

US EPA ARCHIVE DOCUMENT



4-27-90

Shaughnessy No.: 125301

Date Out of EFGWB:

To: Mr. Phillip Hutton
Product Manager # 25
Registration Division (TS-767)

APR 24 1990

From: Paul Mastradone, Ph.D., Chief *PK*
Environmental Chemistry Review Section #1
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief *Henry Jacoby*
Environmental Fate & Ground Water Branch/EFED (H7507C)

Attached, please find the EFGWB review of...

Reg./File #: _____

Chemical Name: Fenoxycarb

Type Product: Insecticide

Product Name: LOGIC

Company Name: Maag Agrochemicals

Purpose: Review of additional information on spectral data in response to aqueous photolysis study.

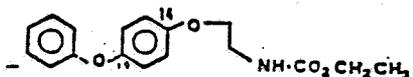
Action Code: 740 EFGWB #(s): 99777 89-0474

Date Received: 12/15/88 Total Reviewing Time: 0.25days

- Deferrals to: Ecological Effects Branch
 Dietary Exposure Branch
 Non-Dietary Exposure Branch
 Toxicology Branch I
 Toxicology Branch II

1.0 CHEMICAL:

chemical name: Ethyl (2-[4-phenoxyphenoxy]-ethyl) carbamate
common name: Fenoxycarb
trade name: Logic Fire Ant Bait
structure:



CAS #:
Shaughnessy #:125301

2.0 TEST MATERIAL: discussed in DER

3.0 STUDY/ACTION TYPE:

Review of additional information relating to the fenoxycarb aqueous photolysis study.

4.0 STUDY IDENTIFICATION:

Rosbery, G. D. 1989. Additional Information Relating to the Fenoxycarb Aqueous Photolysis Study; EPA Accession No. 071853. Project ID. FXC 161-2 3-89. Maag Agrochemicals. MRID 410208-01 071847.

5.0 REVIEWED BY:

James A. Hetrick, Ph.D.
Chemist, ECRS # 1
EFGWB/EFED/OPP

Signature: *James A. Hetrick*
Date: *4/19/90*

6.0 APPROVED BY:

Name: Paul Mastradone, Ph.D.
Section Chief, ECRS # 1
EFGWB/EFED/OPP

Signature: *Paul J. Mastradone*
Date: *APR 24 1990*

7.0 CONCLUSIONS:

The spectral information for the Hg-vapor light provides supplemental data; however, the data does not provide evidence the Hg-vapor lamp simulates natural light. The additional information indicates that the Hg-vapor lamp is approximately 6 times more intense than natural sunlight over a spectral region of 300 to 600 nm. Therefore, the total light energy of the lamp was regulated by decreasing the irradiation time proportionally (6X) to provide an irradiation energy of 296 W m⁻². The distribution of light energy for a Hg-vapor lamp, however, cannot be physically controlled to simulate natural light. Unlike natural light, the Hg-vapor lamp inherently has light energy occurring at very discrete wavelengths. EFGWB, therefore, concludes the aqueous photolysis study (MRID 00115232) does not meet the data requirement because the Hg-vapor lamp can not simulate natural light.

A full review of the original submission and the supplemental data was done for the chemical registration standard dated 3/2/90. A copy of the aqueous photolysis review is attached.

8.0 RECOMMENDATIONS:

Inform the registrant that the additional information does not provide necessary data to substantiate the Hg-vapor lamp can simulate natural light. The registrant should conduct the experiment using a light source that more closely simulates natural light. EFGWB has accepted photolysis experiments using a Xenon lamp to simulate natural light.

9.0 BACKGROUND:

In a previous review (Creger, 4/25/85), the aqueous photolysis study (MRID 00115232) was partially satisfied because the Hg-vapor light source was not compared to natural light. In addition, the registrant did not provide evidence the DURAN glass shield eliminated wavelengths less than 290 nm. Therefore, EFGWB requested additional information pertaining to the spectral properties of the Hg-vapor light.

10.0 DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

The registrant presented spectral information on the high pressure mercury vapor lamp with a DURAN glass filter for the aqueous photolysis experiment (MRID 00115232). When the Hg vapor light is filtered to remove irradiation below 290 nm, the lamp renders a fair simulation of natural sunlight. So equipped, the lamp produces an irradiance of 1460 W/m², approximately 6 times more intense than ground level solar irradiance (of 250 W/m²) in the spectral region of interest (300-600 nm). Thus, 60 hours of continuous exposure to the UV lamp is equal to 30 day outdoor exposure (Based on 12 hours of effective sunlight per day). These values are confirmed by measurement of ground level sunlight in a plot of wheat plants near Zurich, Switzerland in 1981 and 1982. Here the average net values of ground level irradiance in May/June were 296 and 263 W/m² (DER-Figures 1 and 2). In addition, the spectral transmission of the Duran glass jacket shows that the glass is transparent in the range of wavelengths above 290 nm (DER-Figure 3 attached).

The current EFGWB guideline policy requires use of a light source which simulates natural light. The registrant provided evidence that total light energy was regulated by adjusting the irradiation time to simulate natural light conditions in Zurich, Switzerland. However, the Hg-vapor lamp inherently does not simulate natural light because the distribution of light energy is limited to very discrete wavelengths.

11.0 COMPLETION OF ONE-LINER: N/A

12.0 CBI APPENDIX: There is no CBI used in this review.

DATA EVALUATION RECORD

STUDY IDENTIFICATION:

Dieterle, P. and R. Kaufman. 1982. Photolysis of ¹⁴C-Ro 13-5223/024 in Solutions and On Soil Surfaces. Report No. 41/3061. Maag Agrochemicals. (MRID No. 00115232).

Rosebery, G. D. 1989. Additional Information Relating to the Fenoxycarb Aqueous Photolysis Study. Project ID: FXC 161-1 3-89. Maag Agrochemicals, Inc. (MRID No. 41020801).

TYPE OF STUDY: Aqueous photolysis

REVIEWED BY:

James A. Hetrick, Ph.D., Chemist
Review Section 1, EFGWB/EFED

Signature: *James A. Hetrick*
Date: 3-2-90

APPROVED BY:

Paul J. Mastradone, Ph.D., Section Chief
Review Section 1, EFGWB/EFED

Signature: *Paul J. Mastradone*
Date: 3-2-90

CONCLUSIONS:

EFGWB concludes the study is scientifically valid. However, the study does not meet the subdivision N data requirements because the light source (mercury-vapor light) does not simulate natural light. The mercury vapor-light source has a high cumulative energy at very discrete wavelengths when compared to natural light. Therefore, EFGWB concludes this study provides supplemental data for the aqueous photolysis data requirements.

The results of the study show that fenoxycarb had a photolytic half-life of approximately 6 hours in an unsensitized solution and a half-life of 5 hours in a sensitized solution. Formation of a complex mixture of polar compounds appear to be the major means of photodegradation of fenoxycarb in aqueous solution. Photolysis appears to cause cleavage of the diphenyl ether bond with the monophenyl moieties recombining or forming other numerous monophenyl derivatives.

MATERIALS AND METHODS:

Radiolabeled ¹⁴C-Fenoxycarb (specific activity = 36.06 uCi/mg, radiochemical purity = >98%, chemical purity = >99% (GC)) was used in this study.

nm). Thus, 60 hours of continuous exposure to the UV lamp is equal to 30 day outdoor exposure (Based on 12 hours of effective sunlight per day). These values are confirmed by measurement of ground level sunlight in a plot of wheat plants near Zurich, Switzerland in 1981 and 1982. Here the average net values of ground level irradiance in May/June were 296 and 263 W/m² (Figures 1 and 2). The spectral transmission of the Duran glass jacket shows that the glass is transparent in the range of wavelengths above 290 nm (Figure 3).

REPORTED RESULTS:

The authors report that total recovery of applied radioactivity (material balance) was 89.5% and 95.4% for the unsensitized and acetone sensitized solutions, respectively. (Note: the text reports these values as 89.5% and 95.4%, respectively.). Fenoxycarb accounted for 14% of the applied radioactivity after 24 hours irradiation in the unsensitized solution and for 22% of the applied after 12.1 hours irradiation in the acetone sensitized solution. A complex mixture of polar degradation products (unextractable in the aqueous phase) accounted for 11.8% and 21.8% of the applied radioactivity in the sensitized and unsensitized solutions, respectively. Unidentified extractable but polar photoproducts I (with TLC R_f = 0) accounted for 41% and 37% of the applied radioactivity in the unsensitized and sensitized solutions, respectively. Unidentified extractable photoproducts II (with TLC R_f > 0) accounted for 12% of the applied radioactivity in the unsensitized solution. Total volatilized organic (or ¹⁴CO₂) accounted for 3.5% and 7.8% of the applied radioactivity in the unsensitized and sensitized solutions, respectively (Tables I and II). Also, the authors report that total recovery (material balance) for the dark controls was 99.9% and 104% of the total applied radioactivity to the sensitized and unsensitized solutions maintained in the dark. TLC analysis indicated that the radioactivity present was unaltered fenoxycarb.

Numerous photo-products were extracted in the preparative solutions and two were identified as isomers I and II of the known standard Ro 17-3194, a recombination product formed by the cleavage of fenoxycarb at the diphenyl ether bond (Table IV).

Based on the results, the authors concluded that photolysis of fenoxycarb first order kinetics and had half-lives of 5.7 and 5.0 hours in the unsensitized and acetone sensitized solutions, respectively. The authors noted that the data suggest that the diphenyl ether linkage can be cleaved photolytically and recombination (to form Ro 17-3194) or form numerous polar mono-phenyl derivatives

DISCUSSION:

In the initial review (dated 12-12-83) this study was accepted as satisfying the data requirement for the aqueous photolysis study.

The following solutions were prepared:

1. Unsensitized

A distilled water/acetonitrile (95:5) solution was fortified to 1 ppm with ^{14}C -fenoxycarb and irradiated with a high pressure mercury vapor lamp. The lamp was fitted into a glass photoreactor vessel equipped for passage of air for trapping volatile compounds into hexane and 1 N NaOH. Aliquots were taken after 0, 2.3, 3.5, 4.8, 6.3 and 24 hours irradiation and then extracted with ethyl acetate. The radioactivity in the trapping solutions, the aqueous and ethyl acetate phases was quantitated using LSC. The nature of the radioactivity extractable into the ethyl acetate was investigated by thin-layer chromatography (TLC).

2. Sensitized

A distilled water/acetonitrile/acetone (as sensitizer) (93:5:2) was fortified to 0.99 ppm with ^{14}C -fenoxycarb and irradiated in a similar reaction vessel for 12.1 hours. Extraction and analysis of the extracted radioactivity was conducted similar to that described above.

3. Unsensitized preparative

A distilled water/acetonitrile (3:1) solution was fortified with ^{14}C -fenoxycarb to 25 $\mu\text{g ml}^{-1}$ and similarly irradiated. After 7.75 hours the solution was extracted with ethyl acetate. Extracted radioactivity was analyzed by TLC. Photo-products were separated from parent fenoxycarb by repetitive injection of the extracted radioactivity (re-dissolved into acetonitrile) by HPLC. Separated photodegradation products were analyzed by GC/MS.

4. Dark Controls

Aliquots of the unsensitized and sensitized ^{14}C -fenoxycarb solutions were incubated in the dark and sampled and extracted as described above.

Additional information provided:

In previous review, the registrant was requested to submit additional data on the photolysis study.

Additional information presented by the registrant indicate that the high pressure mercury vapor lamp used in conjunction with the DURAN glass provides energy at various discrete wavelengths over the same approximate range as natural sunlight. When filtered to remove irradiation below 290 nm, the lamp renders a fair simulation of natural sunlight. So equipped, the lamp produces an irradiance of 1460 W/m^2 , approximately 6 times more intense than ground level solar irradiance (of 250 W/m^2) in the spectral region of interest (300-600

Prior to the review of data for a New Chemical Registration Standard, EFGWB requested further clarification of the light source spectra and energy distribution. The registrant provided a study (Roseberry, 410208-01) showing the Hg-vapor light source was 6 times more intense than sunlight. Although, the registrant provided proof that the total light energy of the Hg-vapor light was adjusted to simulate sunlight. The distribution of energy from a Hg-vapor light occurs at very discrete wavelengths and, therefore, does not simulate sunlight.

FENOXYPALR

Page ___ is not included in this copy.

Pages 8 through 10 are not included.

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 - The product confidential statement of formula.
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