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TO: George LaRocca/ A. Heyward
Product Manager #15
Registration Division (H7505C)

FROM:

Paul Mastradone, Section Chief
Environmental Chemistry Review Section #1
Environmental Fate and Groundwater Branch

THRU:

Henry Jacoby, Chief
Environmental Fate and Groundwater Branch
Environmental Fate and Groundwater Division (H7507C)

Attached please find the EFGWB review of:

Reg./File # : 618-97, 618-98

Chemical Name: Avermectin

Product Type : Insecticide/miticide

Product Name : ZEPHYR 0.15 EC

Company Name : Merck Sharp & Dohme

Purpose : Review field dissipation studies to support conditional registration of product for use on cotton and citrus.

Date Received: 8/14/89 Action Code: 570

Date Completed: EFGWB No.: 90710, 90711

Total Reviewing Time (decimal days): 4.0

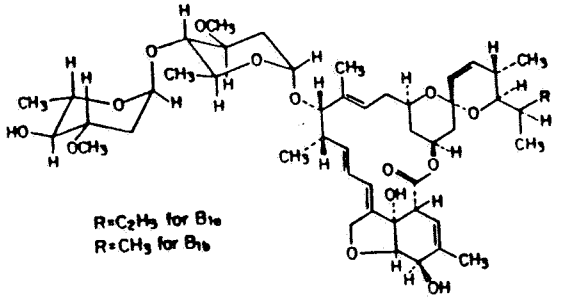
Deferrals to: _____Ecological Effects Branch, EFED
_____Science Integration & Policy Staff, EFED
_____Non-Dietary Exposure Branch, HED
_____Dietary Exposure Branch
_____Toxicology Branch, HED

1.0 CHEMICAL: Common name: Abamectin

Chemical name: Avermectin

Trade Name: ZEPHYR 0.15 EC

Chemical Structure:



2.0 TEST MATERIAL: Abamectin 0.15 EC

3.0 STUDY/ACTION TYPE: The registrant is requesting the review of studies of soil residue (field dissipation) submitted to support registration of products containing avermectin for use on cotton and citrus.

4.0 STUDY IDENTIFICATION:

Wehner, T. 1989. Additional Soil Residue Data in Support of Applications for Registration of Abamectin Soil Leaching and Dissipation Study. Analytical Development Corporation and Merck Sharp & Dohme Research Laboratories. Merck No. 001-87-6045. MRID No. 411915-01.

5.0 REVIEWED BY:

George Tompkins
Entomologist, Review Section 1
EFGWB/EFED

Signature: George Tompkins
Date: 2 April 1990

6.0 APPROVED BY:

Paul Mastradone
Section Chief, Review Section 1
EFGWB/EFED

Signature: Paul J Mastradone
Date: APR - 3 1990

7.0 CONCLUSIONS:

1. The EFGWB concludes that the submitted study is not acceptable. Soil samples were collected (Table T) prior to spraying and on the day of each of the 10 weekly applications, and on days 1,3,7,14,28,42,60,90, and 120 following the 10th application. However, analysis was only performed on selected soil samples, namely the pretreated sample and on the samples 0,7,14,28,42,60,90, and 120 days after the 10th treatment. No analyses or data were submitted for the soil samples between the 1st and 9th spray to determine the dissipation of an individual treatment or to determine the dissipation in soil of avermectin after the initial treatment.

2. The calculated half-life of avermectin, by the study authors, to dissipate was 31 days(± 6 days) in a coarse, sandy soil. The data submitted in Table A shows that there is a greater concentration of material in the 0-6 inch depth soil 12 days after the 10th treatment than at the 0 day after the 10th treatment.

3. The study authors concluded that avermectin B1a did not leach below 18 inches in a coarse, sandy soil with low organic material content(<1.5%) that was irrigated (Table A). However, after 10 treatments of 0.021 lbs ai/ A and reporting maximum values of 8.2-8.6 ng/g in the 0-6 inch depth soil profile (less than 10% of the total applied assuming a $1:2x10^6$ dilution in the 0-6 inch soil profile),the detection limits for this material may not be sufficient to detect its presence below 18 inches. Previous studies showed that no degradation of avermectin occurred under anaerobic conditions.

8.0 RECOMMENDATIONS:

1. Request that the soil samples collected after the 1st through 9th applications be analyzed and the data submitted for review.

2. Recommend that a second field dissipation study be performed in an area representative of areas where the pesticide is expected to be used at the highest recommended label rate. Irrigation and rainfall data should be submitted with this study.

9.0 BACKGROUND:

A previous review (1/17/89, EFGWB # 90227, 90225) evaluated a field dissipation study and found it to be incomplete and judged it to be an interim report. This field dissipation study is the completion of analyses on the three remaining soil core replicates of the previous review in order to complete the data requirement of the soil dissipation study.

10.0 DISCUSSION OF INDIVIDUAL STUDIES:

See attached DER (Data Evaluation Record).

11.0 COMPLETION OF ONE-LINER:

N/A

12.0 CBI APPENDIX:

There is no CBI in this review.

DATA EVALUATION RECORD

STUDY IDENTIFICATION:

Wehner, T. 1989. Additional Soil Residue Data in Support of Applications for Registration of Abamectin Soil Leaching and Dissipation Study. Analytical Development Corporation and Merck Sharp & Dohme Research Laboratories. Merck No. 001-87-6045R. MRID No. 411915-01.

TYPE OF STUDY:

Review studies of soil residue (field dissipation) submitted to support conditional registration of products containing avermectin for use on cotton and citrus.

REVIEWED BY:

George Tompkins, Entomologist
Review Section 1, EFGWB, EFED

Signature:
Date:

APPROVED BY:

Paul J. Mastradone, Section Chief
Review Section 1, EFGWB, EFED

Signature: Paul J Mastradone
Date: APR - 3 1990

CONCLUSIONS:

1. The study is incomplete and unacceptable. Soil samples, although collected (Table T) prior to the first spray, the day of spraying of each of the 10 weekly applications, and on days 1,3,7,14,28,42,60,90, and 120 following the 10th application, were selectively analyzed and data submitted only for the preapplication and on samples 0,7,14,28,42,60,90,and 120 days after the 10th application.

2. The calculated half-life of avermectin to dissipate in a coarse, sandy soil was calculated to be 31 days ($\pm$ 6 days) by the study authors. The data submitted (Table A) shows that there is a greater concentration of material in the 0-6 inch depth soil profile 42 days after the 10th treatment than at the 0 day after the 10th treatment.

3. The submitted results indicate that avermectin B1a/delta residues are stable in soil in frozen storage for relatively long periods of time (42 months duration of test).

4. The study authors concluded that avermectin B1a did not leach below 18 inches in a coarse ,sandy soil with a low organic material content (<1.5%) that was irrigated (Table A). After 10 applications of 0.02 lbs ai/ A of avermectin the maximum reported value was 8.2-8.6 ng/g in the 0-6 inch depth soil profile (less than 10% of the total applied assuming a 1: $2x10^6$ dilution in the 0-6 inch soil profile). It appears that the detection limits for this material by the current method may not be sufficient to detect its presence below 18 inches. Previous studies have shown that no degradation of avermectin occurred under anaerobic conditions.

MATERIALS AND METHODS:

Ten weekly applications of abamectin 0.15 EC were applied by ground sprayers at an average rate of 0.021 lb ai/acre (Table II) per application to a crop of celery. The field contained a sandy loam soil with an organic material content less than 1.5% (Table I) and was located in Tulare County, California. The field plot was 72 by 100 ft and partitioned into four subplot quadrants; each being 15 rows by 50 ft (0.17 ac). Each untreated replicate contained 8 rows by 50 ft (0.09 ac) and the untreated plots were 200 ft from the treated plots. The herbicide Roundup was used for post emergence weed control. Plans to test the celery for residues were abandoned because of poor growth of the plants.

The plot received eight irrigations each being approximately 3.12 inches of water for a total of 24.96 acre inches during the application period of abamectin and until 16 days after the last application. In addition to the irrigation, 2.78 inches of natural rainfall occurred during the application period and an additional 4.10 inches of rainfall occurred up to the last soil sampling.

Soil cores were taken 0-12 inches before treatment, and after each treatment, as well as after the tenth treatment on days 1, 3, 7, 14, 28, 42, 60, 90, and 120. On days 28, 42, 60, 90, and 120, additional cores were collected for analysis at 12-24 and 24-36 inches. Soil sampling was accomplished by utilizing a Giddings hydraulic soil sampler equipped with a probe capable of driving acetate tubes down to the desired depths. Collected soil cores were frozen within 1-2 hours after collection and stored at or below -10° C until analysis.

Before compositing the multiple core samples for each subplot, the individual core tubes were sectioned into 6 inch lengths. The sections were composited, homogenized and stored frozen until analysis. Selected soil samples from each subplot were assayed using Merck Method 8003 entitled: " HPLC-Fluorescence Determination for Avermectin B1 and its Delta 8,9 Isomer in Soil". In this method Avermectin B1a and its delta 8,9 isomer are extracted from soil in a Soxlet apparatus using a 50:50

acetonitrile:deionized water mixture (Fig 1, Method 8003). The sample extract is purified by solid phase and liquid-liquid extraction and the purified residue is derivatized to be quantitated on HPLC with fluorescence detection. The limit of detection by this me hod is 0.5 ng/g (ppb) and the limit of quantitation is 1.0 ng/g.

REPORTED RESULTS:

1. The half-life (time for 50% of the initial avermectin residue to dissipate) of avermectin was 31 days (±6 days). The residue decline curve is shown in Figure 1.

2. Avermectin B1a residues were shown to be stable in frozen storage for several years (Table S).

3. The avermectin B1a/delta 8,9 residues found in the top soil section (0-6") at day zero after the last application averaged 8.2 ng/g for all four subplots. In the deeper cores (6-12") at day 0 there was no detectable (all below 0.5 ppb) residues. By 90 days after the last application, the B1a delta 8,9 residue in the top (0-6") section had decreased to a 1.2 ng/g (ppb) average for the four subplots. No quantifiable residues were detected in the deeper cores down to 36 inches.

DISCUSSION:

1. The results of the study indicate that the avermectin B1a/delta residues are stable in soil in frozen storage for long periods of time(42 months).

2. The data presented indicates that avermectin residues, in a coarse sandy soil with a low organic content, did not leach below 18 inches in the soil as no detectable residues were detected in deeper samples. This agrees with the information presented in the Leaching-Adsorption/ Desorption study (1/18/90, EFGWB # 90534) which showed a Kads of 9.7 in sandy soil; and also with the TLC data (EAB # 4170, 3/28/84) showing that avermectin lacked mobility and was in the immobile class of materials.However, the dilution factor of this material in the 18 inch and below soil zones, combined with the aerobic metabolism and photolysis that may be occurring indicate that the detection limits of this compound may not have been adequate to have detected its presence below 18 inches in this study.

3.This study was conducted in only one site but was performed in a coarse, sandy soil with a low organic material content(<1.5%) and received considerable irrigation after most applications to supplement natural rainfall to simulate a worse case leaching situation. The study is not acceptable at this time and does not satisfy the data requirement for field dissipation studies. The analysis of the soil samples collected on the day of treatment of

each of the first nine spray applications must be performed to determine the dissipation of this material in the soil. A second field dissipation study in an area representative of an area where the material is expected to be applied is recommended so that the true picture of the mobility of this compound under actual conditions can be determined.