12-9-87

Shaughnessy No.: 083601

Date Out of EAB: DEC 9 1987

TO: L. Rossi, PM-21
Registration Division (TS-767)

FROM: Emil Regelman, Supervisory Chemist
Environmental Chemistry Review Section #3
Exposure Assessment Branch/HED (TS-769C)

THRU: Paul F. Schuda, Chief
Exposure Assessment Branch/HED (TS-769C)

Attached, please find the EAB review of ...

Reg./File#: 8340-17 and 53265-O

Chemical Name: Triphenyltin hydroxide

Type Product: Fungicide

Product Name: TPTH

Company Name: American Hoechst Corporation

Purpose: Addendum to a Standard.

Date Received: 1/24/86, 2/11/86, 3/31/87, & 8/3/87

Action Code(s): 400, 656

EAB #(s): 60273, 60360, 70463 70844, 70681

Date Completed: ______

Total Reviewing Time: 12.5

Monitoring Study Requested: ______

Monitoring Study Volunteered: ______

Deferrals to:

______ Ecological effects Branch

______ Residue Chemistry Branch

______ Toxicology Branch

1. CHEMICAL: Common name:

Triphenyltin hydroxide

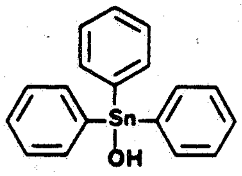
Chemical name:

Triphenyltin hydroxide

Trade name(s):

Du-Ter, Duter, Haitin, Phenostat-H, Suzu H, TPTH, TPTOH, Triple Tin, Tubotin

Structure:



Formulations:

47.5% WP, 19.7% FlC, 40% FlC

Physical/Chemical properties:

Molecular formula: $C_{18}H_{16}OSn$.
Molecular weight: 367.
Physical state: Crystalline.
Melting point: 118-120°C.
Stability: Subject to dehydration at elevated temperatures.
Solubility: Practically insoluble in water; moderately soluble in most organic solvents.

2. TEST MATERIAL:

See individual studies.

3. STUDY/ACTION TYPE:

Addendum to the Triphenyltin hydroxide Registration Standard.

4. STUDY IDENTIFICATION:

The following studies are new submittals:

Burkle, W.L. and U. Rutz. 1985. Hoe 029664-14-C (TPTH), residues in rotational crops sown 30 days after treatment of the soil at an application rate of 330 g ai/ha. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 6.

Gildemeister, H. 1985. Hoe 029664-14C leaching study. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 5.

Gildemeister, H. and P. Grundschottel. 1985. Hoe 029664-14C photodegradation studies in water. Report No. (B)242/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 2.

Gildemeister, H. and H. Sochor. 1985. Hoe 029664-14C, aerobic soil metabolism study with the fungicide triphenyltin hydroxide (TPTH). Report No. (B)227/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 3.

Gildemeister, H., W.L. Burkle, and H. Sochor. 1985. Anaerobic soil metabolism study with the fungicide. Report No. (B)221/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 4.

MRID's
156002 TO
156007

Gildemeister, H., K. Kunzler, and B. Haberkorn. 1985. Hoe 029664-14C photodegradation studies on soil. Report No. (B)160/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 1.

155453

White, S.M. 1985. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota and peanuts in Georgia. Including Soil residue dissipation of LX 124-09, and Triphenyltin hydroxide field dissipation study in peanuts. Prepared by Agri-Growth Research, Inc., Hollandale, MN, Southern Agricultural Research, Inc., Donalsonville, GA, and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 261019.

White, S.M. 1987a. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to peanuts in Georgia. Prepared by Southern Agricultural Research, Inc., Donalsonville, GA; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 401065-01.

White, S.M. 1987b. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota. Prepared by Agri-Growth Research, Inc., Hollandale, MN; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 401065-02.

5. **REVIEWED BY:**

A. Reiter
Chemist
EAB/HED/OPP

Signature: Allan J. Reiter

Date: DEC 7 1987

6. APPROVED BY:

Emil Regelman
Supervisory Chemist
Review Section #3, EAB/HED/OPP

Signature: E Regelman

Date: DEC 9 1987

7. CONCLUSIONS:

The following environmental fate requirements have been met to date: hydrolysis studies, aerobic and anaerobic soil metabolism studies, and, leaching and adsorption/desorption studies.

The following study requirements have not been satisfied for the reasons cited:

a) Photodegradation in Water - test substance not completely dissolved and material balances incomplete; inappropriate analytical methodology; incomplete characterization of the metabolic products; lack of buffered test solutions; other minor omissions listed below in reporting of procedural data.

b) Photodegradation on Soil - in both experiments the reported material balances were incomplete; more than one sampling interval is needed to establish a pattern of decline for both the parent and its metabolites.

c) Terrestrial Field Dissipation - The field dissipation data are not acceptable, because less than maximum (permissible) label rate was applied. At the Minnesota site, only 0.3 lb ai/A was used, and at the Georgia site, 7.6 oz ai/A were applied. For peanuts, maximum label use rate can exceed 2 lb ai/A. Sugar beet label rate application can exceed 1 lb ai/A.

In the Minnesota field dissipation study, parent TPTH residues in sugar beet plots ranged from 0.04 to 0.10 in the 0- to 5-cm soil layer. Parent residues were not detected in the lower soil layers. The degradate diphenyltin dihydroxide was detected in the 0- to 5-cm soil layer of bare ground plots at 0.07 ppm. The estimated half-life was approximately 21 days.

Data from the Georgia field dissipation study showed that half-lives were between 3 and 7 days in both the peanut and bare ground plots. Parent residues in the 0- to 5-cm soil layer of both the peanut and bare gound plots ranged from 0.05 to 0.13 ppm; parent was not detected at the (lower) 5- to 10- and 10- to 15-cm depths. No degradate residues were reported at the Georgia site.

d) Confined Accumulation Studies on Rotational Crops - These studies are incomplete because they were not conducted at the maximum number of permissible treatments. These data support a 30-day rotation interval for TPTH when only a single application is made at 3.8 oz ai/A.

e) Fish Bioaccumulation - No data were received for this addendum.

Finally, other studies may be required (e.g., reentry, long-term field

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dissipation studies, etc.) based upon the results of the aforecited incomplete studies.

8. RECOMMENDATIONS:

The environmental fate requirements for TPTH have not been satisfied.

a) Photodegradation in Water - This study must be repeated using a buffered solution and in a vessel that minimizes adsorption of the parent TPTH compound (e.g., Teflon or polycarbonate vessel). The comments made by Dynamac regarding reporting of results and analytical methodology must be taken into consideration when a new study report is prepared.

b) Photodegradation on Soil - This study must be repeated to achieve a reasonable material balance (>90% to <110%) with sufficient sampling intervals to establish a pattern of degradation for the parent and its degradation product(s).

c) Terrestrial Field Dissipation - These studies must be repeated at maximum label rates, giving full meteorological data, analytical methodology, and characterization of residues from all sites.

d) Confined Accumulation Studies on Rotational Crops -

e) Accumulation in Fish - A bluegill study may have been submitted for this addendum. The PM has been contacted, and if another copy is received by EAB, it will be reviewed ASAP.

To support maximum label rates, the study must be repeated using the maximum number of permissible applications at the maximum application rate.

9. BACKGROUND:

A. Introduction

Seven environmental fate studies were submitted by American Hoechst Corporation on TPTH in response to the Registration Standard of 9/30/84 and are reviewed in this report:

1) Degradation and photodegradation in water,
2) Degradation and photodegradation in soil,
3) Aerobic soil metabolism,
4) Anaerobic soil metabolism,
5) Leaching and adsorption/desorption studies,
6) Terrestrial field dissipation studies,
7) Confined accumulation studies on rotational crops.

In addition, the registrant requested (EAB #70844) an explanation of why we stipulated a 12-fold higher application rate for the confined

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accumulation in rotational crop study (Acc. No. 263970). (This has been verbally answered by John Jordan of EAB in a telecon from the registrant earlier this summer.)

B. Directions for Use

Triphenyltin hydroxide is a nonsystemic, protectant, foliar fungicide registered for use on carrots, pecans, peanuts, potatoes, and sugar beets. Triphenyltin hydroxide is also registered for use on tobacco and as an industrial preservative, but is no longer marketed for these uses. Of the total domestic triphenyltin hydroxide usage, 82% is applied to pecans. Application rates range from 0.06 to 0.71 lb ai/A. There are no multiple active ingredient products containing triphenyltin hydroxide. Single active ingredient formulations of triphenyltin hydroxide consist of 47.5% WP, and 19.7 and 40% FlC. These formulations may be applied using either ground equipment or aircraft. Applicators need not be certified or under the direct supervision of applicators certified to apply triphenyltin hydroxide.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

See attached reviews of individual studies.

11. COMPLETION OF ONE-LINER:

12. CBI APPENDIX:

The data reviewed here are considered company-confidential by the registrant and must be treated as such.

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DYNAMAC
CORPORATION

TRIPHENYLTIN HYDROXIDE

Final Report

Task 1: Review and Evaluation of Individual Studies

Task 2: Environmental Fate Assessment

Contract No. 68-02-4250

DECEMBER 3, 1987

Submitted to:
Environmental Protection Agency
Arlington, VA 22202

Submitted by:
Dynamac Corporation
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

TRIPHENYLTIN HYDROXIDE

Table of Contents

INTRODUCTION

Triphenyltin hydroxide is a nonsystemic, protectant, foliar fungicide registered for use on carrots, pecans, peanuts, potatoes, and sugar beets. Triphenyltin hydroxide is also registered for use on tobacco and as an industrial preservative, but is no longer marketed for these uses. Of the total domestic triphenyltin hydroxide usage, 82% is applied to pecans. Application rates range from 0.06 to 0.71 lb ai/A. There are no multiple active ingredient products containing triphenyltin hydroxide. Single active ingredient formulations of triphenyltin hydroxide consist of 47.5% WP, and 19.7 and 40% FlC. These formulations may be applied using either ground equipment or aircraft. Applicators need not be certified or under the direct supervision of applicators certified to apply triphenyltin hydroxide.

DATA EVALUATION RECORD

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 1 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Gildemeister, H. and P. Grundschottel. 1985. Hoe 029664-14C photodegradation studies in water. Report No. (B)242/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 2.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

REVIEWED BY: L. Binari
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: A. Reiter
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7709

SIGNATURE: Allan J. Reiter DATE: DEC 7 1987

CONCLUSIONS:

Degradation - Photodegradation in Water

This study is unacceptable because the test substance was not completely in solution and material balances were incomplete. In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides because inappropriate analytical methodology was used, not all degradates comprising >10% of the applied radioactivity were characterized, the test solutions were not buffered, the intensity of the artificial light source was not reported, the intensity and wavelength distribution of the artificial light source were not compared to natural sunlight, and the incubation temperature of the dark control was not specified.

MATERIALS AND METHODS:

Phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.5%, specific activity 22.62 mCi/g, Hoechst AG) in methanol was added at 3.9 ppm to distilled water; the final concentration of the cosolvent was <0.5%. The irradiated solution was incubated in a photoreactor equipped with a mercury vapor lamp (TQ 150 Z3, Original Hanau Quarzlampen GmbH) having a total output of 33.8 W between 297 and 579 nm. The spectral energy distribution of the lamp is presented in Table 1. Duran glass enclosing the lamp was used to filter out wavelengths <290 nm; the UV permeability of the Duran glass is presented in Figure 1. The irradiated solution was maintained at 25 ±1°C and attached to a gas collection system (air flow rate unspecified) having three successive traps (Figure 2). As a control, a sample of the test solution was placed in a flask and incubated in the dark. Samples of the irradiated solution and gas trap solutions were taken at 0, 1, 2, 4, 8, 24, 48, 96, 144, and 192 hours posttreatment. The dark control solution was sampled at 24 and 96 hours posttreatment.

Total radioactivity in the test solutions and gas trap solutions was quantified by LSC. The presence of water-soluble volatile degradates (which were not removed by the air passed through the solution) was determined by evaporating an aliquot of the test solution to dryness, quantifying the amount of radioactivity in the remaining residue by LSC, and comparing the amount of radioactivity found in the residue to that present in the test solution prior to evaporation. Samples of the test solutions were also analyzed by TLC on silica gel plates developed in toluene:ethyl acetate:acetic acid:water (50:50:1:0.5). Radioactive areas were located and quantified with a TLC-linear analyzer, then identified by comparison to reference standards.

REPORTED RESULTS:

The half-life of triphenyltin hydroxide was 48-96 hours in distilled water irradiated with artificial light; the calculated half-life was 95 hours (Table 2). At 192 hours posttreatment, parent triphenyltin hydroxide accounted for 24.2% of the applied radioactivity. Monophenyltin, diphenyltin, and tetraphenyltin compounds accounted for 15.8, 6.7, and 1.7% of the applied, respectively. In addition, 12.8% of the applied was recovered at 192 hours posttreatment by rinsing the photoreactor vessel; parent triphenyltin hydroxide accounted for the majority of the recovered radioactivity (~94% of the recovered; 12% of the applied).

Triphenyltin hydroxide and monophenyltin compounds accounted for 77.1 and 7.7% of the applied radioactivity, respectively, after 96 hours in the dark control.

DISCUSSION:

1. Material balances were incomplete; up to 32.7% of the applied radioactivity was unaccounted for.

2. All of the parent material was not in solution. At study termination (192 hours posttreatment), the registrant determined that ~13% of the applied radioactivity had adsorbed to the photoreactor vessel and parent triphenyltin hydroxide comprised ~94% of this radioactivity.

3. An inappropriate TLC solvent system was utilized. The primary degradate, monophenyltin compound, did not migrate in the solvent system used, and

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the registrant did not show that other polar degradates were not present at the origin of the TLC plates.

4. The registrant proposed that the soluble volatiles (which accounted for up to 17.6% of the applied) were comprised of benzene; however, no data were presented to support this conclusion.

5. The test solutions were not buffered.

6. The intensity of the artificial light source was not reported; only the total energy output (in Watts) was reported.

7. The intensity and wavelength distribution of the light source were not compared to natural sunlight.

8. The incubation temperature of the dark control was not specified.

9. It was not specified if the reference standards were cochromatographed with the samples and how they were visualized.

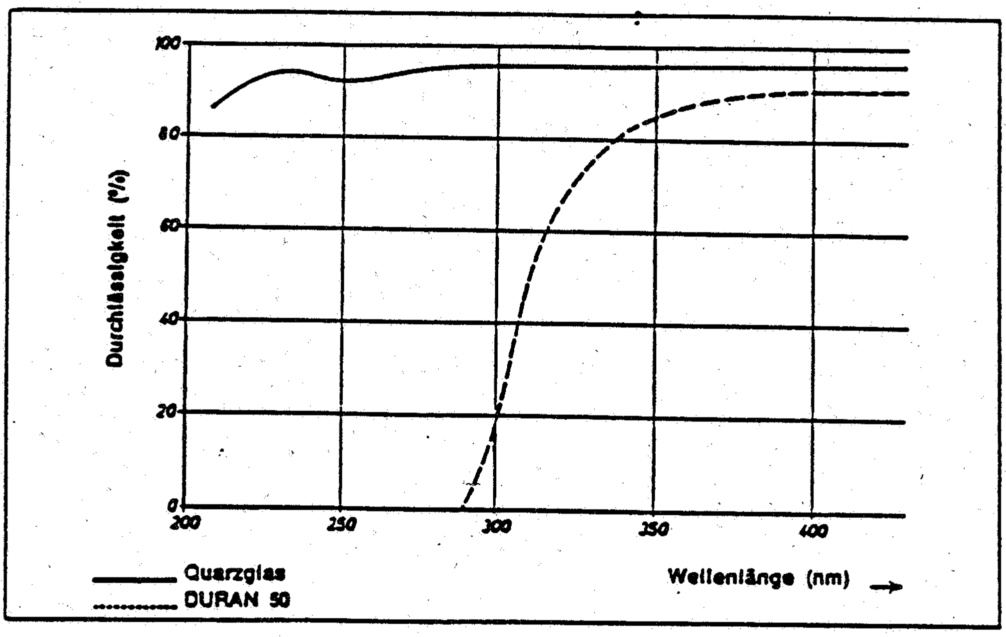

Figure 1. UV permeability of Duran glass.

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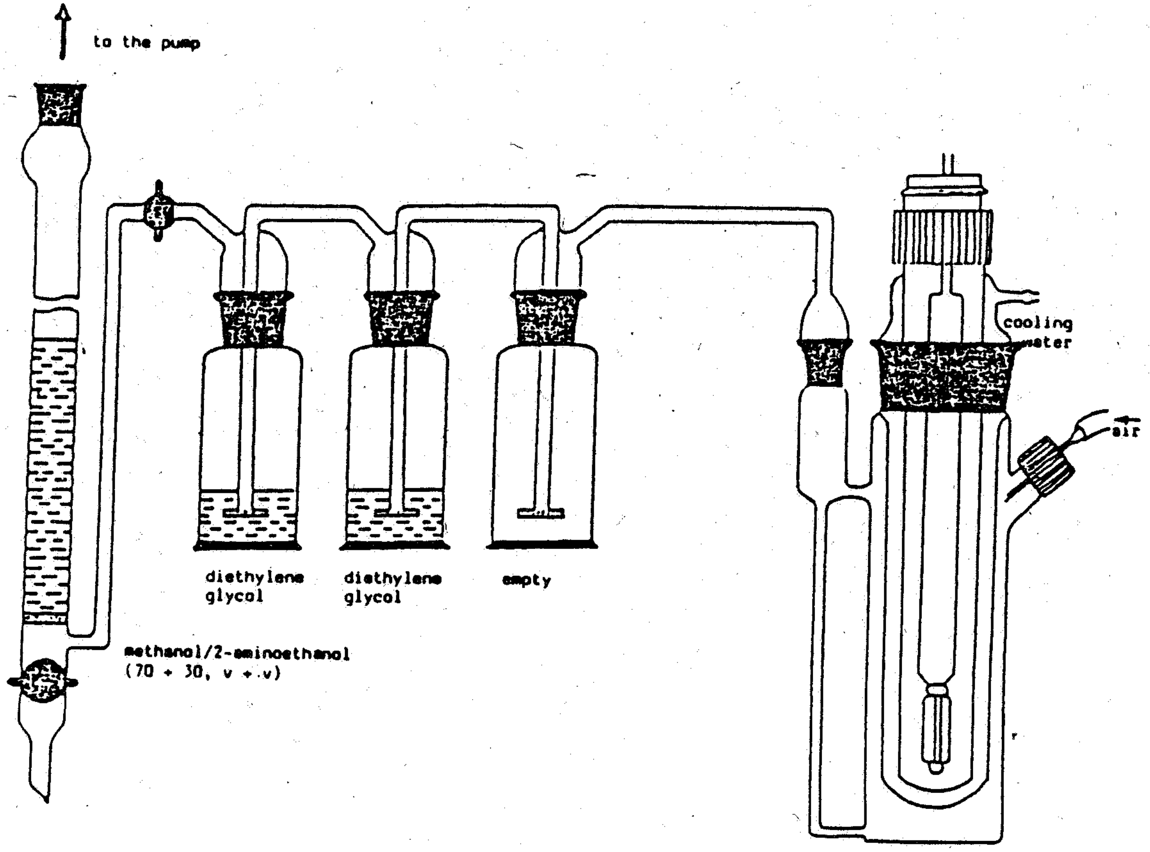

Figure 2. Apparatus for collection of CO_2 and volatiles.

Table 1. Spectral energy distribution of mercury vapor lamp (TQ 150 Z3, Original Hanau Quarzlampen GmbH) filtered through Duran glass.

Wavelength (nm)	Radiated energy (Watts)	Molar quanta per hour x 10^3
297	0.2	2
302	0.5	5
313	2.1	20
326	0.5	5
334	0.4	4
340	0.5	5
346	1.3	14
361	2.5	27
366	5.8	64
390	0.4	5
405/08	1.9	23
436	4.4	58
467	0.5	7
480	1.5	21
492	0.3	4
508	1.9	29
546	4.5	74
577/79	4.6	80
Total Watts	33.8	--

Table 2. Distribution of radioactivity (% of the applied) in distilled water treated with phenyl-labeled [^{14}C]-triphenyltin hydroxide (radiochemical purity 98.5%) at 3.9 ppm.

Sampling interval (hours)	Aqueous					$^{14}CO_2$ (ethanolamine: methanol solution)	Volatiles (diethylene glycol solution)	Reactor vessel wash	Total [^{14}C] recovered
	TPTH[a]	Monophenyl-tin[b]	Diphenyl-tin[c]	Tetraphenyl tin	Volatiles[d]				
					Irradiated				
0	85.8	2.0	ND[e]	ND	ND	--	--	--	87.7
1	82.3	3.2	ND	ND	3.2	0.03	0.03	--	88.8
2	75.5	5.2	ND	ND	3.9	0.03	0.03	--	84.7
4	78.0	1.9	ND	ND	1.9	0.03	0.03	--	81.9
8	76.4	0.7	0.5	ND	7.3	0.05	0.05	--	85.0
24	71.8	2.4	2.2	ND	7.5	0.12	0.16	--	84.2
48	60.2	2.9	2.6	ND	17.6	0.39	0.30	--	84.0
96	41.8	12.4	5.5	2.7	7.1	1.25	0.55	--	71.2
144	22.4	18.2	3.9	2.0	17.2	2.65	0.87	--	67.3
192	24.2	15.8	6.7	1.7	14.1	4.02	1.17	12.8	80.6
					Dark control				
24	64.4	2.5	1.2	2.2	0.3	<0.01	<0.01	--	70.6
96	77.1	7.7	1.9	ND	1.9	<0.01	<0.01	3.5	92.1

[a] Triphenyltin hydroxide.

[b] The reference standard used for comparison was phenyltin trichloride.

[c] The reference standard used for comparison was diphenyltin dichloride.

[d] Proposed by the registrant to be benzene.

[e] Not detected; the detection limit was not specified.

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CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 2 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Gildemeister, H., K. Kunzler, and B. Haberkorn. 1985. Hoe 029664-14C photodegradation studies on soil. Report No. (B)160/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 1.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

REVIEWED BY: L. Binari
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: A. Reiter
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7709

SIGNATURE: Allan J. Reiter DATE: DEC 7 1987

CONCLUSIONS:

Degradation - Photodegradation on Soil

This study is unacceptable because: Experiment 1 - material balances were incomplete (up to 35% of the applied was unaccounted for); and Experiment 2 - the sampling protocol was inadequate (one sampling interval) and the material balance was incomplete (~16% of the applied was unaccounted for). In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides because both experiments failed to accurately establish a pattern of decline of parent triphenyltin hydroxide and patterns of formation and decline of its degradates.

MATERIALS AND METHODS:

Experiment 1

A slurry of sieved (250 μm) silt loam soil (7.2% sand, 70.4% silt, 22.4% clay, 1.6% organic matter, pH 6.4, CEC 21.3 meq/100 g) and water was spread on glass plates and air-dried. Phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.7%, specific activity 8.3 mCi/g, Hoechst AG) in methanol was applied (0.228 mg/plate) to the soil and dried under red light. The test samples were placed in a quartz glass box and irradiated in a photoreactor (Original Hanau Suntest accelerated exposure machine, Hanau Quarzlampen GmbH) equipped with a xenon burner emitting light of 820 W/m^2 intensity between 300 and 830 nm. The xenon burner was surrounded by reflective mirrors to divert infra-red radiation from the test samples, a quartz glass dish, and an ultra-violet glass filter to eliminate radiation below 290 nm (Figure 1). The spectral energy distribution of the xenon burner as compared to global radiation is presented in Figure 2. The quartz glass box containing the test samples was attached to a gas collection system (air-flow rate unspecified) having an ethylene glycol trap for volatiles and a carbosorb trap for CO_2 (Figure 3); however, the air flow was interrupted twice for 14 hours each time. As a control, a similarly prepared sample was maintained in darkness. Irradiated soil was sampled after 0, 2, 4, 8, 16, 32, and 45 hours of irradiation (24 hours of irradiation was equivalent to 16 days of outdoor exposure with 12 hours of sunshine per day). The dark control soil was sampled at 45 hours posttreatment.

Radioactivity in the gas trap solutions was quantified by LSC. Soil samples were extracted with methanol, and the extract was analyzed by TLC on silica gel plates with development in toluene:ethyl acetate: acetic acid:water (50:50:1:0.5). Radioactive areas were located and quantified with a TLC-linear analyzer. Unextractable radioactivity in the soil was quantified by combustion and LSC.

Experiment 2

Samples of silt loam soil were prepared, treated with [^{14}C]triphenyltin hydroxide, and irradiated as described in Experiment 1. For this experiment, the air flow of the gas collection system was not interrupted. The irradiated soil was sampled at 45 hours posttreatment only, and the soil and gas trap solutions were analyzed for total radioactivity as previously described.

REPORTED RESULTS:

Experiment 1

The half-life of triphenyltin hydroxide was ~16 hours on silt loam soil irradiated with artificial light (Table 1). At 45 hours posttreatment, triphenyltin hydroxide and the major degradate, $^{14}CO_2$, accounted for ~35 and 17% of the applied radioactivity, respectively. Triphenyltin hydroxide comprised ~69% of the applied after 45 hours in the dark control.

Experiment 2

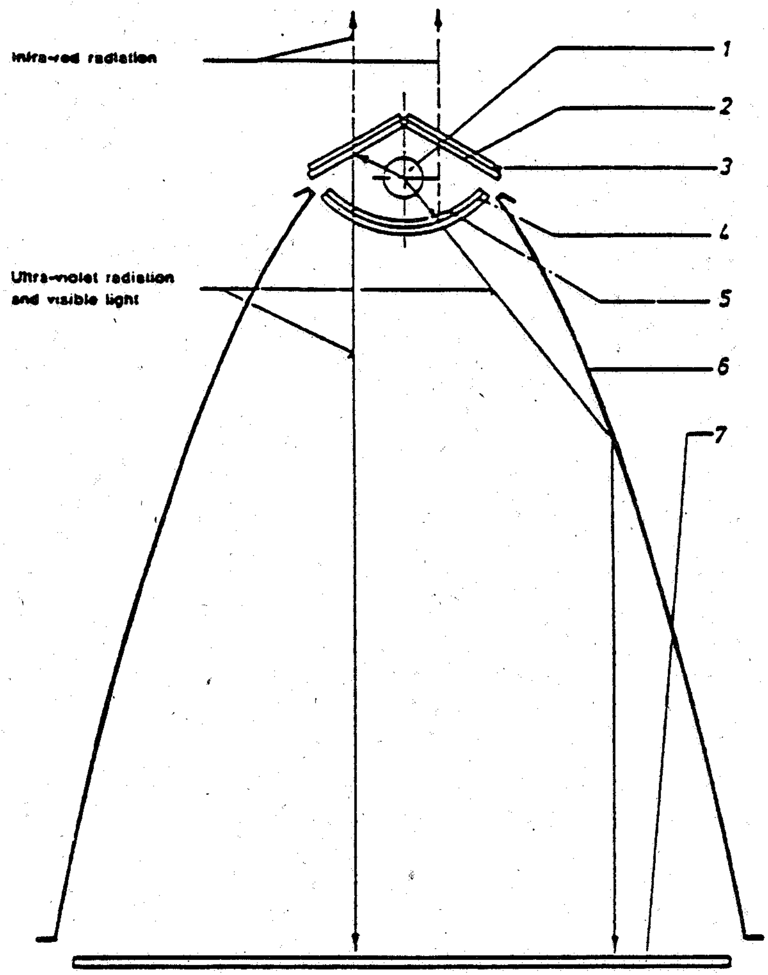
After 45 hours of irradiation, ~58% of the applied radioactivity was recovered as $^{14}CO_2$, and total accountability of radioactivity was ~84% of the applied (Table 1).

DISCUSSION:

1. For Experiment 1, material balances were incomplete; up to 35% of the applied radioactivity was unaccounted for. The registrant proposed that the unaccountable radioactivity was due to loss of $^{14}CO_2$ from the system when the air flow was interrupted twice for 14 hours each time. Experiment 2 was performed in an effort to support that hypothesis. Although a higher percentage of radioactivity was recovered as $^{14}CO_2$ in Experiment 2, the results from Experiments 1 and 2 are not comparable because of significant differences in the amounts of extractable and unextractable radioactivity present in the irradiated soil. In addition, the results from Experiment 2 would not fulfill data requirements because of only one sampling interval during the study and ~16% of the applied radioactivity was unaccounted for.

2. The incubation temperature was not reported.

3. It was not specified if reference standards were cochromatographed with the samples and how the reference standards were visualized.



1 Xenon burner
2 Ultra-violet mirror
3 Light mirror
4 Quartz glass dish with selective reflecting coating
5 Supplementary filter in special ultra-violet glass or window glass
6 Parabolic reflector
7 Specimen plane

Figure 1. Xenon burner and filters.

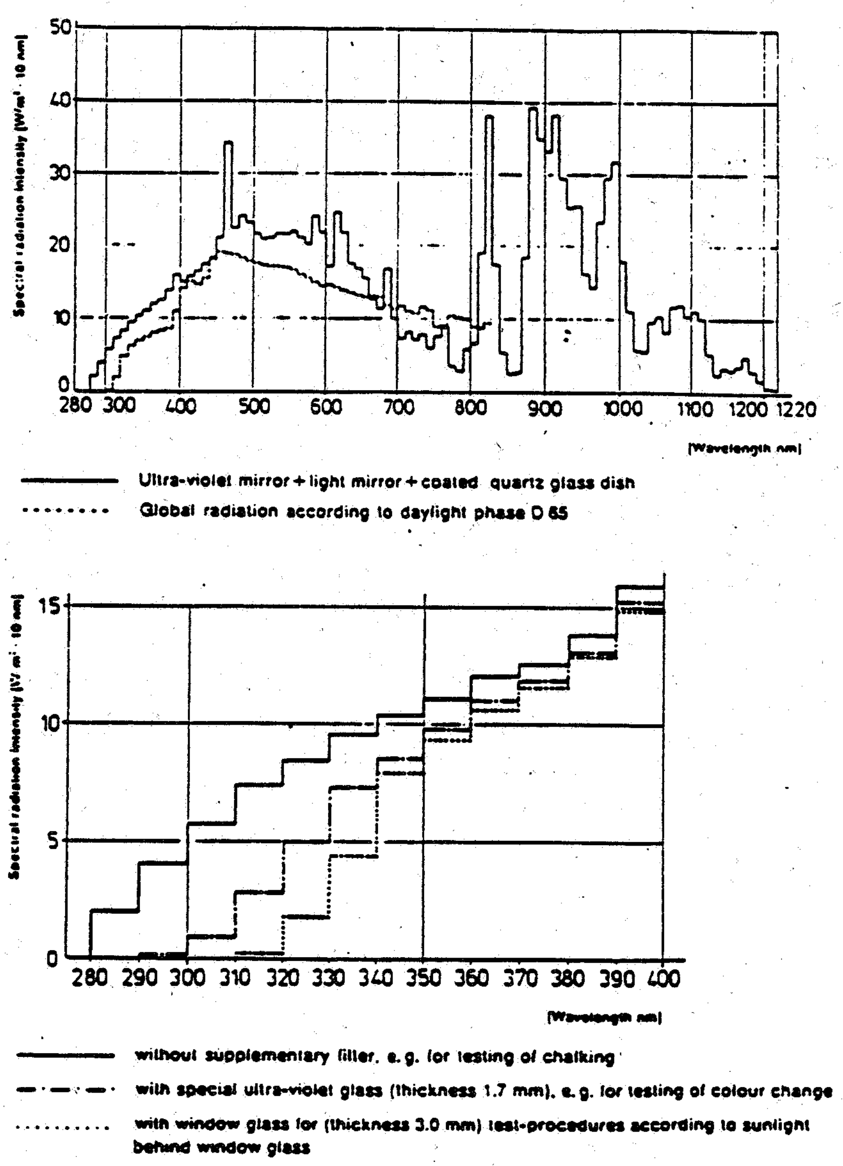


Figure 2. Spectral energy distribution of the xenon burner as compared to global radiation.

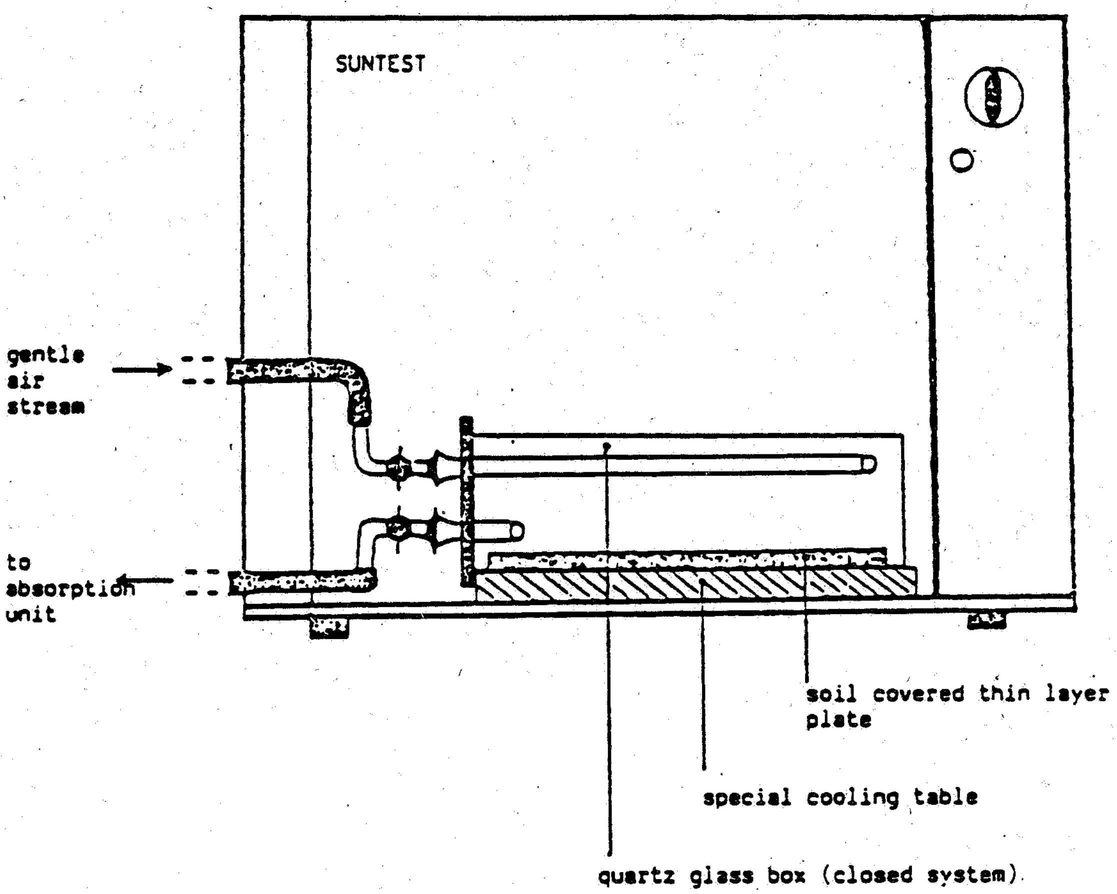


Figure 3. Test apparatus.

Table 1. Distribution of radioactivity (% of the applied) in silt loam soil treated with phenyl-labeled [^{14}C]-triphenyltin hydroxide (radiochemical purity 98.7%).

	Soil								
	Extractable								
Sampling interval (hours)	TPTH[a]	Origin	R_f = 0.61-0.64	R_f = 0.77-0.83	Total [^{14}C]	Unextractable	$^{14}CO_2$ (Carbo-sorb solution)	Volatiles (ethylene glycol solution)	Total [^{14}C] recovered
					Irradiated				
0	90.6	2.4	5.0	ND[b]	98.0	1.5	--	--	99.5
2	85.2	ND	1.4	1.7	88.2	7.3	1.6	0.4	97.5
4	77.5	1.6	1.8	1.6	82.5	8.0	2.9	0.3	93.7
8	72.2	ND	0.7	1.2	74.1	8.8	3.5	0.8	87.2
16	49.8	ND	2.6	1.3	53.7	12.9	6.0	1.6	74.2
32	26.9	1.6	2.6	1.3	32.3	14.9	22.0	0.8	70.0
45	35.2	1.6	1.0	0.8	38.7	8.6	17.1	0.6	65.0
45[c]	--	--	--	--	8.4	16.5	58.4	0.5	83.8
					Dark control				
45	68.9	ND	ND	1.3	70.2	4.0	5.4	0.8	80.4

[a] Triphenyltin hydroxide.

[b] Not detected; the detection limit was not specified.

[c] Results from Experiment 2 in which air flow of gas collection system was not interrupted.

DATA EVALUATION RECORD

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 3 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01
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TITLE: Staff Scientist
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SIGNATURE: Allan J. Reiter DATE: DEC 7 1987

CONCLUSIONS:

Metabolism - Aerobic Soil

1. This study is acceptable.

2. Phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%), at ~2.2-2.3 ppm, degraded with half-lives of ~8 and 16 days in silty clay and silt loam soils, respectively, incubated at 22 ± 2°C in the dark. $^{14}CO_2$ was the major degradate, accounting for 54-55% of the applied radioactivity at 254 days posttreatment. Minor degradates, including [^{14}C]-benzene and several unknowns, each accounted for <6% of the applied. To identify all degradates, both TLC and HPLC were employed using a wide variety of stationery and mobile phases. Considering that the major degradate was $^{14}CO_2$ and that the source of this carbon was from uniformly-labeled phenyl ring, it may be reasonably concluded that complete decomposition of the parent compound occurs.

3. Although this study does not report that the soil moisture content was maintained at the Guideline recommendation of 75% of 0.33 bar, a 40%

moisture capacity was maintained with periodic replacement of lost moisture. This suffices to fulfill the requirement.

MATERIALS AND METHODS:

Experiment 1

Air-dried silt loam (25.2% sand, 62.4% silt, 12.4% clay, 0.8% organic matter, pH 6.5, CEC 12.1 meq/100 g) and silty clay (1.2% sand, 48.4% silt, 50.4% clay, 2.0% organic matter, pH 6.7, CEC 43.6 meq/100 g) soils were sieved (1 mm), moistened to 40% of their moisture holding capacity, and maintained in the dark at 22 ± 2°C for 2 weeks. Following this period, the soils were treated with phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%, specific activity 8.3 mCi/g, Hoechst AG) in methanol at ~2.3 ppm (0.648 kg/ha). The treated soils were incubated in the dark at 22 ± 2°C in flasks attached to a gas collection system having three successive traps (Figure 1). The gas trap containing concentrated sulfuric acid was replaced with one containing diethylene glycol at 13 days posttreatment. The flasks were purged with air every few days for 5 hours at a time. Gas trap solutions were sampled periodically at intervals up to 254 days posttreatment.

Radioactivity in the gas trap solutions was quantified by LSC. Aliquots of the diethylene glycol trapping solution were heated at 160°C under a stream of nitrogen, and the resulting volatiles were passed through a drying trap (calcium chloride) followed by a trap containing n-butyl acetate (Figure 2). The n-butyl acetate was analyzed by HPLC.

Experiment 2

Silt loam and silty clay soils were prepared as described in Experiment 1 and treated with phenyl-labeled [^{14}C]triphenyltin hydroxide at ~2.2 ppm (0.622 kg/ha). The treated soils were incubated in the dark at 22 ± 2°C in flasks sealed with cotton-wool plugs. Soil samples were taken at 0, 1, 2, 4, 8, 16, 32, and 66 days posttreatment.

Soil samples were extracted six or seven times with methanol. The extracts were concentrated and analyzed by HPLC and TLC on silica gel plates with development in toluene:ethyl acetate:acetic acid:water (50:50:1:0.5). Radioactive areas were located and quantified with a TLC-linear analyzer. Radioactivity remaining in the extracted soil was quantified by combustion and LSC.

Samples of the extracted soils were hydrolyzed in the presence of 6 M hydrochloric acid and zinc. The extracted soil was combined with zinc powder and water in a reaction flask (Figure 3). Following the dropwise addition of hydrochloric acid (at 50°C), the contents of the reaction flask were heated to 80°C for 10 minutes. Released volatiles were passed through a drying trap and then into methanol. The methanol was analyzed for benzene by HPLC.

REPORTED RESULTS:

[^{14}C]Triphenyltin hydroxide degraded with half-lives of ~8 days in

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silty clay soil and ~16 days in silt loam soil (Table 1). At 66 days posttreatment, parent triphenyltin hydroxide accounted for 7.9-10.7% of the applied radioactivity in the two soils and unextractable residues accounted for 28.7-37.4% of the applied (Tables 2 and 3). At 254 days posttreatment, 54.3-55.0 and 3.35.9% of the applied radioactivity was recovered as volatilized $^{14}CO_2$ and [^{14}C]benzene, respectively.

Following hydrolysis of the extracted soils in the presence of hydrochloric acid and zinc, 39.4-68.3% of the unextractable radioactivity was released as [^{14}C]benzene.

DISCUSSION:

1. Although soil and gas trap solutions were not sampled at similar intervals, material balances appear to be adequate to establish the half-life of the test substance.

2. The soil moisture content was 40% of the moisture holding capacity rather than 75% of 0.33 bar.

3. It was not specified if reference standards were cochromatographed with the samples and how they were visualized.

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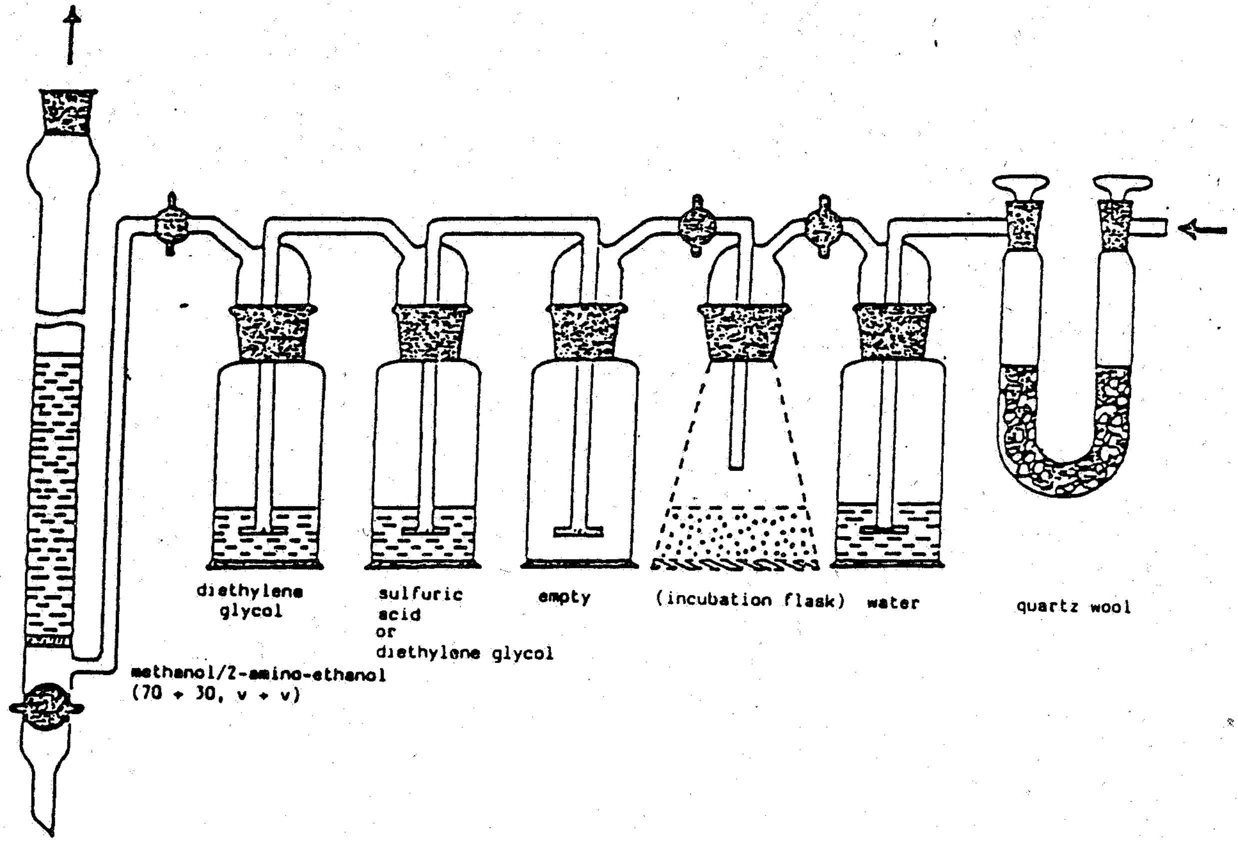

Figure 1. Apparatus for collection of CO_2 and volatiles.

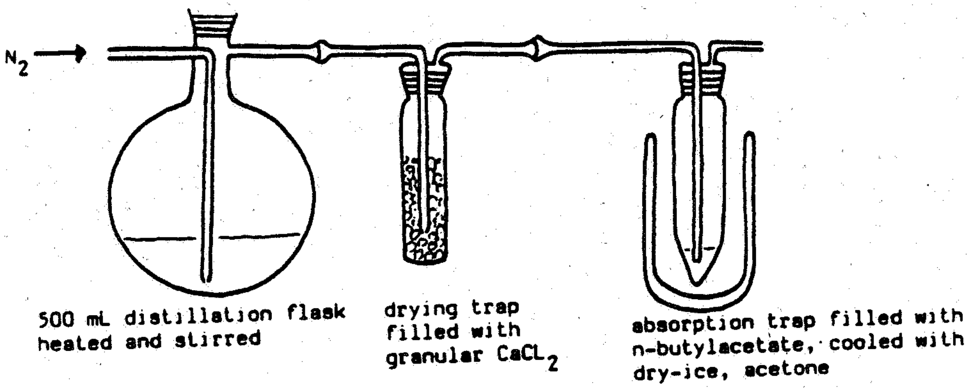

Figure 2. Apparatus used to distill diethylene glycol trapping solution.

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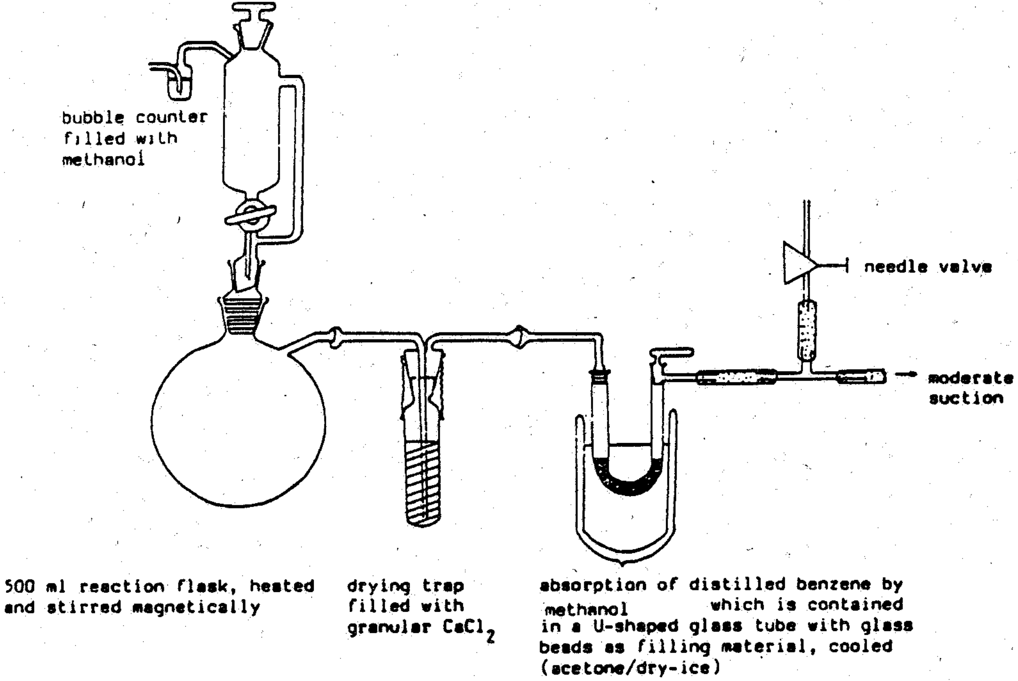

Figure 3. Apparatus used to hydrolyze extracted soil.

Table 1. Distribution of radioactivity (% of the applied) following the application of phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%) at ~2.2 ppm to silt loam and silty clay soils and incubated under aerobic conditions.[a]

Sampling interval (days)	TPTH[b]	Origin (R_f ~0)	Unknown 1 (R_f = 0.14)	Unknown 2 (R_f = 0.71)	Unknown 3 (R_f = 0.81)
			Silt loam soil		
0	80.4	4.2	2.2	ND[c]	--
1	84.5	1.9	ND	1.1	--
2	68.7	4.8	2.1	1.2	--
4	73.6	1.8	1.2	1.0	--
8	66.2	3.2	6.0[d]	1.3	--
16	49.0	3.0	1.0	1.2	--
32	20.8	4.0	1.1	1.0	--
66	10.7	1.8	1.0	1.5	--
			Silty clay soil		
0	73.6	ND	ND	1.3	ND
1	66.0	ND	ND	1.4	ND
2	69.6	ND	ND	1.0	ND
4	61.3	0.7	0.6	1.1	ND
8	49.5	1.0	1.0	1.2	ND
16	31.8	0.8	0.5	1.6[e]	ND
32	18.7	1.3	0.4	1.7[e]	ND
66	7.9	0.9	0.3	1.2	0.2

[a] Results are average of duplicate samples.

[b] Triphenyltin hydroxide.

[c] Not detected; the detection limit was not specified.

[d] Sum of two unknowns at R_f = 0.10 and 0.24.

[e] Sum of two unknowns at R_f = 0.71 and 0.81.

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Table 2. Distribution of radioactivity (% of the applied) following the application of phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%) at ~2.2-2.3 ppm to silt loam soil and incubated under aerobic conditions.[a]

Sampling interval (days)	Soil		Volatiles[b]		Total [^{14}C] recovered[d]
	Extractable	Unextractable	CO_2[c]	Benzene	
0	86.8	3.8	--	--	90.6
1	87.4	7.2	--	--	94.6
2	76.7	9.0	1.1	0.3	87.1
4	77.4	11.9	--	--	--
6	--	--	3.2	1.3	93.8
8	76.5	12.3	--	--	--
10	--	--	5.8	2.4	97.0
13	--	--	7.1	2.9	--
16	54.1	22.5	--	--	86.6
28	--	--	13.0	5.0	--
32	26.8	26.9	--	--	71.7
62	--	--	29.9	5.9	--
66	14.9	28.7	--	--	79.4
97	--	--	40.6	5.9	--
122	--	--	44.8	5.9	--
176	--	--	50.8	5.9	--
254	--	--	55.0	5.9	--

[a] Results are average of duplicate samples.

[b] Results of analyses from additional sampling intervals were reported, but are not presented in this review.

[c] Radioactivity detected in ethanolamine:methanol trapping solution, assumed by study authors to be $^{14}CO_2$.

[d] Due to the differing sampling dates, this value is the sum of data from closely corresponding sampling dates and was calculated by the Dynamac reviewer.

Table 3. Distribution of radioactivity (% of the applied) following the application of phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%) at ~2.2-2.3 ppm to silty clay soil and incubated under aerobic conditions.[a]

Sampling interval (days)	Soil		Volatiles[b]		Total [^{14}C] recovered[d]
	Extractable	Unextractable	CO_2	Benzene	
0	74.9	17.2	--	--	92.1
1	67.3	22.0	--	--	89.3
2	70.6	25.4	1.1	0.3	97.4
4	63.6	28.4	--	--	--
6	--	--	3.7	0.5	96.2
8	52.6	35.6	--	--	--
10	--	--	6.7	1.0	95.9
13	--	--	8.4	1.4	--
16	34.6	40.1	--	--	84.5
28	--	--	14.3	2.8	--
32	22.0	35.7	--	--	74.8
62	--	--	31.8	3.3	--
66	10.5	37.4	--	--	83.0
97	--	--	40.9	3.3	--
122	--	--	45.3	3.3	--
176	--	--	50.5	3.3	--
254	--	--	54.3	3.3	--

[a] Results are average of duplicate samples.

[b] Results of analyses from additional sampling intervals were reported, but are not presented in this review.

[c] Radioactivity detected in ethanolamine:methanol trapping solution, assumed by study authors to be $^{14}CO_2$.

[d] Due to the differing sampling dates, this value is the sum of data from closely corresponding sampling dates and was calculated by the Dynamac reviewer.

DATA EVALUATION RECORD PAGE 1 OF 6

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 4 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Gildemeister, H., W.L. Burkle, and H. Sochor. 1985. Anaerobic soil metabolism study with the fungicide. Report No. (B)221/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 4.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

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CONCLUSIONS:

Metabolism - Anaerobic Soil

1. This study is acceptable.

2. [^{14}C]Triphenyltin hydroxide declined from 29.4 to 7.9% of the applied during 67 days of anaerobic incubation (flooding plus nitrogen atmosphere) in silty clay soil previously treated with phenyl-labeled [^{14}C]-triphenyltin hydroxide (radiochemical purity 98.7%) at ~2.3 ppm and incubated aerobically in darkness at 22 ± 2°C for 26 days. Degradates identified as mono- and diphenyltin compounds were ≤1.0% of the applied. Approximately 31.1% of the applied evolved as $^{14}CO_2$ during anaerobic incubation.

3. This study fulfills EPA Data Requirements for Registering Pesticides by providing information on the anaerobic degradation of triphenyltin hydroxide in soil.

MATERIALS AND METHODS:

Air-dried silty clay soil (1.2% sand, 48.4% silt, 50.4% clay, 2.0% organic matter, pH 6.7, CEC 43.6 meq/100 g) was sieved (1 mm), moistened to 40% of capacity, and maintained in the dark at 22 ± 2°C for 2 weeks. Following this period, the soil was treated with phenyl-labeled [^{14}C]-triphenyltin hydroxide (radiochemical purity 98.7%, specific activity 8.3 mCi/g, Hoechst AG) in methanol at ~2.3 ppm (0.65 kg ai/ha). The soil was incubated in the dark in flasks sealed with cotton-wool plugs. Water was added at 2- to 3-day intervals to maintain initial moisture. After 26 days of incubation, the soil samples were converted from aerobic to anaerobic conditions by flooding with distilled water and purging with nitrogen (1 hour/day until 33 days posttreatment). To ensure a substrate for anaerobic metabolism, 10 mg of peptone was added to the treated soil samples just before conversion to anaerobic conditions. At 33 days posttreatment, two replicate flasks covered with aluminum foil were attached to a closed incubation system (Figure 1). The apparatus was flushed with nitrogen for 5 hours at intervals of several days. Volatiles were absorbed in trapping solutions of sulfuric acid, ethylene glycol, and ethanolamine:methanol (3:7, v:v). The other flasks (two replicates per sampling date) were sealed with glass stoppers and stored in darkness at 22 ± 2°C. Samples were analyzed at intervals from 0 to 93 days posttreatment.

At each sampling interval, the water was separated from the soil, and the soil was extracted with methanol six times. The extracts were combined with the separated water, evaporated to dryness, and redissolved in methanol. Subsamples were analyzed for radioactivity by LSC. Radioactivity in the extracted soil was determined by LSC following combustion. In addition, soil extracts were analyzed for degradates by TLC using silica gel plates developed with toluene:ethyl acetate:acetic acid: water (50:50:1:0.5, v:v:v:v). The plates were visualized by linear analyzer. The soil extracts were also analyzed by HPLC. The extracted soil was agitated with Zn:HCl:H_2O to extract bound residues which were subsequently identified by HPLC. The trapping solutions were analyzed for $^{14}CO_2$ and volatiles by LSC.

REPORTED RESULTS:

When anaerobic conditions were established after 26 days of aerobic incubation, 29.4% of the applied radioactivity was [^{14}C]triphenyltin hydroxide (Table 1). By 93 days posttreatment (67 days anaerobic incubation), 7.9% of the applied remained as [^{14}C]triphenyltin hydroxide. Degradates identified as mono- and diphenyltin compounds were <1.0% of the applied. Approximately 31.1% of the applied radioactivity evolved as $^{14}CO_2$ during the anaerobic portion of the study (Table 2). No other volatiles were detected. Benzene in the unextractable fraction of residues accounted for 15.3-19.7% of the applied radioactivity throughout the study.

DISCUSSION:

1. The registrant states that anaerobic conditions were established 33 days posttreatment based on measurement of redox-potential Eh. However,

the reviewer set day 26 as the beginning of anaerobic incubation since soil samples were flooded on that day.

2. The aerobic portion of this study was not reviewed separately from the anaerobic portion because the aerobic study, evaluated independently, would have been invalid because of an incomplete material balance. The registrant attributed the loss of 38.4% of the applied during aerobic incubation to evolution of CO_2 and volatiles, but no supporting data were provided.

3. The soil moisture was maintained at only 40% of capacity during aerobic incubation.

4. The registrant indicated that there was a radioactive contaminant in the parent compound (Table 1) but did not identify the contaminant. It was most likely ^{14}C-tetraphenyltin, a common manufacturing impurity.

5. It was not clear how soil samples were purged with nitrogen to establish anaerobic conditions since only two flasks were attached to incubation apparatus and the rest of the flasks were sealed with glass stoppers.

6. Raw data were not provided.

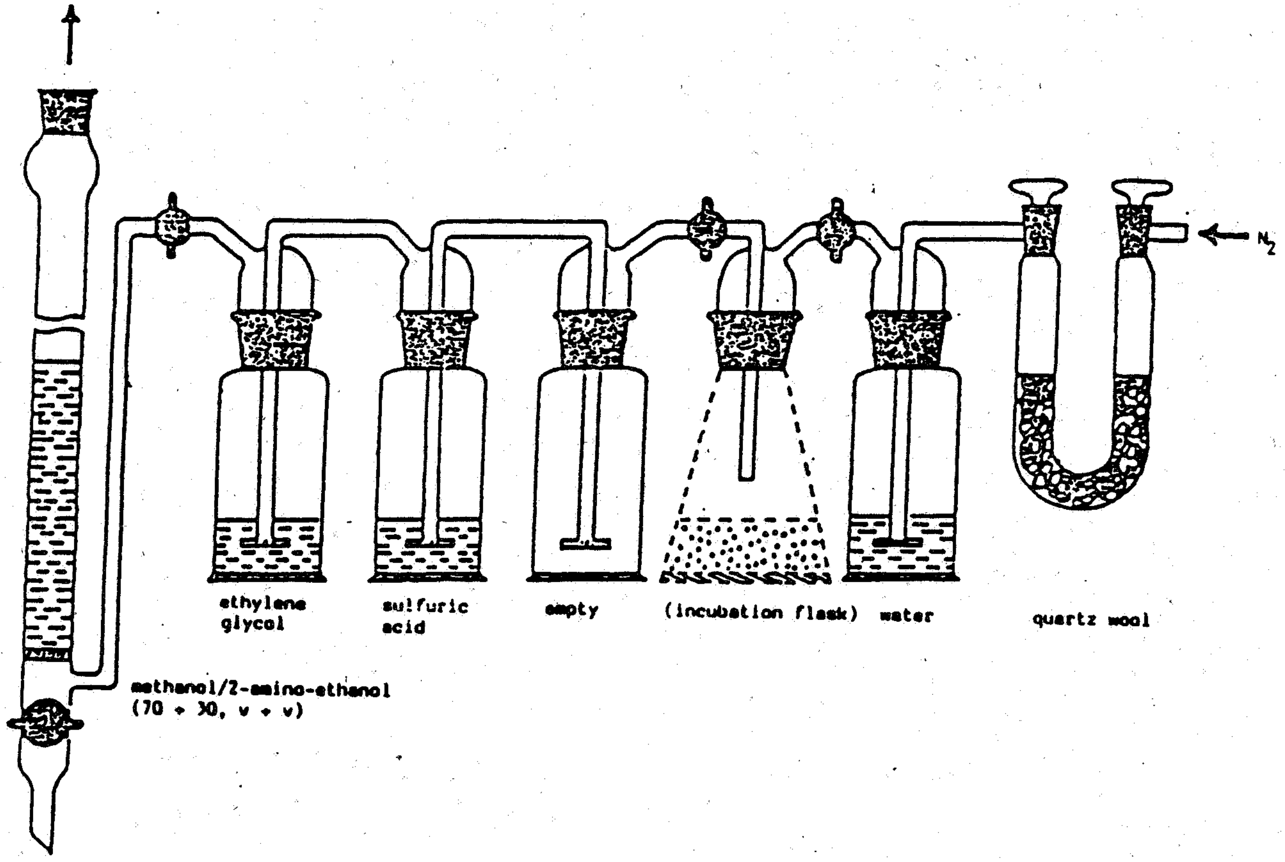

Figure 1. Soil metabolism apparatus.

Table 1. Distribution of radioactivity (% of applied) based on TLC data from silty clay soil treated with [^{14}C]triphenyltin hydroxide at 2.3 ppm, incubated aerobically for 26 days, followed by anaerobic incubation for 67 days.

Sampling interval (days)	R_f intervals			
	0.0-0.1 (MPT[a])	0.1-0.2 (DPT[b])	0.3-0.5 (TPTH[c])	0.7-0.8[d]
0	--	--	82.1	1.1
26	0.9	--	29.4	1.5
33	0.9	0.2	25.3	1.3
63	1.0	0.3	15.2	1.6
93	0.6	0.1	7.9	1.3

[a] Monophenyltin compounds.

[b] Diphenyltin compounds.

[c] Triphenyltin hydroxide.

[d] Radioactive contaminants of the parent compound.

Table 2. Distribution of radioactivity (% of applied) in silty clay soil treated with [^{14}C]triphenyltin hydroxide at 2.3 ppm, incubated aerobically for 26 days, followed by anaerobic incubation for 67 days.

Sampling interval (days)	Extractable residues	Unextractable residues	$^{14}CO_2$ (cumulative)	Total
0	83.1	16.4	--	99.5
26	31.7	30.4	--	62.1
33	27.8	33.8	--	61.6
63	17.9	31.4	16.1	65.4
93	10.0	35.2	31.1	76.3

DATA EVALUATION RECORD PAGE 1 OF 4

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 5 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01
Gildemeister, H. 1985. Hoe 029664-14C leaching study. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 5.

SUBST. CLASS = S.

DIRECT RVW TIME = 6 (MH) START-DATE END DATE

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SIGNATURE: Allan J. Reiter DATE: 12-9-87

CONCLUSIONS:

Mobility - Leaching and Adsorption/Desorption

1. The portion of this study conducted with silty clay, silt loam, and sand soils is acceptable. The portion of this study conducted with clay provides supplemental information towards the registration of triphenyltin hydroxide.

2. Based on soil TLC studies, $[^{14}C]$triphenyltin hydroxide was immobile ($R_f \leq 0.09$) in silty clay, silt loam, sand, and clay soils. Aged (26-day) $[^{14}C]$triphenyltin hydroxide residues were immobile to slightly mobile ($R_f \leq 0.34$) in the same four soils.

3. This study partially contributes toward the fulfillment of EPA Data Requirements for Registering Pesticides by providing information on the mobility (soil TLC) of triphenyltin hydroxide and aged triphenyltin hydroxide residues in silty clay, silt loam, and sand soils. Data from the clay soil, a volcanic ash soil from Japan, would not fulfill EPA Data Requirements for Registering Pesticides because it is not typical of soils in the United States.

MATERIALS AND METHODS:

Silty clay soil (Table 1) was treated with phenol-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.7%, specific activity 8.3 mCi/g, Hoechst AG) at 2.33 ppm, moistened to 40% of its moisture holding capacity, and incubated in the dark at 22 ± 2°C. At 26 days posttreatment, the soil was extracted in methanol. The extracted soil was analyzed for remaining radioactivity by LSC following combustion. An aliquot of the extract was concentrated and analyzed using TLC on silica gel plates developed in toluene:ethyl acetate:acetic acid:water (50:50:1:0.5, v:v:v:v).

Soil TLC plates were prepared using four soils ranging in texture from sand to clay (Table 1). The soils were sieved (<250 or <500 µm), mixed with distilled water to form a slurry, spread onto TLC plates (500- or 750-µm thickness), and air-dried. Each plate was spotted (0.01 - 0.03 µCi) with an aliquot of the aged extract, with unaged [^{14}C]triphenyltin hydroxide, and with reference standards [^{14}C]chloridazon and [^{14}C]buturon. The plates were air-dried, then developed in distilled water to a height of 10 cm. Radioactive areas on the plates were located using a TLC linear analyzer.

REPORTED RESULTS:

After 26 days of incubation in the silty clay soil, 28.6% of the applied radioactivity was triphenyltin hydroxide, 2.6% was extractable unidentified compounds, 35.5% was unextractable, and 17.1% had been volatized.

Aged [^{14}C]triphenyltin hydroxide residues were immobile to slightly mobile ($R_f \leq 0.34$)in silty clay, silt loam, sand, and clay soils (Table 2). Unaged [^{14}C]triphenyltin hydroxide was immobile ($R_f < 0.09$) in the same four soils.

DISCUSSION:

1. The clay soil was a volcanic ash from Japan, and as such would not be typical of soils in the United States.

2. It was unclear how the registrant determined volatilization from the incubated soil, since the incubation flask was sealed with a cotton plug and apparently no trapping solutions were used.

Table 1. Soil characteristics.

Soil type	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)	Bulk density (g/cm^3)	Moisture capacity (g/100 g soil)	Aerobic bacteria	Soil fungi	Actino-myecetes
	%										
Silty clay[a]	1.2	48.4	50.4	2.0	6.7	43.6	1.36	41.2	3.4 x 10^5/g	6.8 x 10^4/g	2.4 x 10^4/g
Silt loam[a]	7.2	70.4	22.4	1.6	6.4	21.3	1.37	45.8	1.08 x 10^6/g	3.0 x 10^2/g	30/g
Sand[b]	92.5	4.2	3.3	0.9	6.8	3.0	1.70	30	2.4 x 10^5/g	2.6 x 10^3/g	4.0 x 10^3/g
Clay[c]	23.3	30.6	46.1	4.3	5.8	18.3	0.96	53.3	5.85 x 10^4/g	2.4 x 10^3/g	60/g

[a] Soils from the United States.

[b] Soil from Germany.

[c] Volcanic ash from Japan.

Table 2. Mobility (% of recovered) of triphenyltin hydroxide and aged tripheyltin hydroxide residues in four soils.

Soil type	R_f values	TPTH[a]	Aged TPTH residues	Chloridazon	Buturon
Silty clay	0.00-0.09	92.5	88.0	68.8	80.2
	0.10-0.34	5.2	10.9	30.2	18.1
	0.35-0.64	1.2	0.8	0.7	1.3
	0.65-0.89	0.8	0.1	0.2	0.4
	0.90-1.00	0.4	0.2	0.1	0.1
Silt loam	0.00-0.09	94.1	77.6	22.0	37.5
	0.10-0.34	3.5	17.6	72.4	53.1
	0.35-0.64	1.3	3.3	5.1	7.8
	0.65-0.89	1.0	1.0	0.4	1.4
	0.90-1.00	0.2	0.5	0.1	0.3
Sand	0.00-0.09	96.0	85.2	9.1	25.6
	0.10-0.34	1.6	5.5	54.0	64.8
	0.35-0.64	1.1	1.9	36.1	4.4
	0.65-0.89	1.0	6.5	0.7	4.6
	0.90-1.00	0.3	1.0	0.1	0.8
Clay[b]	0.00-0.09	89.3	84.6	28.2	39.8
	0.10-0.34	7.1	13.5	67.1	52.4
	0.35-0.64	1.6	1.3	4.4	6.4
	0.65-0.89	1.4	0.3	0.2	0.8
	0.90-1.00	0.6	0.4	0.1	0.5

[a] Triphenyltin hydroxide.

[b] Volcanic ash.

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 6 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 14 - FLOWABLE CONCENTRATE (FlC)

FICHE/MASTER ID No MRID CONTENT CAT 01
White, S.M. 1985. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota and peanuts in Georgia. Including soil residue dissipation of LX 124-09, and triphenyltin hydroxide field dissipation study in peanuts. Prepared by Agri-Growth Research, Inc., Hollandale, MN; Southern Agricultural Research, Inc., Donalsonville, GA; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 261019.

FICHE/MASTER ID No MRID CONTENT CAT 01
White, S.M. 1987a. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to peanuts in Georgia. Prepared by Southern Agricultural Research, Inc., Donalsonville, GA; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 401065-01.

FICHE/MASTER ID No MRID CONTENT CAT 01
White, S.M. 1987b. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota. Prepared by Agri-Growth Research, Inc., Hollandale, MN; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc No. 401065-02.

SUBST. CLASS = S.

DIRECT RVW TIME = 8 (MH) START-DATE END DATE

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SIGNATURE: Allan J. Reiter DATE: DEC 7 1987

CONCLUSIONS:

Field Dissipation - Terrestrial

1. This study is scientifically sound and provides supplemental information towards the registration of triphenyltin hydroxide.

2. In field plots at Hollandale, Minnesota, treated with triphenyltin hydroxide (Wesley Triple Tin 4L) at 0.3 lb ai/A, triphenyltin hydroxide residues in sugar beet plots ranged from 0.06 to 0.15 ppm in the 0- to 5-cm soil layer without an apparent trend, while residues in the bare ground plots ranged from 0.23 to 0.06 ppm with a decreasing trend. No residues were detected in the lower soil layers. Degradate diphenyltin dihydroxide was detected at 0.07 ppm in the 0- to 5-cm soil layer of the bare ground plots at day 14. In field plots at Donalsonville, Georgia, treated with triphenyltin hydroxide at 7.6 oz ai/A, triphenyltin hydroxide residues in both the sugar beet and bare ground plots degraded with a half-life of 3-7 days. No residues were detected in the lower soil layers.

3. This study would not fulfill EPA Data Requirements for Registering Pesticides because residues were not characterized, complete meteorological data were not provided, and the maximum label rate was not used.

MATERIALS AND METHODS:

Two field plots (20 x 20 feet) of loam soil (34% sand, 48% silt, 18% clay, 4.9% organic matter, pH 7.4, CEC 21.1 meq/100 g) at Hollandale, Minnesota, one of which had been planted with sugar beets (5/30/85) and one of which had been left as bare ground, were sprayed with triphenyltin hydroxide (Wesley Triple Tin 4L, Wesley Industries, Inc.) at 0.3 lb ai/A on July 25, 1985. Two field plots (12 x 40 feet) of sandy loam soil (78.6% sand, 9.6% silt, 11.8% clay, 2.7% organic matter, pH 6.4, CEC 8.0 meq/100 g) at Donalsonville, Georgia, one of which had been planted with peanuts (6/18/85) and one of which had been left as bare ground, were sprayed with triphenyltin hydroxide (4 L) at 7.6 ounces ai/A on July 22, 1985. Untreated control plots were maintained at both locations. Five soil core samples (0- to 5-, 5- to 10-, and 10- to 15-cm depth) were taken from each plot prior to treatment and at intervals from 0 to 92 days posttreatment. Soil core samples were frozen until analysis.

The five replicates of each soil layer were composited and analyzed for triphenyltin hydroxide residues by method 5.12 "Analysis of Triphenyltin Hydroxide in Soil" issued on May 14, 1982 by Tegeris Laboratories. Soil samples were extracted four times with acetonitrile:acetic acid (99.5:0.5). Following the last extraction, the soil residues were washed into a filtering funnel with solvent and allowed to drain. The combined extracts were evaporated to near dryness using a rotary flash evaporator at 40-45°C. To the residues was added 20% tetrahydrofuran in hexane followed by methylmagnesium chloride solution. After 2-3 minutes, saturated ammonium chloride solution was added to stop the reaction. The hexane and aqueous fractions were separated. The aqueous fraction was washed twice with hexane. The hexane fraction and washes were combined and flash evaporated at 40-45°C. The residues were dissolved in ethyl acetate and analyzed by GC. Recovery from fortified soil samples ranged from 78 to 110%.

REPORTED RESULTS:

During the study at Hollandale, Minnesota, air temperatures ranged from

31 to 92°F and soil temperatures at the 4-inch depth ranged from 44 to 94°F. A total of >14.2 inches of precipitation were received (Table 1). No meteorological data were provided for the Georgia site.

At Hollandale, Minnesota, triphenyltin hydroxide residues in sugar beet plots ranged from 0.06 to 0.15 ppm in the 0- to 5-cm soil layer without an apparent trend, while residues in the bare ground plots ranged from 0.23 to 0.06 ppm with a decreasing trend (Table 1). No residues were detected in the lower soil layers. Degradate diphenyltin dihydroxide was detected at 0.07 ppm in the 0- to 5-cm soil layer of the bare ground plots at day 14 (Table 2). At Donalsonville, Georgia, triphenyltin hydroxide residues in both the sugar beet and bare ground plots degraded with a half-life of 3-7 days (Table 3). No residues were detected in the lower soil layers.

DISCUSSION:

1. Characterization of residues was performed on only the day 14 soil samples from the Hollandale, Minnesota, study site. Residues were not characterized from the Donalsonville, Georgia, study.

2. Meteorological data for the Hollandale, Minnesota, site were incomplete; data for October 1985 to March 1986 were not provided. Meteorological data for Waseca, Minnesota, for November 1985 to March 1986 were provided; however, these data are not acceptable as a substitute for meteorological data for the test site.

3. No data were provided for the control plots.

4. Maximum label rate was not used.

5. Patterns of parent decline and formation and decline of degradates were not established.

6. In the reported methodology, an optional clean-up step was described in which the residues dissolved in ethyl acetate were eluted with hexane through a deactivated alumina column prior to analysis by GC. The registrant did not indicate whether this step was actually performed.

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Table 1. Distribution of triphenyltin hydroxide residues (ppm) in loam soil at Hollandale, Minnesota, planted with sugar beets or left as bare ground, and treated with triphenyltin hydroxide (4 L) at 0.3 lb ai/A.

Sampling interval (days)	Sample depth (cm) 0-5	5-10	10-15	Cumulative precipitation (inches)
	Sugar beet plots			
Pretreatment	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	--
0	0.10 ± 0.04	<0.05 ± 0.00	<0.05 ± 0.00	1.03
1	0.12 ± 0.06	<0.05 ± 0.00	<0.05 ± 0.00	1.03
3	0.16 ± 0.09	<0.05 ± 0.00	<0.05 ± 0.00	1.03
7	0.09 ± 0.05	<0.05 ± 0.00	<0.05 ± 0.00	1.33
14	0.09 ± 0.05	<0.05 ± 0.00	<0.05 ± 0.00	1.46
21	0.10 ± 0.09	0.03 ± 0.50	<0.05 ± 0.00	3.35
30	0.06 ± 0.06	<0.00 ± 0.00	<0.05 ± 0.00	4.87
92	0.15 ± 0.02	<0.05 ± 0.00	<0.05 ± 0.00	>14.20
251	0.06 ± 0.05	<0.05 ± 0.00	<0.05 ± 0.00	--
274	0.05 ± 0.08	<0.05 ± 0.00	<0.05 ± 0.00	--
365	0.04 ± 0.04	<0.05 ± 0.00	<0.05 ± 0.00	--
	Bare ground plots			
Pretreatment	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	--
0	0.23 ± 0.08	<0.05 ± 0.00	<0.05 ± 0.00	1.03
1	0.12 ± 0.06	<0.05 ± 0.00	<0.05 ± 0.00	1.03
3	0.17 ± 0.01	<0.05 ± 0.00	<0.05 ± 0.00	1.03
7	0.17 ± 0.03	<0.05 ± 0.00	<0.05 ± 0.00	1.33
14	0.12 ± 0.11	<0.04 ± 0.07	<0.05 ± 0.00	1.46
21	0.13 ± 0.04	<0.05 ± 0.00	<0.05 ± 0.00	3.35
30	0.06 ± 0.06	<0.00 ± 0.00	<0.05 ± 0.00	4.87
92	0.08 ± 0.06	<0.05 ± 0.00	<0.05 ± 0.00	14.20
251	0.10 ± 0.08	<0.05 ± 0.00	<0.05 ± 0.00	--
274	0.08 ± 0.03	<0.05 ± 0.00	<0.05 ± 0.00	--
365	0.02 ± 0.03	<0.05 ± 0.00	<0.05 ± 0.00	--

Table 2. Characterization of residues (ppm) in loam soil (14 days posttreatment) at Hollandale, Minnesota, planted with sugar beets or left as bare ground, and treated with triphenyltin hydroxide (4 L) at 0.3 lb ai/A.

Soil depth (cm)	Diphenyltin dihydroxide	Triphenyltin hydroxide
	Sugar beet plots	
0-5	<0.05	0.05-0.15[a]
5-10	<0.05	<0.05
10-15	<0.05	<0.05
	Bare ground plots	
0-5	<0.05-0.07[a]	<0.05-0.15[a]
5-10	<0.05	<0.05-0.12[a]
10-15	<0.05	<0.05

[a] Value represents range of three replicates.

Table 3. Distribution of triphenyltin hydroxide residues (ppm) in sandy loam soil at Donalsonville, Georgia, planted with peanuts or left as bare ground, and treated with triphenyltin hydroxide (4 L) at 0.3 lb ai/A.

Sampling interval (days)	Sample depth (cm)			Cumulative precipitation (inches)
	0-5	5-10	10-15	
		Peanut plots		
Pretreatment	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	--
0	0.13 ± 0.05	<0.05 ± 0.00	<0.05 ± 0.00	0.00
1	0.13 ± 0.02	<0.05 ± 0.00	<0.05 ± 0.00	0.25
3	0.09 ± 0.01	<0.05 ± 0.00	<0.05 ± 0.00	0.30
7	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	0.30
14	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	0.90
21	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	3.15
30	<0.05 ± 0.00	<0.00 ± 0.00	<0.05 ± 0.00	3.60
90	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	11.53
		Bare ground plots		
Pretreatment	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	--
0	0.13 ± 0.05	<0.05 ± 0.00	<0.05 ± 0.00	0.00
1	0.08 ± 0.07	<0.05 ± 0.00	<0.05 ± 0.00	0.25
3	0.09 ± 0.02	<0.05 ± 0.00	<0.05 ± 0.00	0.30
7	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	0.30
14	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	0.90
21	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	3.15
30	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	3.60
90	<0.05 ± 0.00	<0.05 ± 0.00	<0.05 ± 0.00	11.53

' DATA EVALUATION RECORD

CASE GS -- TRIPHENYLTIN HYDROXIDE STUDY 7 PM 21

CHEM 080813 Triphenyltin hydroxide

BRANCH EAB DISC --

FORMULATION 00 - ACTIVE INGREDIENT

FICHE/MASTER ID No MRID CONTENT CAT 01

Burkle, W.L. and U. Rutz. 1985. Hoe 029664-14-C (TPTH), residues in rotational crops sown 30 days after treatment of the soil at an application rate of 330 g ai/ha. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 6.

SUBST. CLASS = S.

DIRECT RVW TIME = 5 (MH) START-DATE END DATE

REVIEWED BY: B. Price
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: A. Reiter
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7709

SIGNATURE: Allan J. Reiter DATE: DEC 7 1987

CONCLUSIONS:

Confined Accumulation - Rotational Crops

1. This study is scientifically sound and provides supplemental information towards the registration of triphenyltin hydroxide.

2. [^{14}C]Triphenyltin hydroxide residues (uncharacterized) were <0.022 mg eq/kg (TPTH) in green wheat straw, fresh radish bulbs and leaves, and carrot roots and leaves; and <0.007 mg eq/kg in fresh spinach leaves, radish leaves, grain, and husks of wheat plants seeded 30 days after sandy loam soil was treated with [^{14}C]triphenyltin hydroxide at 330 g ai/ha. Radioactivity remained highest in the top 5 cm of the soil throughout the experiment, ranging from 2.60 mg eq/kg at day 0 to 0.03 mg eq/kg at day 169. Radioactivity was <0.002 mg eq/kg in the 5- to 20-cm layers of soil at all sampling intervals.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because less than the maximum label rate for a single application and less than the maximum number of permissible treatments were applied

to the test soil. For carrots this would be four applications at 7-14 day intervals at a rate equivalent to 3.8 oz/A of the 4.75% WP.

MATERIALS AND METHODS:

[^{14}C]Triphenyltin hydroxide (purity 98%, specific activity 32.4 mCi/g, Hoechst AG) plus nonlabeled TPTH (purity 99%, source unspecified) in acetone were applied evenly in droplets at 330 g ai/ha to the surface of a sandy loam soil (23.4% sand, 65.8% silt, 10.8% clay, 1.6% organic matter, pH 7.1, CEC 14.1 meq/100 g) in a stainless steel plant container (1.0 x 0.7 x 0.5 m, length x width x height). After the acetone evaporated, the upper layer of the soil was lightly raked. Thirty days after soil treatment, spinach, radishes, carrots, and wheat were planted in the soil. All crops were harvested by day 169 posttreatment. Spinach leaves and radish bulbs and leaves were sampled on day 77. Carrot roots and leaves were sampled on day 120 and day 169. Leaves, husks, and grain of wheat were sampled on day 169. Soil (0- to 5- and 5- to 20-cm depths) was sampled at intervals up to 169 days posttreatment.

Total radioactivity in portions of the plant and soil samples was determined using LSC following combustion. Residues in the soil were characterized by extracting the soil with methanol:40% hydrobromic acid:water: acetone (2:1:4:8, v:v:v:v), concentrating the extract, distributing the concentrate between water and dichloromethane, concentrating the organic constituents and separating the organic phase by TLC using a toluene:ethyl acetate:acetic acid:water (50:50:1:0.5, v:v:v:v) solvent system. Quantification of residues was determined using a TLC linear-analyzer.

REPORTED RESULTS:

The highest concentrations of [^{14}C]triphenyltin hydroxide residues in rotational crops (30-day treatment-to-planting interval) were found in green wheat straw (0.022 mg eq/kg) and fresh radish bulbs (0.013) (Table 1).

The highest concentrations of radioactivity in the soil samples were detected only in the 0- to 5-cm layer of soil (Table 2). The residues in this layer of soil were identified as bound, polar, or nonpolar; the majority of the radioactivity was associated with triphenyltin hydroxide at all sampling intervals (Table 3).

DISCUSSION:

Less than the maximum label rate for a single application and less than the maximum number of permissible treatments were applied to the test soil.

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Table 1. [^{14}C]Triphenyltin hydroxide residues (mg eq/kg of triphenyltin hydroxide) in crops planted in sandy loam soil 30 days after soil was treated with [^{14}C]triphenyltin hydroxide at 330 g ai/ha.

	Application-to-harvest interval (days)		
Crop	77	120	169
Spinach leaves (fresh)	0.005	--	--
Radish bulbs (fresh)	0.013	--	--
Radish leaves (fresh)	0.006	--	--
Carrot roots (fresh)	--	0.010	0.006
Carrot leaves (fresh)	--	0.011	0.007
Wheat grain (fresh)	--	--	0.005
Wheat husks (fresh)	--	--	0.007
Wheat straw (green)	0.005	--	0.022

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Table 2. Total radioactivity (mg eq/kg triphenyltin hydroxide) in dry sandy loam soil treated with [^{14}C]triphenyltin hydroxide at 330 g ai/ha.

Sampling interval (days)	Sampling depth (cm)	
	0-5	5-20
0	2.60[a]	ND[b]
30	1.40	ND
77	0.24	ND
169	0.03	ND

[a] Sampling depth of 0-1 cm.

[b] Not detected; the limit of detection was <0.002 mg eq/kg.

Table 3. Composition of [^{14}C]triphenyltin hydroxide residues (% of the recovered) in the top 5 cm of sandy loam soil treated with [^{14}C]-triphenyltin hydroxide at 330 g ai/ha.

	Sampling interval (days)		
Component	30	77	169
Bound residues	5	21	23
Polar residues[a]	3	3	3
Nonpolar residues	78	75	57
Triphenyltin hydroxide	73	69	57
Diphenyltin compounds	3	5	--
Total residues (mg eq/kg)	1.40	0.24	0.03

[a] Water soluble.

EXECUTIVE SUMMARY

The following findings are derived from those reviewed studies which have met the requirements of 40 CFR Part 158.130 and the guidance of Subdivision N and were also deemed acceptable.

Aerobic Soil Metabolism:

Phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.6%), at approximately 2.2-2.3 ppm, degraded with half-lives of approximately 8 and 16 days in silty clay and silt loam soils, respectively, incubated at 22 ± 2°C in the dark (Gildemeister and Sochor, 1985). $^{14}CO_2$ was the major degradate, accounting for 54-55% of the applied radioactivity at 254 days posttreatment. Minor degradates, including [^{14}C]benzene and several unknowns, each accounted for <6% of the applied. To identify all degradates, both TLC and HPLC were employed using a wide variety of stationery and mobile phases. Considering that the major degradate was $^{14}CO_2$ and that the source of this carbon was from uniformly-labeled phenyl ring, it may be reasonably concluded that complete decomposition of the parent compound occurs.

Anaerobic Soil Metabolism:

[^{14}C]Triphenyltin hydroxide declined from 29.4 to 7.9% of the applied during 67 days of anaerobic incubation (flooding plus nitrogen atmosphere) in silty clay soil previously treated with phenyl-labeled [^{14}C]triphenyltin hydroxide (radiochemical purity 98.7%) at ~2.3 ppm and incubated aerobically in darkness at 22 ± 2°C for 26 days (Gildemeister et al., 1985). Degradates identified as mono- and diphenyltin compounds were <1.0% of the applied. Approximately 31.1% of the applied evolved as $^{14}CO_2$ during anaerobic incubation.

Mobility - Leaching and Adsorption/Desorption:

Based on soil TLC studies, [^{14}C]triphenyltin hydroxide was immobile (R_f<0.09) in silty clay, silt loam, sand, and clay soils (Gildemeister, 1985). Aged (26-day) [^{14}C]triphenyltin hydroxide residues were immobile to slightly mobile (R_f <0.34) in the same four soils.

The following findings are derived from those reviewed studies which have not met the requirements of 40 CFR 158.130 and/or the guidance of Subdivision N, but have been deemed good studies following generally sound scientific practice. They thereby provide supplemental information on the fate of the pesticide.

Terrestrial Field Dissipation:

In field plots at Hollandale, Minnesota, treated with triphenyltin hydroxide (Wesley Triple Tin 4L) at 0.3 lb ai/A, triphenyltin hydroxide residues in sugar beet plots ranged from 0.06 to 0.15 ppm in the 0- to 5-cm soil layer without an apparent trend, while residues in the bare ground plots ranged from 0.23 to 0.06 ppm with a degreasing trend (White, 1985, 1987a, 1987b) No residues were detected in the lower soil layers. Degradate diphenyltin dihydroxide was detected at 0.07 ppm in the 0- to 5-cm soil layer of the bare ground plots at day 14. In field plots at Donalsonville, Georgia, treated with triphenyltin hydroxide at 7.6 oz ai/A, triphenyltin hydroxide residues in both the sugar beet and bare ground plots degraded with a half-life of 3-7 days. No residues were detected in the lower soil layers.

Confined Accumulation - Rotational Crops:

[^{14}C]Triphenyltin hydroxide residues (uncharacterized) were $\leq$0.022 mg eq/kg (TPTH) in green wheat straw, fresh radish bulbs and leaves, and carrot roots and leaves; and $\leq$0.007 mg eq/kg in fresh spinach leaves, radish leaves, grain, and husks of wheat plants seeded 30 days after sandy loam soil was treated with [^{14}C]triphenyltin hydroxide at 330 g ai/ha (Burkle and Rutz, 1985). Radioactivity remained highest in the top 5 cm of the soil throughout the experiment, ranging from 2.60 mg eq/kg at day 0 to 0.03 mg eq/kg at day 169. Radioactivity was $\leq$0.002 mg eq/kg in the 5- to 20-cm layers of soil at all sampling intervals. Since residues were found in all of the exposed raw agricultural commodities, these studies do not support even a 30-day rotation interval for TPTH when a single 3.8 oz a.i./A application is made to small grain, leafy vegetable and root crops.

RECOMMENDATIONS

Available data are insufficient to fully assess the environmental fate of triphenyltin hydroxide. The submission of data required for full registration for terrestrial food crop and terrestrial nonfood use sites is summarized below:

The following data are required:

Photodegradation studies in water: One study (Gildemeister and Grundschottel, 1985) was reveiwed and is unacceptable because the test substance was not completely in solution and material balances were incomplete. In addition, this study would not fulfill data requirements because inappropriate analytical methodology was used, not all degradates comprising $\geq$10% of the applied radioactivity were characterized, the test solutions were not buffered, the intensity of the artificial light source was not reported, the intensity and wavelength distribution of the artificial light source were not compared to natural sunlight, and the incubation temperature of the dark control was not specified.

Photodegradation studies on soil: One study (Gildemeister et al., 1985) was reviewed and is unacceptable because: Experiment 1 - material balances were incomplete (up to 35% of the applied was unaccounted for); and Experiment 2 - the sampling protocol was inadequate (one sampling interval) and the material balance was incomplete (~16% of the applied was unaccounted for). In addition, this study would not fulfill data requirements because both experiments failed to accurately establish a pattern of decline of parent triphenyltin hydroxide and patterns of formation and decline of its degradates.

Terrestrial field dissipation studies: One study (White, 1985, 1987a, 1987b) was reviewed and provides supplemental information. This study would not fulfill data requirements because residues were not characterized, complete meteorological data were not provided, and the maximum label rate was not used.

Confined accumulation studies on rotational crops: One study (Burkle and Rutz, 1985) was reviewed and is unacceptable because less than the maximum

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label rate for a single application and less than the maximum number of permissible treatments were applied to the test soil. It is recommended that when the registrant conducts the study using maximum label rates, that consideration be given to adopting a 120 day crop rotation interval or longer.

Laboratory studies of pesticide accumulation in fish: A bluegill study may have been submitted for this addendum. The PM has been contacted on this matter and if another copy is received by EAB, it will be reviewed ASAP.

The following data requirements are fulfilled:

Hydrolysis studies: No data were reviewed for this addendum; however, based on previously submitted data, no additional data are required.

Aerobic soil metabolism studies: One study (Gildemeister and Sochor, 1985) was reviewed and fulfills data requirements by providing information on the aerobic metabolism of triphenyltin hydroxide in soil.

Anaerobic soil metabolism studies: One study (Gildemeister et al., 1985) was reviewed and fulfills data requirements by providing information on the anaerobic degradation of triphenyltin hydroxide in soil.

Leaching and adsorption/desorption studies: One study (Gildemeister, 1985) was reviewed and contributes toward the fulfillment of data requirements for Registering Pesticides by providing information on the mobility (soil TLC) of triphenyltin hydroxide and aged triphenyltin hydroxide residues in silty clay, silt loam, and sand soils. Data from the clay soil, a volcanic ash soil from Japan, would not fulfill data requirements because it is not typical of soils in the United States. Based on these data and previously submitted and accepted data on five unaged soil types, no additional data are required.

The following data requirements are deferred or are not required for presently registered uses:

Photodegradation studies in air: No data were reviewed for this addendum; however, no data are required because of the low vapor pressure of triphenyltin hydroxide.

Anaerobic aquatic metabolism studies: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide does not have an aquatic or aquatic impact use.

Aerobic aquatic metabolism studies: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide does not have an aquatic or aquatic impact use.

Laboratory volatility studies: No data were reviewed for this addendum; however, no data are required because of the low vapor pressure of triphenyltin hydroxide.

Field volatility studies: No data were reviewed for this addendum; however, no data are required because of the low vapor pressure of triphenyltin hydroxide.

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Aquatic field dissipation studies: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide does not have an aquatic or aquatic impact use.

Forestry dissipation studies: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide has no forestry use.

Dissipation studies for combination products and tank mix uses: No data were reviewed for this addendum; however, no data are required because data requirements for combination products and tank mix uses are currently not being imposed.

Long-term field dissipation studies: No data were reviewed for this addendum, but all data may be required if the results from the field dissipation/aerobic soil metabolism studies demonstrate residues do not reach 50% dissipation in soil prior to the recommended subsequent application.

Field accumulation studies on rotational crops: No data were reviewed for this addendum; however, all data may be required if significant [^{14}C]residues of concern to the agency are detected in the test crops analyzed in the confined accumulation study.

Accumulation studies on irrigated crops: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide does not have an aquatic food crop or aquatic noncrop use, is not used in and around holding ponds used for irrigation purposes, and has no use involving effluents or discharges to water used for crop irrigation.

Field accumulation studies on aquatic nontarget organisms: No data were reviewed for this addendum; however, no data are required because triphenyltin hydroxide currently has no registered forestry, aquatic, or aquatic impact uses.

Reentry studies: No data were reviewed for this addendum; however, all data may be required if toxicity and exposure data indicate a potential hazard exists.

REFERENCES

The following studies are new submittals reviewed in this report:

Burkle, W.L. and U. Rutz. 1985. Hoe 029664-14-C (TPTH), residues in rotational crops sown 30 days after treatment of the soil at an application rate of 330 g ai/ha. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 6.

Gildemeister, H. 1985. Hoe 029664-14C leaching study. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 5.

Gildemeister, H. and P. Grundschottel. 1985. Hoe 029664-14C photodegradation studies in water. Report No. (B)242/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 2.

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Gildemeister, H. and H. Sochor. 1985. Hoe 029664-14C, aerobic soil metabolism study with the fungicide triphenyltin hydroxide (TPTH). Report No. (B)227/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 3.

Gildemeister, H., W.L. Burkle, and H. Sochor. 1985. Anaerobic soil metabolism study with the fungicide. Report No. (B)221/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 4.

Gildemeister, H., K. Kunzler, and B. Haberkorn. 1985. Hoe 029664-14C photodegradation studies on soil. Report No. (B)160/85. Prepared by Hoechst Aktiengesellschaft, Frankfurt, Germany, and submitted by American Hoechst Corporation, Somerville, NJ. Acc. No. 260854. Reference 1.

White, S.M. 1985. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota and peanuts in Georgia. Including Soil residue dissipation of LX 124-09, and Triphenyltin hydroxide field dissipation study in peanuts. Prepared by Agri-Growth Research, Inc., Hollandale, MN; Southern Agricultural Research, Inc., Donalsonville, GA; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 261019.

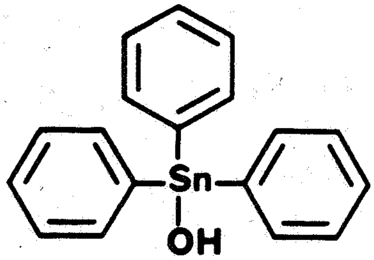
White, S.M. 1987a. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to peanuts in Georgia. Prepared by Southern Agricultural Research, Inc., Donalsonville, GA; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 401065-01.

White, S.M. 1987b. Terrestrial soil dissipation of triphenyltin hydroxide residue applied to sugar beets in Minnesota. Prepared by Agri-Growth Research, Inc., Hollandale, MN; and Tegeris Laboratories, Temple Hills, MD. Submitted by W.R. Landis Associates, Inc., Valdasta, GA. Acc. No. 401065-02.

APPENDIX

STRUCTURE OF TRIPHENYLTIN HYDROXIDE

DU-TER, DUTER, HAITIN, PHENOSTAT-H
SUZU H, TPTH, TPTOH, TRIPLE TIN,
TUBOTIN



Triphenyltin hydroxide