Line; 59.2% as 1,3-dichloropropene plus 32.6% as chloropicrin; TSN 101658, Lot No. B119-84, Dow AgroSciences LLC, pp. 14-15) was applied at a rate equivalent to 24.5 gallons/A (p. 17) by shallow drip irrigation to a strawberry field (9.4 acres divided into 4.42 and 4.98-acre irrigation zones; slope and depth to water table not reported) of sandy loam soil (0- to 6-inch depth, 67.5-68.4% sand, 16.8-19.7% silt, 12.8-15.2% clay, 1.24-1.51% organic matter, pH 7.5-7.8, CEC 3.68-5.07 meq/100 g; Table 1, pp. 41-42) located in Salinas, California on October 2, 1998 (pp. 15-17). The fields were laid out in 41-inch beds on 52-inch centers (p. 17). Each soil bed had dual drip lines (PVC pipe) placed 0- to 1-inch below the soil surface. Bed tops and sides, and irrigation tubing were covered with Hytibar tarp, which is virtually impermeable to 1,3-dichloropropene (p. 9). 1,3-Dichloropropene was injected into the water supply from approximately 8:32 am until 11:05 am; irrigation was continued until 12:30 pm to flush the system (p. 16). Two samples of the treated irrigation water were collected from the ends of the irrigation lines during treatment; the average concentration of 1,3-dichloropropene in the irrigation water was 1215 ± 175.2 mg/L (pp. 22-23).

To collect volatilized 1,3-dichloropropene, air was continuously drawn (flow rate 1-2 L/minute) through an air sampler (activated charcoal adsorption tube) using a SKC battery-operated vacuum pump (p. 19). Five air samplers were placed vertically at 15, 33, 55, 90, and 150 cm above ground level on a pole (flux mast) located at the center of the treated plot (sampler locations A-E, respectively). Eight off-site poles, each equipped with one air sampler positioned 150 cm above ground level, were placed along north-south and east-west transects through the treated plot center at approximately 100 feet (sampler locations F-I) and 300 feet (sampler locations J-M) from the edge of the treated plot (p. 27; Figure 2, p. 52). Air sampling began on September 30, 1998 and continued for 19 days (p. 21). Charcoal adsorption tubes were collected and replaced at approximately 7 am, 12 noon, and 5 pm daily throughout the study. Upon collection, the charcoal adsorption tubes were placed in frozen storage "as soon as possible after being removed from the field" (p. 21). The air flow rate of the samplers was determined and re-adjusted, if needed, using an electronic flow meter each time a charcoal adsorption tube was installed and replaced (p. 19).

Soil moisture (6-inch increments to 30 inches), soil temperatures (2.5-, 10-, and 50-cm depths), air temperatures (1.5-m height), relative humidity, barometric pressure, precipitation, total solar radiation, and wind velocity and direction (2.06 m height) were measured at the site (pp. 18-19, 24). Soil gas samples were collected daily from two soil vapor wells (6-, 12-, 18, 24-, 30, and 36-inch depths) located along the center of the bed, and from within furrows (6- and 12-inch depths) located on both sides of the bed (p. 24).

The charcoal samplers were analyzed according to Dow AgroSciences Method GRM 97.09 (p. 155). Charcoal samples from the front and back half of each adsorption tube

¹ Vapor pressure (25°C) reported as 34.3 mm Hg (*cis*) and 23.0 mm Hg (*trans*, p. 23). Aqueous solubility (25°C) reported as 2180 mg/L (*cis*) and 2320 mg/L (*trans*).

were removed and placed in separate vials, then extracted with chilled (-20°C) acetone using a reciprocating shaker for 1 hour (p. 34). Extracts were separated from charcoal by centrifugation and aliquots were analyzed for *cis*- and *trans*-1,3-dichloropropene by GC electron capture (GC/ECD); GC conditions were not described. Limits of detection and quantitation were 0.03 and 0.10 µg/tube, respectively (p. 160). Recovery efficiencies from charcoal adsorption tubes fortified with *cis*- and *trans*-1,3-dichloropropene at 0.01-3000 µg/tube averaged 84 ± 9% (53-110%, n = 95) of the applied for *cis*-1,3-dichloropropene and 82 ± 9% (51-109%, n = 95) for *trans*-1,3-dichloropropene (Table 5, pp. 186-188). Results were corrected for mean recovery efficiencies (p. 170). Air concentrations (µg/m³) of 1,3-dichloropropene were calculated as the sum of the concentrations of *cis*- and *trans*-1,3-dichloropropene detected in an adsorption tube divided by the volume of air pulled through that tube.

Water samples were analyzed using Dow AgroSciences Method GRM 94.11. 1,3-Dichloropropene was purged from the water by sparging with helium, then captured on a Tenax trap. The trap was heated and backflushed with helium, and the 1,3-dichloropropene was desorbed and transferred to a GC with MS detection. Recovery efficiencies from water fortified with *cis*- and *trans*-1,3-dichloropropene at 0.05-1,000,000 ng/mL averaged 109 ± 13% of the applied for *cis*-1,3-dichloropropene and 110 ± 13% for *trans*-1,3-dichloropropene (Table 7, pp. 149-150)

RESULTS/DISCUSSION

The volatilization of 1,3-dichloropropene (*cis*-/*trans*-1,3-dichloropropene; Telone C-35 E.C.; In-Line; 59.2% as 1,3-dichloropropene and 32.6% as chloropicrin by weight) under field conditions was studied on sandy loam soil in Monterey County, California. 1,3-Dichloropropene was applied at an rate equivalent to a broadcast rate of approximately 24.5 gal/A to a 9.4-acre drip-irrigated strawberry field. The drip lines were placed 0 to 1 inch below the soil surface, and the bed tops and sides were covered with a tarp described as virtually impermeable to 1,3-dichloropropene. Volatilized 1,3-dichloropropene was collected near the center of the treated plot at 15, 33, 55, 90, and 150 cm above the bed top, and at 30 and 90 m (1.5 m height) from the perimeter of the treated plot on all four sides of the plot. Air samples were collected through 19 days posttreatment. Soil gas was sampled once per day to a depth of 36 inches, and was a maximum 26.3 µg/mL in a treated bed at a depth of 18 inches 8 days posttreatment (Table 3, pp. 102-111). Volatilization was measured using the aerodynamic flux method (flux density using 33- and 90-cm sampling heights at plot center).

Volatilization of 1,3-dichloropropene exhibited pronounced diurnal fluctuation, with daytime period flux rates much greater than nighttime period flux rates. Volatilization decreased from 51.9 mg/m²hr on the afternoon of the application day to 3.7-22.1 mg/m²hr by 7 days, 3.2-13.2 mg/m²hr by 9 days, 1.7-7.6 mg/m²hr at 11-13 days, and 0.5-1.3 mg/m²hr at 19 days posttreatment (Table 4, pp. 45-46). At the plot center at a height of 33 cm, 1,3-dichloropropene was a maximum of 120.24-188.77 µg/m³ on the application day, decreased to 76.73-108.37 µg/m³ by 5 days, 38.88-64.84 µg/m³ by 7-8 days, 11.00-

15.46 $\mu\text{g}/\text{m}^3$ at 14-15 days, and 3.28-6.14 $\mu\text{g}/\text{m}^3$ at 19 days posttreatment. At the plot center at a height of 90 cm, 1,3-dichloropropene was a maximum of 72.63-116.88 $\mu\text{g}/\text{m}^3$ at 1 day, decreased to 45.91-54.78 $\mu\text{g}/\text{m}^3$ by 5 days, 7.80-11.90 $\mu\text{g}/\text{m}^3$ by 12 days, and 2.23-3.90 $\mu\text{g}/\text{m}^3$ at 18-19 days posttreatment. The total mass of 1,3-dichloropropene lost from the soil was 28.9% of the applied (157.7 kg). Soil gas concentration of 1,3-dichloropropene was a maximum of 26.275 $\mu\text{g}/\text{mL}$ at 8.2 days posttreatment (18-inch depth; Appendix A, Table 3, pp. 102-111).

During the study, average daily temperatures ranged from 7.72 to 26.48°C and wind speed (33-cm height) ranged from 0.69 to 4.95 m/second (Table 4, pp. 45-46).

DEFICIENCIES/DEVIATIONS

1. The data were presented as "Periods", where Periods 1-6 were pretreatment and 7-62 were posttreatment. No table was found in the report that clearly defined the date, start time, and end time associated with each period. It was therefore very awkward to interpret the critical data tables. Based on the information provided in the text, it was assumed that Period 7 ran from 7 am until 1 pm of October 2, Period 8 from 1 pm until 7 pm, Period 9 from 7 pm until 7 am, and so forth. The study authors should have provided a sample summary table.
2. The study authors reported that the aerodynamic flux method used in this study is a modified form of the Thornthwaite-Holzman equation (Majewski, M.S., M.M. McChesney, J.N. Seiber. A Field Comparison of Two Methods for Measuring DCPA Soil Evaporation Rates, *Environmental Toxicology and Chemistry*, 1991, 10: 301-311.) which is based upon the log-law of the wind speed profile. Aerodynamic flux is a gradient method requiring accurate vertical gradient measurements of horizontal wind speed, air temperature, and pesticide concentrations. The modified equation compensates for conditions which cause the atmosphere to be stable or unstable.
3. Charcoal adsorption tubes were stored frozen for up to 204 days prior to analysis (Table 1, pp. 175-180). The study authors stated that 1,3-dichloropropene has been shown to be stable when stored frozen on charcoal for up to 364 days (p. 153). The storage stability study was referenced, but was not available to review.
4. Immediate posttreatment soil samples were not collected to confirm the application rate. The application rate was determined by weighing the test substance container prior to and after application (p. 17). A density of 11.2 lb/gallon was assumed to convert weight (2032 lbs) of the In-Line used to volume (181.4 gallons) used. 1,3-Dichloropropene comprised 59.2% of the In-Line. The treated plot measured 9.4 acres.
5. Stability of 1,3-dichloropropene on the charcoal adsorption tubes during shipment was investigated (p. 154). Activated charcoal adsorption tubes were fortified with *cis*- and *trans*-1,3-dichloropropene at 5, 50 and 2,000 $\mu\text{g}/\text{tube}$. The fortified tubes were shipped to the field site, where some were exposed to ambient air, and all were returned to the

analytical laboratory with a shipment of field samples. Travel spike sample recoveries ranged from 74-104% (mean 85-89%), and field spike recoveries ranged from 82-102% (mean 91-92%; pp. 181-182).

6. Although reportedly measured during the study, percent relative humidity values were not reported.
7. The slope of the plot and the depth to the water table were not reported.
8. GC conditions were not described.

ATTACHMENT 1
Data Critical to the Study Interpretation

**THE FOLLOWING ATTACHMENT IS NOT AVAILABLE ELECTRONICALLY
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