Cert

Shaughnessy #: 059101

Due Date: 7/26/85

Init: JMK

JUN 21 1985

To: J. Ellenberger
Product Manager #12
Registration Division (TS-767)

From: Joseph C. Reinert, Ph.D., Chief
Special Review Section
Exposure Assessment Branch
Hazard Evaluation Division (TS-769C)

JCR

Attached please find the EAB review of...

Reg./File No.: 464-404

Chemical: Chlorpyriphos

Type Product: Insecticide

Product Name: Dursban

Company Name: Dow Chemical

Submission Purpose: Exposure Protocol

ZBB Code: _____

ACTION CODE: 352

Date In: 05/06/85

EAB # 5587

Date Completed: 6/19/85

TAIS (level II) Days

3

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

_____ Benefits and Use Division

1

TABLE 1. ESTIMATION OF APPLICATOR INHALATION EXPOSURE TO CHLORPYRIFOS

ASSUMPTIONS:

1. Air pump samples recovery rate = 100%.
2. Each applicator weighed 70 kg.
3. Respiratory volume for each applicator = 28 l/min.
4. Exposure time to chlorpyrifos = 1.7 hours.
5. Airborne chlorpyrifos concentration is constant throughout exposure.
6. Application rate =(400 gallons/1.7 hrs)x(0.5 LBS chlorpyrifos/100 gallons)= 1.2 LBS chlorpyrifos per hour.

CALCULATIONS:

Air volume respired = 28 l/min x 1.7 hrs x 60 min/hr = 2,856 l
2,856 l = 2.856 m^3.

Minimum chlorpyrifos inhaled = 2.856 m^3 x 0.01 mg/m^3 = 29 ug/1.7 hr.

Maximum chlorpyrifos inhaled = 2.856 m^3 x 0.02 mg/m^3 = 57 ug/1.7 hr.

EXPOSURE	LOW	HIGH
ug/1.7 hr	29	57
ug/hr	17	34
ug/kg/hr	0.24	0.48

E. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

The data presented in the study were of little value in attempting to assess applicator exposure to chlorpyrifos when applied in a greenhouse. The study failed to determine exposure to chlorpyrifos by the dermal or the inhalation route.

The dermal route of exposure was not assessed in the study because the applicators wore PVC raingear. The raingear would be expected to reduce but not eliminate dermal exposure during application. Exposure to chlorpyrifos would be expected on the lower legs, face, forearms, and the front of the neck. Hand exposure would be dependent on the type of gloves worn, if any, by the applicator. The draft labeling for DURSBAN 50W does not specify a requirement for the use of protective clothing, therefore an assessment of the dermal exposure to DURSBAN 50W during spray application was not answered by the study.

The inhalation route of exposure to chlorpyrifos was not assessed in the study because the applicators wore respirators. Properly worn respirators with pesticide cartridges would be expected to almost completely eliminate inhalation exposure to pesticide dusts. The efficacy of pesticide cartridges to pesticide spray is questionable. The filters that are placed over the activated charcoal portion of the cartridges may become saturated with the spray, if it is directed in other than a downward direction, and inhibit the applicator's ability to breathe. The draft labeling for DURSBAN 50W does not require respiratory protection, therefore, an assessment of inhalation exposure to DURSBAN 50W during indoor spray application was not answered by the study.

An attempt was made by this reviewer to estimate inhalation exposure from the chlorpyrifos air concentrations presented in the report. The inhalation exposure to chlorpyrifos was estimated to range from 0.24 to 0.48 ug/kg/hr (Table 1). These estimates are rough at best because of deficiencies in the study methods for determining air concentrations of chlorpyrifos. The study report did not indicate that the recovery efficiency of the analytical methods used with the Chromosorb 102 tubes was determined. If the reported data were not corrected for recovery efficency, then the reported chlorpyrifos air concentrations may be grossly underestimated.

The study concluded that PVC raingear was warranted due to the close quarters in a greenhouse and the wet foliage. Although not addressed in the report, the question of significant dermal exposure to the flower pickers after application of DURSBAN 50W may need to be addressed.

The study was considered invalid for exposure assessment purposes because of the following deficencies:

1). Percent recovery of the analytical chemistry methodology was not determined.
2). Dermal exposure was not assessed.
3). Actual applicator exposure to chlorpyrifos by the inhalation route was not measured. Ambient air concentrations are only estimates of respiratory tract exposure.
4). Mixer/loader or post-application worker exposure data were not measured.

into two sections. The volume of air sampled was determined by multiplying the stroke volume by the number of strokes recorded on the pump's stroke counter. Midland Analytical Laboratory analyzed the samples by EC/GC using the method of Melcher, et.al. (Analytical Chemistry, 50:251, 1978). Sample storage conditions and time to analysis were not given. It was not stated whether a percent recovery was determined.

The applicators started at opposite ends of the greenhouse and walked the length of each aisle until they met in the middle of the greenhouse. The plants on both sides of the aisle were sprayed by the applicators as they walked. The application of DURSBAN 50W required 1.7 hours and the greenhouse louvered vents were open during application. Dermal and respiratory tract exposures during application were not measured.

Post-application air concentrations of chlorpyrifos in the greenhouse were measured by placing the air pumps at five selected locations around the greenhouse. The pumps were hung from the overhead greenhouse supports with the sampling tubes 5' to 6' above the ground in the center of the aisles. The post-application sampling began about 15 minutes after the termination of the spraying operation and continued for 1.8 to 1.9 hours. The sampling tubes were handled in a manner similar to that used for the applicators.

C. REPORTED RESULTS: The airborne concentrations of chlorpyrifos in the breathing zones of the applicators were 0.01 and 0.02 mg/m^3. The duration of exposure was reported to be 1.7 hours. No other quantitative data were reported for applicator exposure.

The airborne concentration of chlorpyrifos measured after application was 0.01 mg/m^3 at two sample sites and 0.02 mg/m^3 at the remaining three sites. The 0.01 mg/m^3 concentrations were measured at the two sites closest to the greenhouse door.

Temperatures in the greenhouse were 74°F at 0940 and 84°F at 1045. A slight odor of chlorpyrifos was reported near the mix tank and during the preparation of the suspension. The applicators noticed the odor during treatment. During the post-application period one observer noticed the odor for approximately 40 minutes and a second observer noticed the odor throughout the 2 hour post-application period. English sparrows in the greenhouse were apparently unaffected by the activity.

D. STUDY AUTHOR'S CONCLUSIONS: The airborne concentration of chlorpyrifos that the applicators were exposed to were far below the ACGIH TLV of 0.2 mg/m^3 for chlorpyrifos. The applicator exposure levels of 0.02 and 0.01 mg/m^3 represented potential exposure because both applicators wore respiratory protection.

Airborne chlorpyrifos concentrations during the approximately 2 hour post-application period were far below the TLV throughout the treated area.

To the extent that application conditions during the study were typical of greenhouse treatment, inhalation exposure to chlorpyrifos is controlled.

The use of PVC raingear used to minimize dermal contact was "definitely warranted because of the close quarters and significant opportunity for contact with wet foliage."

Particularly, data on dermal and inhalation exposure to DURSBAN 50W during mixer/loader, applicator, and post-application worker duties in a greenhouse setting are required.

9. BACKGROUND

A. INTRODUCTION: The purpose of the submission and the company were not identified with the submission. The draft labeling for DURSBAN 50W does not identify the company.

B. DIRECTIONS FOR USE: DURSBAN 50W is a wettable powder insecticide designed for use as a spray to control various pests injurious to turf and ornamental plants. The label states that 0.5 LBS to 2.0 LBS DURSBAN 50W is to be mixed with water to make 100 gallons for use on ornamental plants. The concentration of DURSBAN 50W is dependent on the pests to be controlled.

The precautionary statements on the label do not specify the type of clothing to be worn, need for respiratory protection, or re-entry times after use. The label does warn against breathing the dust or getting DURSBAN 50W in the eyes or on the skin or clothes.

The draft label is presented in Appendix 1.

10. DISCUSSION OF STUDY

A. STUDY IDENTIFICATION: Axe,F.D. 1983. Evaluation of Applicator Exposure and Work-Environment Impact Following Treatment of a Greenhouse With DURSBAN®50W. Nakashima Nursery, Watsonville, CA. Accession Number 253928, EPA Registration No. 464-590.

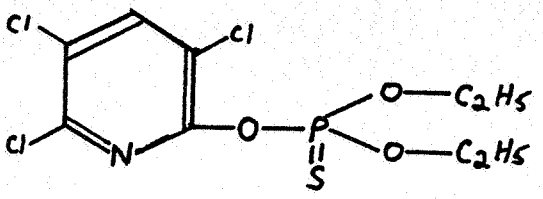
B.METHODS AND MATERIALS: DURSBAN 50W was applied as a formulated suspension with a concentration of 0.5 LBS of the active ingredient, chlorpyrifos, per 100 gallons of water. The pesticide was applied under an Experimental Use Permit to roses for the control of orange tortrix in one range of a greenhouse at the Nakashima Nursery, Watsonville, California. The range was a ridge and furrow construction enclosed by side walls and covered with polyethylene. The greenhouse range was 230' x 333' (76,590 ft^2) and had louvered vents running the length of each of the 16 ridges. A total of 400 gallons of DURSBAN 50W suspension was prepared and applied in the greenhouse range. The spraying was accomplished by each applicator tapping into the pressurized underground greenhouse delivery system with 3/8" hose. Each hose was fitted with a three-headed nozzle.

Two applicators were used in the study. No other personnel were present in the greenhouse during application. Both applicators wore PVC raingear and American Optical cartridge respirators equiped with pesticide cartridges. Air concentrations of chlorpyrifos in the applicators' breathing zone were measured during application by use of a small battery operated pump (SKC, West Inc., Fullerton, California). A bubble tube flow calibrator was used to calibrate the pump stroke volume prior to the study. Air was drawn by the pumps at a rate of approximately 100 ml/min through glass tubes packed with 100 mg of Chromosorb 102 which was divided

DATA EVALUATION RECORD

1. CHEMICAL

DURSBAN® 50W, chlorpyrifos, O,O-Diethyl O-(3,5,6-trichloro-2-pyridyl) phosphorothioate. DURSBAN 50W is a wettable powder formulation consisting of 50% chlorpyrifos and 50% inert ingredients. Chlorpyrifos is a white granular crystal with a melting point of 41.5 to 43.5°C.



2. TEST MATERIAL

DURSBAN 50W (50% chlorpyrifos, 50% inert ingredients). DURSBAN 50W was applied at a concentration of 0.5 LBS chlorpyrifos per 100 gallons of water.

3. STUDY/ACTION TYPE

Registration of product.

4. STUDY IDENTIFICATION

Axe,F.D. 1983. Evaluation of Applicator Exposure and Work-Environment Impact Following Treatment of a Greenhouse With DURSBAN®50W, Nakashima Nursery, Watsonville, CA.

5. REVIEWED BY

Curt Lunchick, Chemist
Special Review Section,EAB
Room 709C
557-1622

Signature: Curt Lunchick

Date: 6 September 1984

6. APPROVED BY

Joseph C. Reinert,Ph.D.
Chief Special Review Section
EAB
Room 709C
557-1622

Signature: Joseph C Reinert

Date: 9/6/84

7. CONCLUSIONS

The study did not provide a valid assessment of human exposure to DURSBAN 50W.

8. RECOMMENDATIONS

Additional data pertaining to the exposure of greenhouse workers to DURSBAN 50W would be required to assess exposure potential.