Secl File

Shaughnessy No.: 122101

Date Out of EAB: JUN 20 1986

To: Robert Taylor
Product Manager #25
Registration Division (TS-767)

From: Emil Regelman, Supervisory Chemist
Review Section #3
Exposure Assessment Branch
Hazard Evaluation Division (TS-769)

Attached, please find the EAB review of...

Reg./File # : 100 -617

Chemical Name: Propiconazole

Type Product : Fungicide

Product Name : TILT

Company Name : Ciba-Geigy Corporation

Purpose : Addendum to an application for full registration of propiconazole on pecans, rice, wheat, barley, and rye.

Action Code(s): 331

Date Received: 1/29/86

Date Completed: 6/18/86

Monitoring Study Request ______

Monitoring Study Voluntarily ______

EAB #(s) : 6261

TAIS Code: 62

Total Reviewing Time: 3.0 days

Deferrals to:

______ Ecological Effects Branch

______ Residue Chemistry Branch

______ Toxicology Branch

/

32322

[illegible]ISTRATION DIVISION DATA REVI[illegible] [illegible]ECORD

Confidential Business Information — Does Not Contain National Security [illegible]formation (E.O. 12065)

1/29/86
12978

1. CHEMICAL NAME: TILT 122101-9

2. IDENTIFYING NUMBER	3. ACTION CODE	4. ACCESSION NUMBER	TO BE COMPLETED BY PM
100-617	331	260795	5. RECORD NUMBER: 166194
		260796	6. REFERENCE NUMBER: 13
		260797 260798	7. DATE RECEIVED (EPA): 12-17-85
		260799	8. STATUTORY DUE DATE: NA
		260800	9. PRODUCT MANAGER (PM): Jacoby
		260801 260802 260803	10. PM TEAM NUMBER: 21

14. CHECK IF APPLICABLE

- ☐ Public Health/Quarantine
- ☐ Minor Use
- ☐ Substitute Chemical
- ☐ Part of IPM
- ☐ Seasonal Concern
- ☐ Review Requires Less Than 4 Hours

TO BE COMPLETED BY PCB

11. DATE SENT TO HED/TSS: 1-29-86
12. PRIORITY NUMBER: 50
13. PROJECTED RETURN DATE: 4-11-86

15. INSTRUCTIONS TO REVIEWER

A. HED
- ☐ Total Assessment - 3(c)(5)
- ☐ Incremental Risk Assessment - 3(c)(7) and/or E.L. Johnson memo of May 12, 1977.

B. SPRD (Send Copy of Form to SPRD PM)
- ☐ Chemical Undergoing Active RPAR Review
- ☐ Chemical Undergoing Active Registration Standards Review

C. ☐ BFSD
D. ☐ TSS/RD
E. ☒ Other

F. INSTRUCTIONS

Review Env. Fate Data to support new proposed uses for TILT.

16. RELATED ACTIONS

4F 3074 + others.

17. 3(c)(1)(D)
- ☐ Use Any or All Available Information
- ☐ Use Only Attached Data
- ☐ Use Only the Attached Data for Formulation and Any or All Available Information on the Technical or Manufacturing Chemical.

18. REVIEWS SENT TO
- ☐ TB ☐ EEB ☐ EF ☐ PL
- ☐ RCB ☐ EFB ☐ CH ☐ BFSD

19.	To	TYPE OF REVIEW	Registration	Petition	EUP	SLN	Sec. 18	Inert	MNR. USE	Other
HED		TOXICOLOGY								
HED		ECOLOGICAL EFFECTS								
HED		RESIDUE CHEMISTRY								
HED	✓	ENVIRONMENTAL ~~FATE~~ AB	1							
RD/TSS		CHEMISTRY								
RD/TSS		EFFICACY								
RD/TSS		PRECAUTIONARY LABELING	Previously sent							
BFS.		ECONOMIC ANALYSIS								2

(NUMBER OF ACTIONS spans Registration through Other.)

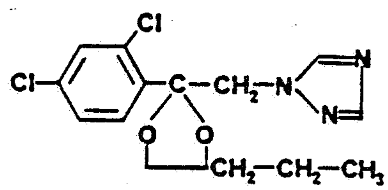
20. ☐ Label Submitted with Application Attached
21. ☑ Confidential Statement of Formula
22. ☐ Representative Labels Showing Accepted Uses Attached
23. Date Returned to RD (to be completed by HED)
24. Include an Original and 4 (four) Copies of This Completed Form for Each Branch Checked for Review.

1. CHEMICAL: Common Name Propiconazole

Common Name: 1-[(2-[2,4-Dichlorophenyl]-propyl-1,3-dioxolan-2-yl0 methyl]-1H-1,2,4-triazole

Trade Name: Tilt, CGA-64250, Desmel, Banner

Structure:



FORMULATIONS: 3.6 lb/gal EC

Physical/Chemical properties (company submitted data):
- Physical state: Colorless, orderless viscous liquid
- Water solubility: 110 ppm at 20°C
- Boiling point: 180°C at 0.1 mm Hg
- Vapor pressure: <3 x 10^{-6} Torr at 20°C

2. TEST MATERIAL:

2.1 Terrestrial field dissipation (164-1): propiconazole 3.6 lb ai/gal EC

2.2 Field dissipation, aquatic (164-2): propiconazole 3.6 lb ai/gal EC

2.3 Confined accumulation, rotational crop (165-1):

a. Triazole-labeled ^{14}C-3.6 lb ai/gal EC propiconazole.

b. Either phenyl-or triazole-labeled ^{14}C-propiconazole in ethanol.

2.4 Field accumulation, rotational crop (165-2): propiconazole 3.6 lb ai/gal EC.

3. STUDY ACTION TYPE:

Studies were submitted to provide data for the following requirements:

- o Terrestrial field dissipation (164-1)
- o Field dissipation-aquatic (164-2)
- o Confined accumulation in rotational crops (165-1)
- o Field accumulation, rotational crops (165-2)

4. STUDY IDENTIFICATION:

The following studies are new or amended submittals:

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982a. Field rotational crop studies on propiconazole in Alabama. SE-FR-306-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 13, 14, 15, 34, 35, 37, 38, 41, 42, 44, 45, 66, 70, 75, and 77.

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982b. Field rotational crop studies on propiconazole in Mississippi. 3-FR-5-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 17, 18, 19, 26, 27, 28, 29, 50, 51, 52, 53, 54, 59, 60, and 73.

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982c. Field rotational crop studies on propiconazole in Nebraska. 4-FR-1-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 13, 14, 16, 30, 31, 32, 33, 36, 39, 40, 43, 46, 47, 48, 49, 70, 71, 72, and 77.

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982d. Field rotational crop studies on propiconazole in Texas. SW-FR-805-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 20, 21, 22, 23, 24, 25, 55, 56, 57, 58, and 74.

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1983. Field rotational crop studies on propiconazole in California. 2-FR-21-82. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260801 and 260802. References 61, 62, 63, 64, 65, and 76.

Honeycutt, R.C. 1985a. Field dissipation studies on CGA-64250 (Tilt) (Columbia Co., NY). Report No. EIR-85028. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260799.

Honeycutt, R.C. 1985b. Field dissipation studies on CGA-64250 (Tilt) (Fresno, CA). Report No. EIR-85027. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260797.

Honeycutt, R.C. 1985c. Field dissipation studies on CGA-64250 (Tilt) (Geneso, IL). Report No. EIR-85025. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260798.

Honeycutt, R.C. 1985d. Field dissipation studies on CGA-64250 (Tilt) (Lenoir, NC). Report No. EIR-85018. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260796.

Honeycutt, R.C. 1985e. The freezer storage stability of CGA-64250 in field soil. Report No. EIR-85004. Ciba-Geigy Corp. Greensboro, NC. Acc. No. 260800. Reference 68.

Madrid, S.O. and J.E. Cassidy. 1983. Soil uptake of phenyl ^{14}C vs. triazole ^{14}C-CGA-64250 in target peanuts followed by rotational winter wheat and corn. A side by side comparison in the greenhouse. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260800, Reference 10 and Acc. No. 260803, pgs. 236, 279, 363, and 367.

Staley, J., S.O. Madrid, and J.E. Cassidy. 1982. The uptake of triazole. ^{14}C-CGA-64250 and its soil degradation products in field rotational winter wheat, lettuce, corn, and carrots. Report No. ABR-82007. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260803, pgs. 189, 344, 348, 352, and 382.

The following studies are resubmissions. No new data were provided with these studies that would alter the previous Dynamac or EAB evaluations.

Honeycutt, R.C., EIR-83022, "Environmental Impact of CGA-64250 and Worker Exposure Assessment - Addendum to EIR-81001 - For Use of CGA-64250 on Pecans," November 29, 1983. Acc. No. 260800. Reference 1.

Honeycutt, R.C., EIR-83003, "The Metabolism and Dissipation of CGA-64250 from Laboratory and Field Soil - A Summary Report," April 6, 1983. Acc. No. 260800. Reference 4.

Honeycutt, R.C., EIR-83016, "An Assessment of the Environmental Fate and Environmental Toxicology of 1,2,4-H-Triazole (CGA-71019) and D,L-(2-amino-3-(1-H-1,2,4-triazole-1-yl)-propanoic acid (CGA-131013)," January 6, 1984. Acc. No. 260801. Reference 67.

Keller, A., Project Report 29/79, "Degradation of the Fungicide CGA-64250 in Aerobic Soil (Provisional)," August 27, 1979. Acc. No. 260800. Reference 5.

Keller, A., Project Report 31/79, "Degradation of the Fungicide CGA-64250 in Two German Standard Soils under Laboratory Conditions (Provisional), "August 28, 1979. Acc. No. 260800. Reference 6.

Keller, A., Project Report 22/80, "Degradation of CGA-64250 (Tilt) in soil under Aerobic, Aerobic/Anaerobic and Sterile/Aerobic Conditions," June 24, 1980. Acc. No. 260800. Reference 7. Also, Acc. No. 260803, pg. 287.

Keller, A., Project Report 10/81, "Distribution and Degradation of CGA-64250 (Tilt) in a Field Soil," March 24, 1981. Acc. No. 260800. Reference 8.

Keller, A., Project Report 08/82, "Degradation of ^{14}C-Dioxolane and ^{14}C-Phenyl Ring-labeled CGA-64250 (Tilt) in Aerobic Soil," April 8, 1982. Acc. No. 260800. Reference 9. Also, Acc. No. 260803, pg. 314.

Keller, A., Project Report 45/82, "Degradation of CGA-64250 (Tilt) in Aerobic Soil. Isolation and Identification of the Major Polar Soil Metabolite," September 15, 1982. Acc. No. 260800. Reference 11. Also, Acc. No. 260803, pg. 336.

Nixon, W.B., and L.G. Ballantine, EIR-81001, "CGA-64250 Environmental Impact Statement," January 16, 1981. Acc. No. 260800. Reference 2.

Spare, W., "Aquatic Aerobic and Anaerobic Metabolism of CGA-64250," Biospherics, Inc., August 20, 1982. Acc. No. 260800. Reference 3.

The following studies were previously deferred to Residue Chemistry:

Madrid, S.O., and J.E. Cassidy, ABR-81013, "The Uptake, Distribution and Characterization of Triazole-^{14}C-CGA-64250 and Their Metabolites in Field Grown Peanuts," April 14, 1982. Acc. No. 260800. Reference 12. Also, Acc. No. 260803, pg. 122 and 158.

Ross, J.A., ABR-81018, "Stability of Residues of CGA-64250 Under Freezer Storage." May 4, 1981. Acc. No. 260802. Reference 69.

The following studies were not reviewed because they contain plant metabolism data:

Madrid, S. and J.E. Cassidy. 1980. The uptake, distribution, and characterization of triazole- and phenol-^{14}C-CGA-64250 and their metabolites in greenhouse-grown peanuts. Report ABR-80006. Acc. No. 260803, pg. 46.

Madrid, S.O. and J.E. Cassidy. 1980. Structure elucedation of Phase I metabolites of CGA-64250 in greenhouse-grown peanut stalks. Report ABR-80037. Acc. No. 260803, pg. 88.

Seim, V. and G. Brown. 1979. Biological report for the metabolism of triazole- ^{14}C-CGA-64250 and 0-^{14}C-CGA-64250 when applied as a foliar spray to greenhouse-grown peanuts. Report B10L-79007. Acc. NO. 260803, pg. 274.

Szolics, I.M. and B.J. Simoneaux. 1985. Metabolism data and correlation of metabolites in target and rotation crops of propiconazole. Report ABR-85056. Acc. No. 260803, pg. 1.

5. REVIEWED BY:
Hudson Boyd
EAB/HED/OPP

Signature: Hudson Boyd

Date: 6/20/86

6. APPROVED BY:

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

Signature: E Regelman

Date: JUN 20 1986

7. <u>CONCLUSION:</u>

Data from the terrestrial field dissipation studies showed that propiconazole degrades rapidly (halflife < 1 month) in silt and sandy loam soils and leaves residues of about 0.07-0.12 ppm of 1,2,4-H triazole. These data fulfill the requirements of EPA Pesticide Assessment Guidelines, Subdivision-N and no further testing per Sec 164-1 is required.

Data from field dissipation (aquatic and aquatic impact) studies could not be validated because of either poor study design or data reporting. It was not possible to assess the formation and decline of degradates - degradates were not characterized and data were too variable to generate valid conclusions. Consequently, these studies do not fulfill EPA Guideline requirements (Sec. 164-2) for registering pesticides.

Data from confined accumulation in rotational crop studies indicated that ^{14}C-propiconazole may accumulate in all plant parts of wheat, corn, carrots, and lettuce when planted in soils treated with propiconazole up to 5 months preplanting. However, the studies did not specify the purity of the test substance nor the degradates in the plant parts and otherwise failed to fulfill EPA Guideline requirements for registering pesticides, Sec # 165-1.

Studies in field-grown rotational crops for accumulation of propiconazole were inadequate to assess the potential for accumulation in plant parts resulting from soil treatment with this fungicide. Non-specific assay methods were employed, and degradates were not identified. Consequently, no valid conclusion could be drawn from the data.

Based upon previously submitted data and combined with currently considered studies the following studies must yet be conducted:

- Anaerobic soil metabolism (162-2)*
- Anaerobic aquatic metabolism (162-3)*
- Aerobic aquatic metabolism (162-4)*
- Field dissipation, aquatic (164-2)
- Confined, and possibly field accumulation in rotational crops (165-1, 165-2)

* By prior agreement the requirement for data from these studies is deferred until after registration is complete.

8. <u>RECOMMENDATIONS:</u>

Require the submission of acceptable data from field dissipation, aquatic (164-2) and rotational crop studies (165-1 and/or 165-2) prior to full registration of propicanazole.

Advise the registrant that since 1,2,4-triazole is the major metabolite of propiconazole it, and not simply total triazoles or

^{14}C-should be determined in the above studies. The 2,4-dichlorobenzene moiety should also be looked for.

9. BACKGROUND:

A. Introduction

Propiconazole has been previously reviewed by Dynamac (8/17/84) and EAB. Based on previous submissions, the following data requirements have been fulfilled and these conclusions drawn (copied directly from the EAB review dated 2/9/84):

1. Hydrolysis: Stable to hydrolysis.
   N. Burkhard: Rate of hydrolysis of CGA-64250 under laboratory conditions. 1/30/80; Acc. No. 244269; reviewed: 6/17/81.

2. Water photodegradation: Rapid with sensitizers - $t_{1/2}$ <1 day.
   G. Miller: Photochemistry of CGA-64250. Acc. No. 244269; reviewed: 6/17/81.

3. Soil photodegradation: No degradation over 24 hour time period.
   N. Burkhard: Photolysis of CGA-64250 on soil surface under artificial sunlight conditions. 3/24/80; Acc. No. 244269; reviewed: 6/17/81.

4. Aerobic soil metabolism: $t_{1/2}$ = 10 weeks.
   A. Keller: Degradation of CGA-64250 (Tilt) in soil under aerobic, aerobic/anaerobic and sterile/aerobic conditions. 6/24/80; Acc. No. 244269; reviewed: 6/17/81.

5. Mobility studies:
   Adsorption/desorption: Tightly bound to soil.
   N. Burkhard: Adsorption and desorption of CGA-64250 in various soil types. 8/14/80; Acc. No. 244269; reviewed: 6/17/81.

   Soil column: Little propensity to leach.
   A. Keller: Leaching characteristics of aged ^{14}C-CGA-64250 in farm.
   J. Gouth: Leaching model study with the fungicide CGA-64250 in farm standard soils. 8/27/78; Acc. No. 244269; reviewed: 6/17/81 and 10/14/81.

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Aged leaching: Low leaching potential.
A. Keller: Leaching characteristics of aged ^{14}C-CGA-64250 residues in two standard soils. 11/14/79; Acc. No. 244269; reviewed: 6/17/81.

6. Fish accumulation; In muscle tissue BCF 24x; depuration almost complete in 14 days.
EG and G, Bionomics Aquatic Toxicology Laboratory of Wareham, MA: Accumulation and elimination in ^{14}C-residues by bluegill sunfish (*Lepomis macrochivies*) exposed to ^{14}C-CGA-64250. December, 1980. Acc. No. 245708; reviewed: 10/14/81.

According to a letter submitted by Ciba-Geigy to H. Jacoby with the data currently under review, EAB agreed (4/15/85) to make aerobic and anaerobic aquatic metabolism studies postregistration requirements. The company predicts the studies will be complete by September, 1986.

Propiconazole is registered (or registration has been applied for) for use on grasses grown for seed in the Pacific Northwest.

B. Directions for Use

Propiconazole is a broad spectrum foliar fungicide with systemic and eradicative properties. It is effective against Ascomycetes, Basidiomycetes, and Imperfects. Propiconazole is applied at 8-12 fluid oz/A to bearing pecans (6-9 fluid oz/A if trees are <30 feet in height); 4-5.5 fluid oz/A to nonbearing pecans; 4 fluid oz/A to wheat, barley, and rye; 6 fluid oz/A twice or 8-10 fluid oz/A once to rice; and 4-8 fluid oz/A to grasses grown for seed. Multiple applications may be made to nonbearing pecans and grasses; applications are limited to six on bearing pecans, two on rice (depending on application rate), and one on wheat, barley and rye. Propiconazole may be applied using ground spray equipment or aircraft.

10. DISCUSSION OF INDIVIDUAL TESTS OF STUDIES:

See attached reviews of individual studies.

11. COMPLETION OF ONE-LINER:

One-liner completed as for as possible.

12. CBI APPENDIX:

All data discussed here are considered CBI and must be treated as such.

ORIGINAL SIGNED BY
WELDON L. BOYD

DYNAMAC CORPORATION

PROPICONAZOLE

Final Report

Task 1: Review and Evaluation of Individual Studies

Task 2: Environmental Fate and Exposure Assessment

Contract No. 68-02-4250

JUNE 4,1986

Submitted to:
Environmental Protection Agency
Arlington, VA 22202

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

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PROPICONAZOLE

Table of Contents

//

INTRODUCTION

This report is a scientific evaluation of environmental fate data submitted to EPA by Ciba-Geigy Corporation in order to obtain full registration of propiconazole (Tilt), a 3.6 lb/gal EC broad spectrum systemic foliar fungicide, for use on orchard crop (pecans), field and vegetable crop (wheat, barley, and rye), and aquatic foodcrop (rice) use sites. Propiconazole is applied at 8-12 fluid oz/A to bearing pecans (6-9 fluid oz/A if trees are <30 feet in height); 4-5.5 fluid oz/A to nonbearing pecans; 4 fluid oz/A to wheat, barley, and rye; 6 fluid oz/A twice or 8-10 fluid oz/A once to rice; and 4-8 fluid oz/A to grasses grown for seed (Pacific Northwest only). Multiple applications may be made to nonbearing pecans and grasses; applications are limited to six on bearing pecans, two on rice (depending on application rate), and one on wheat, barley and rye. Propiconazole may be applied using ground spray equipment or aircraft.

In addition to the nine studies reviewed herein, numerous studies were previously reviewed by EAB and Dynamac. The contribution of all studies that have been reviewed to date toward fulfillment of data requirements is considered under Recommendations. Structures, including the 1,2,4-H-triazole degradate, are illustrated in the Appendix.

CASE GS -- PROPICONAZOLE STUDY 1 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01

Honeycutt, R.C. 1985a. Field dissipation studies on CGA-64250 (Tilt) (Columbia Co., NY). Report No. EIR-85028. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260799.

Honeycutt, R.C. 1985b. Field dissipation studies on CGA-64250 (Tilt) (Fresno, CA). Report No. EIR-85027. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260797.

Honeycutt, R.C. 1985c. Field dissipation studies on CGA-64250 (Tilt) (Geneso, IL). Report No. EIR-85025. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260798.

Honeycutt, R.C. 1985d. Field dissipation studies on CGA-64250 (Tilt) (Lenoir, NC). Report No. EIR-85018. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260796.

SUBST. CLASS = S.

DIRECT RVW TIME = 40 (MH) START-DATE END DATE

REVIEWED BY: G. Moore, K. Patten
TITLE: Staff Scientist
ORG: Dynamac Corp., Rockville, MD
TEL: 468-2500

APPROVED BY: H. Boyd
TITLE: Chemist
ORG: EAB/HED/OPP
TEL: 557-7463

SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Terrestrial

1. Data from California and Illinois sites are scientifically valid. Data from North Carolina and New York sites are scientifically invalid because the data are too variable to accurately assess the dissipation of propiconazole in soil.

2. Propiconazole (3.6 lb ai/gal EC), at 5 lb ai/A, degraded in silt loam (Illinois) and sandy loam (California) soils with a half-life of <1 month, from 6.8 to 2.8 ppm and from 1.8 to 0.29 ppm in the silt loam and sandy loam soils, respectively. 1,2,4-H-Triazole was ≤0.07 ppm at the Illinois site and ≤0.12 ppm at the California site at all sampling intervals.

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3. This study fulfills EPA Data Requirements for Registering Pesticides by providing data on the dissipation of propiconazole at two sites.

MATERIALS AND METHODS:

Propiconazole (Tilt, 3.6 lb/gal EC) was applied once at 5.0 lb ai/A between June 4 and 24, 1984, to the bare soil surface of field plots located in North Carolina (36 x 60 feet), California (10 x 25 feet), Illinois (10 x 30 feet), and New York (18 x 50 feet) (Table 1). Soil samples (0- to 6-, 6- to 12-, 12- to 18-, and 18- to 24-inch depths) were taken immediately after treatment and at ~1, 2, 3, 4, 6, and 9 months posttreatment.

The soils were analyzed for propiconazole using method AG-354 and for 1,2,4-H-triazole using method AG-427. The samples were extracted with methanol:water (4:1, v:v). Following the AG-354 procedures, aliquots of the extract were partitioned with methylene chloride and the aqueous phase was discarded. The organic phase was dried with sodium chloride and filtered through an alumina column. The eluate was analyzed for propiconazole using GC with alkali flame ionization detection. Following the AG-427 procedures, aliquots of the methanol:water extract were derivatized with diazomethane and analyzed using GC. The detection limit for both methods was was 0.05 ppm. Recovery from fortified samples ranged from 88 to 112% for propiconazole and from 72 to 116% for 1,2,4-H-triazole.

REPORTED RESULTS:

Meteorological data for the study sites are summarized in Table 2.

Propiconazole degraded with a half-life of <1 month at the Illinois, California, and North Carolina sites (Table 3). Propiconazole concentrations at the New York site varied between 2.50 and 0.86 ppm throughout the study with no discernable pattern. 1,2,4-H-Triazole increased to a maximum concentration of 0.07 ppm in Illinois, 0.12 ppm in California, and 0.10 ppm in North Carolina by ~4 months posttreatment.

DISCUSSION:

1. Data from the North Carolina and New York test sites are too variable to assess the dissipation of propiconazole in soil.

2. The soil CEC was not reported for the North Carolina and New York sites.

3. Based on aerobic soil metabolism studies, 1,2,4-H-triazole is the major propiconazole degradate in soil.

Table 1. Soil characteristics.

Location	Soil type	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)
		%					
North Carolina	Sandy loam	65.2	23.2	11.6	2.7	6.0	--
New York	Silt loam	30.0	51.6	18.4	2.5	5.5	--
Illinois	Silt loam	18.0	56.4	25.6	3.0	5.8	23.0
California	Sandy loam	52.8	31.2	10.0	1.2	6.2	5.1

Table 2. Meteorological data.

Location	Total rainfall	Rainfall during first month	Temperature range (°F)
	inches		
North Carolina	40.57	2.60	-2 to 56
New York	29.04	6.78	-18 to 97
Illinois[a]	31.30	4.35	-1 to 99
California	11.50	0.10	24 to 109

[a] Data were provided for the period of June 1984 to December 1984, only.

Table 3. Propiconazole and 1,2,4-H-triazole (ppm) in soils at four sites treated with propiconazole (3.6 lb/gal EC) once at 5 lb ai/A in June, 1984.

Sampling interval (months)	0- to 6-inch		6- to 12-inch		12- to 18-inch		18- to 24-inch	
	Parent	1,2,4-H-Triazole	Parent	1,2,4-H-Triazole	Parent	1,2,4-H-Triazole	Parent	1,2,4-H-Triazole
				North Carolina				
0	2.60	ND[a]	--[b]	--	--	--	--	--
1	1.20	ND	--	--	--	--	--	--
2	0.71	0.05	0.12	ND	0.07	0.05	--	--
3	1.40	ND	ND	ND	ND	0.05	--	--
4	1.96	0.10	ND	ND	0.05	ND	--	--
6	0.90	ND	ND	ND	ND	ND	ND	ND
9	0.18	0.05	ND	ND	ND	ND	ND	ND
				New York				
0	1.90	ND	--	--	--	--	--	--
1	2.50	0.10	--	--	--	--	--	--
2	1.09	0.10	ND	ND	ND	ND	--	--
4	0.86	0.09	ND	ND	0.08	ND	--	--
6	2.20	0.11	ND	ND	0.11	ND	ND	ND
9	1.40	0.11	0.05	ND	ND	ND	ND	ND
				Illinois				
0	6.80	ND	--	--	--	--	--	--
1	2.80	0.06	--	--	--	--	--	--
2	2.00	0.06	0.10	ND	0.08	ND	--	--
3	1.50	0.05	0.12	ND	0.13	ND	--	--
4	1.70	0.07	0.14	ND	0.06	ND	--	--
6	1.50	0.06	0.14	ND	0.05	ND	ND	ND
9	0.71	0.05	ND	ND	ND	ND	ND	ND
				California				
0	1.80	ND	--	--	--	--	--	--
1	0.29	0.08	--	--	--	--	--	--
2	0.48	0.10	ND	0.06	0.05	ND	--	--
3	0.38	0.12	ND	0.06	ND	ND	--	--
4	0.33	0.12	ND	0.06	ND	ND	--	--
6	0.16	0.09	ND	0.05	ND	ND	ND	ND
9	0.16	0.06	ND	0.05	ND	ND	ND	ND

a Not detected; detection limit was 0.05 ppm.

b Not sampled.

CASE GS -- PROPICONAZOLE STUDY 2 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 04 and 12 - GRANULAR (G) AND EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01
Honeycutt, R.C. 1985e. The freezer storage stability of CGA-64250 in field soil. Report No. EIR-85004. Ciba-Geigy Corp. Greensboro, NC. Acc. No. 260800. Reference 68.

SUBST. CLASS = S.

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

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CONCLUSIONS:

Ancillary - Storage Stability

1. This study is scientifically valid.

2. The concentration of propiconazole in three soils stored frozen for ~2 years did not decline.

MATERIALS AND METHODS:

Field soils treated with two banded and eight foliar applications of propiconazole (CGA-64250, 2.5% G; and Tilt, 3.6 lb/gal EC; respectively) were sampled at various intervals after application, analyzed for propiconazole, and stored frozen at -20°F. After 2 years of storage, the soil samples were thawed and reanalyzed for propiconazole.

The soil samples were extracted with methanol:water (90:10, v:v) by refluxing for 2 hours. The extracts were filtered, concentrated by evaporation, diluted with water, and filtered through a C-8 Bond Elut column. The eluate was analyzed by GC. Recovery values for soil samples fortified with propiconazole at 0.05-2.0 ppm were 96-114%. The detection limit was 0.05 ppm.

REPORTED RESULTS:

The concentration of propiconazole in soil stored frozen for ~2 years did not decline (Table 2).

DISCUSSION:

The concentration of propiconazole in twelve of the sixteen soil samples tested appears to have increased after being stored under frozen conditions for ~2 years. No explanation was offered for this phenomenon.

Table 1. Soil characteristics.

Soil type	Sand	Silt	Clay	Organic matter	pH	CEC (meq/100 g)
	%					
Sandy loam	64.4	24.8	10.8	0.6	7.2	4.3
Loamy sand	84.0	11.2	4.8	0.5	6.7	4.1
Clay loam	30.0	38.0	32.0	1.3	7.3	10.5

Table 2. Propiconazole (ppm) in field soil treated with propiconazole and stored frozen (-20°F) for ~2 years.

Soil type	Initial concentration	Concentration after 2-year storage
Sandy loam	0.78	0.79
	0.58	0.51
	0.38	0.42
	0.25	0.23
	0.19	0.18
	0.09	0.08
Loamy sand	2.50	4.20
	1.10	1.50
	0.93	1.20
	0.74	0.79
	0.35	0.43
Clay loam	0.26	0.50
	0.22	0.36
	0.25	0.37
	0.16	0.24
	0.23	0.38

CASE GS -- PROPICONAZOLE STUDY 3 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01
Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982a. Field rotational crop studies on propiconazole in Alabama. SE-FR-306-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 13, 14, 15, 34, 35, 37, 38, 41, 42, 44, 45, 66, 70, 75, and 77.

SUBST. CLASS = S.

DIRECT RVW TIME = 16 (MH) START-DATE END DATE

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CONCLUSIONS:

Field Accumulation - Rotational Crops

1. This study is scientifically valid.

2. Residues containing the 1,2,4-triazole moiety accumulated (0.43-11.0 ppm propiconazole equivalents) in cabbage, corn, and sweet potatoes planted 149-188 days after the soil was treated with propiconazole (3.6 lb/gal EC) at 100 + 100 or 200 + 200 g ai/A. Residues containing the 2,4-dichlorobenzene moiety accumulated (≤0.72 ppm) in winter wheat planted 28 days after the soil was treated with propiconazole at 100 + 100 g ai/A, but were not detected (<0.05 ppm) in cabbage, corn, sweet potatoes or second growth wheat planted in soil treated at 100 + 100 g ai/A. Propiconazole decreased from 0.35 to <0.05 ppm (detection limit) in soil treated at 100 + 100 g ai/A and from 0.39 to 0.07 ppm in soil treated at 200 + 200 g ai/A during the 179 days following treatment.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because the methods were nonspecific, degradates were not identified, and the meteorological data were inadequate.

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MATERIALS AND METHODS:

Field plots (40 x 50 feet) of loamy sand soil (76.0% sand, 19.2% silt, 4.8% clay, 0.9% organic matter, pH 6.0, CEC 4.6 meq/100 g) located in Lee County, Alabama, were treated with propiconazole (Tilt, 3.6 lb/gal EC) at 100 and 200 g ai/A on September 26, 1980. The plots were retreated at the same rates on October 10, 1980. Soil samples (0- to 6-, 6- to 12-, and 12- to 18-inch depths) were taken 0 and 14 days after the first application and 0, 24, 28, 179, 215, and 353 days after the second application. The plots were planted with winter wheat 28 days posttreatment (measured from second application), cabbage 149 days posttreatment, corn 180 days posttreatment, and sweet potatoes 188 days posttreatment. Plants were sampled when immature and at maturity. Samples were stored frozen up to 17 months until analysis.

Soil samples were analyzed for propiconazole and for total residues containing 2,4-dichlorobenzene moieties using methods AG-354 and AG-356, respectively. The soil was extracted with methanol:water (2:1) either by a 2-hour reflux or by shaking. Following the AG-354 procedures, an aliquot of the extract was filtered, mixed with sodium chloride, and partitioned three times with methylene chloride. The methylene chloride fraction was filtered through an alumina column and analyzed using GC with alkali flame ionization detection. Recovery from fortified samples ranged from 70.4 to 90.8%; the detection limit was 0.05 ppm. Following the AG-356 procedures, the remaining methanol:water extract was partitioned three times with hexane. The hexane phase was discarded and the aqueous phase was refluxed with nitric acid, then extracted three times with methylene chloride. The methylene chloride extracts were combined, reacted with a diazomethane: ethyl ether solution, and filtered through a silica gel column. The eluate was analyzed for total residues containing 2,4-dichlorobenzene moieties using GC. Recovery from fortified samples ranged from 67.3 to 83.8%; the detection limit was 0.10 ppm.

Plant samples were analyzed for total residues containing the 1,2,4-triazole moiety using method AG-357 and for total residues containing the 2,4-dichlorobenzene moiety using method AG-407. The plant samples were extracted by refluxing with methanol:ammonium hydroxide (80:20) for 1 hour. Following the AG-357 procedures, an aliquot of the extract was refluxed for 30 minutes in sulfuric acid:nitric acid:water (2:1:1). The acid solution was diluted and partitioned with methylene chloride; the methylene chloride was discarded. The aqueous phase was mixed sequentially with sodium bromide dissolved in sodium hydroxide, 20% potassium bicarbonate in water, and 10% sodium metabisulfate in water. The mixture was partitioned twice with ethyl acetate. The ethyl acetate fraction was filtered through a silica gel column. The eluate was methylated with diazomethane and analyzed using GC. Recovery from fortified samples ranged from 49 to 78%; the detection limit was ~1.0 ppm because of a high background level. Following the AG-407 procedures, aliquots of the methanol:ammonium hydroxide extracts were refluxed for 16 hours with 12 N nitric acid. The mixture was partitioned with hexane:diethyl ether (9:1) and the organic phase was derivatized with diazomethane in the presence of dodecane. The solution was filtered through silica gel and acidic alumina columns and analyzed using capillary GC. Recovery from fortified samples ranged from 74 to 91%; the detection limit was 0.05 ppm.

REPORTED RESULTS:

Following the second application of propiconazole, propiconazole in the soil degraded from an initial concentration of 0.13 to <0.05 ppm 24 days posttreatment in the 100 g ai/A treatment plot and from 0.30 to 0.07 ppm 179 days posttreatment in the 200 g ai/A treatment plot (Tables 1 and 2). Residues containing the 2,4-dichlorobenzene moiety were ≤0.06 and ≤0.30 ppm propiconazole equivalents following the second application of propiconazole at 100 and 200 g ai/A, respectively.

Residues containing the 1,2,4-triazole moiety accumulated in cabbage, corn, and sweet potatoes planted 149-188 days after the soil was treated with propiconazole at 100 or 200 g ai/A (Table 3). Residues containing the 2,4-dichlorobenzene moiety accumulated in winter wheat planted 28 days after the soil was treated with propiconazole at 100 g ai/A, but were not detected (<0.05 ppm) in cabbage, corn, sweet potatoes, or second growth wheat planted in soil treated at 100 g ai/A.

DISCUSSION:

1. The methods did not distinguish between propiconazole and its degradates in the rotational crops.

2. Propiconazole was characterized in the soil, but the 2,4-dichlorobenzene degradates were not distinguished and the 1,2,4-triazole degradates were not considered, although 1,2,4-H-triazole is a major soil degradate.

3. The meteorological data provided by the registrant were inadequate. The data were not from the study site but were from weather stations located in Birmingham, Mobile, and Montgomery.

Table 1. Propiconazole (ppm) and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in loamy sand soil in Alabama treated with propiconazole (3.6 lb/gal EC) at 100 g ai/A on September 26 and October 10, 1980.

Sampling interval (days)	Date	Sampling depth (inches) 0-6	6-12	12-18
		Propiconazole		
0[a]	09/26/80	0.35	--	--
14	10/10/80	0.10	--	--
0[b]	10/10/80	0.13	--	--
24	11/03/80	ND[c]	ND	--
28	11/07/80	ND	ND	--
179	04/07/81	ND	ND	--
215	05/13/81	ND	ND	ND
323	09/28/81	ND	ND	ND
		Residues containing 2,4-dichlorobenzene		
0[a]	09/26/80	0.24	--	--
14	10/10/80	0.21	--	--
0[b]	10/10/80	0.12	--	--
24	11/03/80	ND	ND	--
28	11/07/80	ND	ND	--
179	04/07/81	ND	0.16	--
215	05/13/81	ND	0.14	ND
323	09/28/81	ND	ND	ND

[a] Initial application.

[b] Second application.

[c] Not detected; detection limit was 0.05 ppm for propiconazole and 0.10 ppm for residues containing 2,4-dichlorobenzene.

Table 2. Propiconazole (ppm) and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in loamy sand soil in Alabama treated with propiconazole (3.6 lb/gal EC) at 200 g ai/A on September 26 and October 10, 1980.

Sampling interval (days)	Date	Sampling depth (inches)		
		0-6	6-12	12-18
		Propiconazole		
0[a]	09/26/80	0.39	--	--
14	10/10/80	0.16	--	--
0[b]	10/10/80	0.30	--	--
24	11/03/80	0.30	ND[c]	--
28	11/07/80	0.10	ND	--
179	04/07/81	0.07	ND	--
215	05/13/81	0.09	ND	ND
323	09/28/81	ND	ND	ND
		Residues containing 2,4-dichlorobenzene		
0[a]	09/26/80	0.34	--	--
14	10/10/80	0.20	--	--
0[b]	10/10/80	0.30	--	--
24	11/03/80	0.28	ND	--
28	11/07/80	0.17	ND	--
179	04/07/81	0.19	0.20	--
215	05/13/81	0.15	ND	ND
323	09/28/81	ND	ND	ND

[a] Initial application.

[b] Second application.

[c] Not detected; detection limit was 0.05 ppm for propiconazole and 0.10 ppm for residues containing 2,4-dichlorobenzene.

Table 3. Total residues containing the 1,2,4-triazole moiety and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in rotational crops grown in soil treated with propiconazole (3.6 lb/gal EC) at 100 + 100 or 200 + 200 g ai/A on September 24 and October 10, 1980.

Rotational crop	Plant part	Sampling date	Treatment-to-harvest interval (days)	1,2,4-Triazole moiety	2,4-Dichloro-benezene moiety
				100 + 100 g ai/A	
Winter wheat	Immature	01/09/81	91	--	0.72
	Immature	04/07/81	179	--	0.13
	Straw	06/01/81	234	--	0.24
	Grain	06/01/81	234	--	0.05
	Immature[a]	02/02/82	480	--	ND
	Immature	04/12/82	549	--	ND
	Straw	07/23/82	651	--	ND
	Grain	07/23/82	651	--	ND
Cabbage	30-Day	04/07/81	179	0.82	ND
	Head	06/05/81	238	0.65	ND
Corn	Immature	06/05/81	238	1.95	ND
	Fodder	09/03/81	328	3.10	ND
	Grain	09/03/81	328	10.4	ND
Sweet Potato	Immature	06/15/81	248	3.3	ND
	Root	11/02/81	388	3.0	ND
	Top	11/02/81	388	1.9	ND
				200 + 200 g ai/A	
Cabbage	30-Day	04/07/81	179	0.43	--
	Head	06/05/81	238	2.1	--
Corn	Immature	06/05/81	238	3.4	--
	Fodder	09/03/81	328	5.1	--
	Grain	09/03/81	328	11.0	--
Sweet Potato	Immature	06/15/81	248	3.6	--
	Root	11/02/81	388	2.1	--
	Top	11/02/81	388	2.2	--

a Second growth.

b Not detected; detection limit was 0.05 ppm propiconazole equivalents.

CASE GS -- PROPICONAZOLE STUDY 4 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE

FICHE/MASTER ID None CONTENT CAT 01

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982c. Field rotational crop studies on propiconazole in Nebraska. 4-FR-1-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 13, 14, 16, 30, 31, 32, 33, 36, 39, 40, 43, 46, 47, 48, 49, 70, 71, 72, and 77.

SUBST. CLASS = S.

DIRECT RVW TIME = 16 (MH) START-DATE END DATE

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SIGNATURE: DATE:

CONCLUSIONS:

Field Accumulation - Rotational Crops

1. This study is scientifically valid.

2. Propiconazole and residues containing the 2,4-dichlorobenzene moiety were ≤0.05 ppm (propiconazole equivalents) in winter wheat planted 9 and 365 days, corn planted 238 and 621 days, sugar beets planted 256 and 621 days, and lettuce planted 279 and 636 days after the soil was treated with propiconazole (3.6 lb/gal EC) at 100 + 100 g ai/A. Propiconazole and residues containing the 2,4-dichlorobenzene moiety were not detected (<0.05 ppm) in sugar beets and lettuce planted 256 and 279 days, respectively, after the soil was treated with propiconazole at 200 + 200 g ai/A. Residues containing the 1,2,4-triazole moiety were ≤1.25 ppm in sugar beets and lettuce planted 256 and 279 days after the soil was treated with propiconazole at 100 + 100 or 200 + 200 g ai/A. In the soil, propiconazole and residues containing the 2,4-dichlorobenzene moiety degraded with a half-life of <9 days following the second application of propiconazole, from an initial concentration of 0.22-0.71 ppm to ≤0.16 ppm in the 0- to 6-inch depth 238 days posttreatment.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because the methods were nonspecific, degradates were not identified, and meteorological data were inadequate.

MATERIALS AND METHODS:

Field plots (24 x 60 feet) of silt loam soil (20.4% sand, 58.6% silt, 21.0% clay, 2.8% organic matter, pH 6.4, CEC 14.0 meq/100 g) located in York, Nebraska, were treated with propiconazole (Tilt, 3.6 lb/gal EC) at 100 and 200 g ai/A on September 3, 1980. The plots were retreated at the same rates on September 17, 1980. Soil samples (0- to 6-, 6- to 12-, and 12- to 18-inch depths) were taken 0 and 14 days after the first application and 0, 9, 21, 219, 238, and 357 days after the second application. The plots were planted with winter wheat 9 and 365 days posttreatment (measured from second application), corn 238 and 621 days posttreatment, sugar beets 256 and 621 days posttreatment, and lettuce 279 and 636 days posttreatment. Plants were sampled when immature and at maturity. Samples were stored frozen until analysis.

Soil samples were analyzed for propiconazole and for total residues containing the 2,4-dichlorobenzene moiety using methods AG-354 and AG-356, respectively, as described in Study 3. Winter wheat, corn, sugar beet, and lettuce samples were analyzed for residues containing the 2,4-dichlorobenzene moiety using methods AG-356 or AG-407, as described in Study 3. Sugar beet and lettuce samples were analyzed for residues containing the 1,2,4-triazole moiety using method AG-357 as described in Study 3, and for propiconazole using method AG-389. Following the AG-389 procedures, the plant samples were extracted by refluxing with methanol:ammonium hydroxide (80:20). An aliquot of the extract was partitioned with hexane:ether (90:10), and the organic phase was dried and redissolved in cyclohexane:methylene chloride (75:25, v:v). The solution was separated on an automated gel permeation chromatograph and analyzed using GC with alkali flame ionization detection. Recovery from fortified samples ranged from 70 to 128%. The detection limit was 0.05 ppm.

REPORTED RESULTS:

Propiconazole and total residues containing the 2,4-dichlorobenzene moiety degraded with a half-life of <9 days following the second application of propiconazole at 100 or 200 g ai/A (Tables 1 and 2).

Propiconazole was not detected (<0.05 ppm) in sugar beets or lettuce planted 256 and 279 days, respectively, after the soil was treated with propiconazole (Table 3). Residues containing the 2,4-dichlorobenzene moiety were ≤0.05 ppm in wheat, corn sugar beets, and lettuce planted 9-261 days after the soil was treated with propiconazole. Residues containing the 1,2,4-triazole moiety were ≤1.25 ppm in lettuce and sugar beets.

DISCUSSION:

1. Winter wheat and corn were not analyzed for propiconazole. However, since residues containing the 2,4-dichlorobenzene moiety (which would

include propiconazole) were not detected in either crop, it is reasonable to assume that propiconazole was below measurable concentrations in the plants.

2. Residues containing the 1,2,4-triazole moiety were detected but not characterized in the sugar beets and lettuce. Corn and winter wheat were not analyzed for residues containing the 1,2,4-triazole moiety.

3. The soil was not analyzed for residues containing the 1,2,4-triazole moiety.

4. The meteorological data provided by the registrant were inadequate because the data were not for the study site.

Table 1. Propiconazole (ppm) and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in silt loam soil in Nebraska treated with propiconazole (3.6 lb/gal EC) at 100 g ai/A on September 3 and 17, 1980.

Sampling interval (days)	Date	Sampling depth (inches)		
		0-6	6-12	12-18
		Propiconazole		
0[a]	09/03/80	ND[c]	--	--
14	09/17/80	ND	--	--
0[b]	09/17/80	0.22	--	--
9	09/26/80	ND	ND	--
21	10/08/80	ND	ND	--
219	04/24/81	ND	ND	--
238	05/13/81	ND	ND	ND
357	09/09/81	ND	ND	ND
		Residues containing 2,4-dichlorobenzene		
0[a]	09/03/80	ND	--	--
14	09/17/80	ND	--	--
0[b]	09/17/80	0.34	--	--
9	09/26/80	ND	ND	--
21	10/08/80	ND	ND	--
219	04/24/81	ND	ND	--
238	05/13/81	ND	ND	ND
357	09/09/81	ND	ND	ND

[a] Initial application.

[b] Second application.

[c] Not detected; detection limit was 0.05 ppm for propiconazole and 0.10 ppm for residues.

Table 2. Propiconazole (ppm) and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in silt loam soil in Nebraska treated with propiconazole (3.6 lb/gal EC) at 200 g ai/A on September 3 and 17, 1980.

Sampling interval (days)	Date	Sampling depth (inches) 0-6	6-12	12-18
		Propiconazole		
0[a]	09/03/80	ND[c]	--	--
14	09/17/80	0.09	--	--
0[b]	09/17/80	0.71	--	--
9	09/26/80	0.08	ND	--
21	10/08/80	ND	ND	--
219	04/24/81	0.14	ND	--
238	05/13/81	0.10	ND	ND
357	09/09/81	ND	ND	ND
		Residues containing 2,4-dichlorobenzene		
0[a]	09/03/80	ND	--	--
14	09/17/80	0.10	--	--
0[b]	09/17/80	0.61	--	--
9	09/26/80	0.19	ND	--
21	10/08/80	0.24	ND	--
219	04/24/81	0.25	ND	--
238	05/13/81	0.16	0.11	ND
357	09/09/81	0.18	ND	0.16

[a] Initial application.

[b] Second application.

[c] Not detected; detection limit was 0.05 ppm for propiconazole and 0.10 ppm for residues.

Table 3. Propiconazole (ppm) and total residues containing the 1,2,4-triazole or 2,4-dichlorobenzene moieties (ppm propiconazole equivalents) in rotational crops grown in soil treated with propiconazole at 100 + 100 or 200 + 200 g ai/A.

Rotational crop	Plant part	Sampling date	Treatment-to-harvest interval (days)	Propiconazole	1,2,4-Triazole moiety	2,4-Dichloro-benezene moiety
				100 + 100 g ai/A		
Winter wheat	Immature	01/12/80	56	--	--	ND[b]
	Immature	04/24/81	219	--	--	ND
	Straw	07/06/81	292	--	--	0.05
	Grain	07/06/81	292	--	--	ND
	Immature[a]	11/13/81	422	--	--	ND
	Immature	04/19/82	579	--	--	ND
	Straw	07/14/82	665	--	--	ND
	Grain	07/14/82	665	--	--	ND
Corn	Immature	07/13/81	299	--	--	ND
	Fodder	10/21/81	399	--	--	ND
	Grain	10/21/81	399	--	--	ND
	Immature	08/06/82	688	--	--	ND
	Fodder	10/28/82	771	--	--	ND
	Grain	10/28/82	771	--	--	ND
Sugar beets	Immature	08/07/81	324	ND	0.46	ND
	Root	09/09/81	357	ND	0.52	ND
	Top	09/09/81	357	ND	0.37	ND
	Immature	08/06/82	688	--	--	ND
	Root	10/04/82	747	--	--	ND
	Top	10/04/82	747	--	--	ND
Lettuce	Immature	08/17/81	334	ND	ND	ND
	Leaf	09/16/81	364	ND	0.25	ND
	Immature	08/06/82	688	--	--	ND
	Leaf	09/06/82	719	--	--	ND
				200 + 200 g ai/A		
Sugar beets	Immature	08/07/81	324	ND	0.40	ND
	Root	09/09/81	357	ND	0.35	ND
	Top	09/09/81	357	ND	0.57	ND
Lettuce	Immature	08/17/81	334	ND	1.25	ND
	Leaf	09/16/81	364	ND	0.92	ND

[a] Second growth.

[b] Not detected; detection limit was 0.05 ppm for propiconazole and residues containing the 2,4-dichlorobenzene moiety. Detection limit for residues containing the 1,2,4-triazole moiety was not specified, but background concentrations were ~1 ppm.

CASE GS -- PROPICONAZOLE STUDY 5 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01
Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982b. Field rotational crop studies on propiconazole in Mississippi. 3-FR-5-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 17, 18, 19, 26, 27, 28, 29, 50, 51, 52, 53, 54, 59, 60, and 73.

SUBST. CLASS = S.

DIRECT RVW TIME = 16 (MH) START-DATE END DATE

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SIGNATURE: DATE:

CONCLUSIONS:

Field Dissipation - Aquatic and Aquatic Impact Uses

This portion of the study cannot be validated because the movement of water into and out of the system was not described. In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides because the formation and decline of degradates were inadequately addressed, degradates were not characterized, and meteorological data were inadequate.

Field Accumulation - Rotational Crops

1. This portion of the study is scientifically valid.

2. Propiconazole did not accumulate (<0.05 ppm) in sorghum planted 222 days after an irrigated clay soil was treated with propiconazole (3.6 lb/gal EC) at 128 + 128 or 256 + 256 g ai/A. Residues containing the 1,2,4-triazole moiety were <0.25 ppm in cabbage, 0.25-0.86 ppm in sorghum, and 0.30-0.53 ppm in sweet potatoes planted 222, 222, and 257 days, respectively, posttreatment.

Residues containing the 2,4-dichlorobenzene moiety were <0.05 ppm in cabbage and sweet potatoes grown in soil treated at 128 + 128 g ai/A, but were 0.05-0.14 ppm in mature sorghum grown in soil treated at 128 + 128 and 256 + 256 g ai/A. Propiconazole was ≤0.16 ppm in the soil and ≤0.09 ppm in the irrigation water treated at 128 + 128 g ai/A at all sampling intervals, and ≤0.77 and 0.43 ppm in the soil and water, respectively, treated at 256 + 256 g ai/A at all sampling intervals.

3. This portion of the study would not fulfill EPA Data Requirements for Registering Pesticides because the methods were nonspecific, degradates were not identified, and meteorological data were inadequate.

MATERIALS AND METHODS:

Irrigated field plots (10 x 40 feet) of clay soil (12% sand, 32% silt, 56.0% clay, 1.6% organic matter, pH 7.4) located in Washington, Mississippi, were treated with propiconazole (Tilt, 3.6 lb/gal EC) at 128 and 256 g ai/A (0.28 and 0.56 lb ai/A, respectively) on August 8, 1980. The plots were retreated at the same rates on August 22, 1980. Soil samples (0- to 3- and 3- to 6-inch depths) were taken prior to the first application and 0, 4, 9, 14, 19, 28, 75, 222, and 257 days after the second application. Irrigation water samples were taken prior to the first application and 0, 4, 9, and 14 days after the second application. The drainage water from the treated field was sampled 0, 50, 200, and 400 feet downstream from the treatment site on September 5, 1980. The plots were planted with cabbage 222 days posttreatment (measured from second application), sorghum 222 days posttreatment, and sweet potatoes 257 days posttreatment; plants were sampled when immature and at maturity. Samples were stored frozen until analysis.

Soil, water, and plant samples were analyzed for propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and/or total residues containing the 1,2,4-triazole moiety using methods AG-354, AG-356, AG-357, AG-389, and AG-407 as described in Studies 3 and 4. The detection limit was 0.05 ppm for propiconazole and the 2,4-dichlorobenzene moiety in soil and 0.01 ppm in water. The detection limit was not specified for the triazole moiety.

REPORTED RESULTS:

In the irrigated soils, the maximum concentration of propiconazole was measured 4-9 days after treatment; propiconazole was <0.05 ppm at and after 19 days posttreatment (Tables 1 and 2). Total residues containing the 2,4-dichlorobenzene moiety were 0.07 ppm 275 days posttreatment. In the irrigation water treated at 128 + 128 g ai/A, propiconazole decreased from 0.09 to <0.01 ppm during the 14 days posttreatment (Table 1). In water treated at 256 + 256 g ai/A, propiconazole decreased from 0.43 to 0.01 ppm during the 14 days posttreatment (Table 2). Propiconazole was not detected (<0.01 ppm) in water drained from the plots 14 days posttreatment.

Propiconazole was not detected (<0.05 ppm) in sorghum planted 222 days after treatment of the soil at 128 + 128 and 256 + 256 g ai/A (Table 3). Residues containing the 1,2,4-triazole moiety were <0.25 ppm in cabbage, 0.25-0.86 ppm in sorghum, and 0.30-0.53 ppm in sweet potatoes from both treatments. Residues containing the 2,4-dichlorobenzene moiety were not detected (<0.05 ppm) in cabbage and sweet potatoes grown in soil treated with propiconazole at 128 + 128 g ai/A, but were 0.05-0.14 ppm in mature sorghum grown in soil treated at 128 + 128 and 256 + 256 g ai/A.

DISCUSSION:

General

1. Residues containing the 2,4-dichlorobenzene moiety and those containing the 1,2,4-triazole moiety were not identified; the methods were nonspecific.

2. Soil samples were not analyzed for residues containing the 1,2,4-triazole moiety. Water samples were not analyzed for residues containing 2,4-dichlorobenzene (128 + 128 g ai/A treatment) and residues containing 1,2,4-triazole. Cabbage and sweet potato samples were not analyzed for propiconazole or residues containing the 2,4-dichlorobenzene moiety (256 + 256 g ai/A treatment only).

3. The meteorological data provided by the registrant were inadequate because the data were not from the study site.

Field Dissipation - Aquatic and Aquatic Impact Uses

Insufficient information was provided by the registrant on the movement of water into and out of the site. It could not be determined if the irrigation water was drained once or several times during the study. Therefore, it could not be determined if propiconazole degraded on site or was diluted by continuous flooding.

Table 1. Propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and total residues containing the 1,2,4-triazole moiety (ppm propiconazole equivalents) in irrigated clay soil in Mississippi treated with propiconazole at 128 g ai/A on August 8 and 22, 1980.

Sampling interval (days)[a]	Date	Soil sampling depth (inches) 0-3	3-6	Irrigation water
		Propiconazole		
Pretreatment	08/08/80	ND[b]	--	ND
0	08/22/80	ND	--	0.09
4	08/26/80	0.16	--	0.03
9	08/31/80	0.08	--	0.01
14	09/05/80	0.10	--	ND
19	09/10/80	ND	ND	--
28	09/19/80	ND	ND	--
75	11/05/80	--	--	--
222	04/01/81	--	--	--
257	05/06/81	--	--	--
		Residues containing 2,4-dichlorobenzene		
Pretreatment	08/08/80	0.25	--	--
0	08/22/80	0.16	--	--
4	08/26/80	0.18	--	--
9	08/31/80	0.21	--	--
14	09/05/80	0.22	--	--
19	09/10/80	0.17	ND	--
28	09/19/80	0.08	ND	--
75	11/05/80	0.08	0.17	--
222	04/01/81	0.12	ND	--
275	05/06/81	0.07	0.08	--
		Residues containing 1,2,4-triazole		
75	11/05/80	0.28	0.22	--

[a] Days following the second application of propiconazole.

[b] Not detected; the detection limit was 0.05 ppm in soil and 0.01 ppm in water.

Table 2. Propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and total residues containing the 1,2,4-triazole moiety (ppm propiconazole equivalents) in irrigated clay soil in Mississippi treated with propiconazole at 256 g ai/A on August 8 and 22, 1980.

Sampling interval (days)[a]	Date	Soil sampling depth (inches) 0-3	Soil sampling depth (inches) 3-6	Irrigation water
		Propiconazole		
Pretreatment	08/08/80	ND	--	ND
0	08/22/80	0.06	--	0.43
4	08/26/80	0.17	--	0.05
9	08/31/80	0.77	--	0.02
14	09/05/80	0.15	--	0.01
19	09/10/80	ND	ND	--
28	09/19/80	ND	ND	--
75	11/05/80	--	--	--
222	04/01/81	--	--	--
257	05/06/81	--	--	--
		Residues containing 2,4-dichlorobenzene		
Pretreatment	08/08/80	--	--	ND
0	08/22/80	0.16	--	0.33
4	08/26/80	0.35	--	0.04
9	08/31/80	0.46	--	0.02
14	09/05/80	0.40	--	0.02
19	09/10/80	0.13	ND	--
28	09/19/80	0.16	ND	--
75	11/05/80	0.11	0.17	--
222	04/01/81	0.15	ND	--
275	05/06/81	0.07	ND	--
		Residues containing 1,2,4-triazole		
75	11/05/80	0.29	0.21	--

a Days following the second application of propiconazole.

b Not detected; detection limit was 0.05 ppm.

Table 3. Propiconazole, total residues containing the 1,2,4-triazole moiety, and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in rotational crops grown in clay soil treated with propicanozole (3.6 lb/gal EC) at 128 and 256 g ai/A on August 8 and 22, 1980.

Rotational crop	Plant part	Sampling date	Treatment-to-harvest interval (days)	Propiconazole	1,2,4-Triazole moiety	2,4-Dichloro-benezene moiety
				128 + 128 g ai/A		
Cabbage	Head	07/09/81	321	--	<0.25	ND[a]
Sorghum	Forage	07/09/81	321	ND	0.28	ND
	Fodder	09/09/81	383	ND	0.66	0.14
	Grain	09/09/81	383	ND	0.86	0.07
Sweet potatoes	Forage	07/10/81	322	--	0.35	--
	Roots	10/07/81	411	--	0.47	ND
	Tops	10/07/81	411	--	0.33	ND
				256 + 256 g ai/A		
Cabbage	Head	07/09/81	321	--	<0.25	--
Sorghum	Forage	07/09/81	321	ND	0.67	ND
	Fodder	09/09/81	383	ND	0.66	0.05
	Grain	09/09/81	383	ND	0.86	0.06
Sweet potatoes	Forage	07/10/81	322	--	0.53	--
	Roots	10/07/81	411	--	0.47	--
	Tops	10/07/81	411	--	0.30	--

[a] Not detected; detection limit was 0.05 ppm for propiconazole and for residues containing the 2,4-dichlorobenzene moiety. The detection limit for residues containing the 1,2,4-triazole moiety were not specified.

CASE GS -- PROPICONAZOLE STUDY 6 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982d. Field rotational crop studies on propiconazole in Texas. SW-FR-805-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 20, 21, 22, 23, 24, 25, 55, 56, 57, 58, and 74.

SUBST. CLASS = S.

DIRECT RVW TIME = 16 (MH) START-DATE END DATE

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CONCLUSIONS:

Field Dissipation - Aquatic and Aquatic Impact Uses

This portion of the study cannot be validated because the movement of water into and out of the system was not described and the data (128 + 128 g ai/A treatment) were too variable to accurately assess the decline of propiconazole in an aquatic system. In addition, this portion of the study would not fulfill EPA Data Requirements for Registering Pesticides because the formation and decline of degradates were inadequately addressed, degradates were not characterized, and meteorological data were inadequate.

Field Accumulation - Rotational Crops

1. This portion of the study is scientifically valid.

2. Propiconazole did not accumulate (<0.05 ppm) in sorghum planted 253 days after an irrigated clay soil was treated with propiconazole at 128 + 128 g ai/A; residues containing the 1,2,4-triazole moiety were 1.9-9.2 ppm in sorghum, planted in irrigated soil treated at 128 + 128 and 256 + 256 g ai/A. Residues containing the 2,4-dichlorobenzene moiety were ≤0.11 ppm

in sorghum planted in soil treated at 128 + 128 and 256 + 256 g ai/A and ≤0.08 ppm in wheat planted 58 days after the soil was treated at 128 + 128 g ai/A. Propiconazole was ≤0.19 ppm in the soil and ≤0.43 ppm in the irrigation water treated at 128 + 128 g ai/A at all sampling intervals and ≤0.82 and 0.50 ppm in the soil and water, respectively, treated at 256 + 256 g ai/A at all sampling intervals.

3. This portion of the study does not fulfill EPA Data Requirements for Registering Pesticides because the methods were nonspecific, degradates were not identified, and meteorological data were inadequate.

MATERIALS AND METHODS:

Irrigated field plots (0.2 A) of clay soil (11.6% sand, 38.8% silt, 49.6% clay, 2.6% organic matter, pH 6.3, CEC 29.1 meq/100 g) located in Beaumont, Texas, were treated with propiconazole (Tilt, 3.6 lb/gal EC) at 128 and 256 g ai/A on July 8, 1980. The plots were retreated at the same rates on July 22, 1980. Soil samples (0- to 3- and 3- to 6-inch depths) were taken 14 days after the first application and 5, 10, 16, 17, 21, 22, 28, 31, 104, 253, 290, 351, and 398 days after the second application. Irrigation water samples were taken 14 days after the first application and 0, 5, 10, and 16 days posttreatment. The fields were drained on August 6, 1980, and drainage water was sampled 0, 50, 100, and 400 feet downstream from the site. The plots were planted with winter wheat 58 days posttreatment (measured from second application) and with sorghum 253 days posttreatment. Plants were sampled when immature and at maturity. Samples were stored frozen until analysis.

Soil, water, and plant samples were analyzed for propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and total residues containing the 1,2,4-triazole moiety using methods AG-354, AG-356, AG-357, AG-389, and AG-407 as described in Studies 3 and 4. The detection limit was 0.05 ppm for propiconazole and the 2,4-dichlorobenzene moiety in soil and 0.01 ppm in water. The detection limit was not specified for the triazole moiety.

REPORTED RESULTS:

In the soil, the maximum concentration of propiconazole was measured 28 days after the soil was treated at 128 + 128 g ai/A and 17 days after the soil was treated at 256 + 256 g ai/A (Tables 1 and 2). Total residues containing the 2,4-dichlorobenzene moiety were 0.09 and 0.56 ppm in the soil at 398 days posttreatment. In the irrigation water treated at 128 + 128 g ai/A, propiconazole decreased from 0.43 to 0.04 ppm during the first 16 days posttreatment. In water treated at 256 + 256 g ai/A, propiconazole decreased from 0.50 to 0.09 ppm during the first 17 days posttreatment. Propiconazole in water drained from the 128 + 128 g ai/A fields was 0.04, 0.03, <0.01, and <0.01 ppm 0, 50, 200, and 400 feet downstream, respectively. Propiconazole in water drained from the 256 + 256 g ai/A fields was 0.13, 0.13, 0.02, and 0.01 ppm 0, 50, 200, and 400 feet downstream, respectively.

Propiconazole was not detected (<0.05 ppm) in sorghum planted 253 days after the soil was treated with propiconazole at 128 + 128 g ai/A (Table 3). Residues containing the 1,2,4-triazole moiety were 1.9-9.2 ppm in sorghum from both treatments. Residues containing the 2,4-dichlorobenzene moiety were ≤0.11 ppm in winter wheat and sorghum grown in soil from both treatments.

DISCUSSION:

General

1. Residues containing the 2,4-dichlorobenzene moiety and those containing the 1,2,4-triazole moiety were not identified; the methods were nonspecific.

2. Soil samples were not analyzed for propiconazole only for the first 28-31 days and were analyzed for degradates containing the 1,2,4-triazole moiety on ~day 30 of the study. Water samples were not analyzed for degradates of propiconazole. Wheat samples were not analyzed for propiconazole or degradates containing the 1,2,4-triazole moiety; sorghum samples from the 256 + 256 g ai/A treatment were not analyzed for propiconazole.

3. The meteorological data provided by the registrant were inadequate because the data were not for the study site.

Field Dissipation - Aquatic and Aquatic Impact Uses

1. Data from the 128 + 128 g ai/A treatment are too variable to assess the dissipation of propiconazole.

2. Insufficient information was provided by the registrant on the movement of water into and out of the site. The irrigation water was drained on August 6, but it was not specified whether the sites were reflooded and drained after August 6.

Table 1. Propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and total residues containing the 1,2,4-triazole moiety (ppm propiconazole equivalents) in irrigated clay soil in Texas treated with propiconazole at 128 g ai/A on July 8 and 22, 1980.

Sampling interval (days)	Date	Sampling depth (inches) 0-3	3-6	Irrigation water
		Propiconazole		
14 (1st application)	07/22/80	ND[a]	--	0.01
0 (2nd application)	07/22/80	--	--	0.43
5	07/27/80	ND	--	0.06
10	08/01/80	ND	--	0.06
16	08/06/80	0.07	--	0.04
21	08/11/80	ND	ND	--
28	08/19/80	0.19	ND	--
		Residues containing 2,4-dichlorobenzene		
14	07/22/80	ND	--	--
5	07/27/80	0.08	--	--
10	08/01/80	ND	--	--
16	08/06/80	0.19	--	--
17	08/07/80	--	--	--
21	08/11/80	ND	0.19	--
22	08/12/80	--	--	--
28	08/19/80	0.16	ND	--
31	08/22/80	--	--	--
104	11/03/81	ND	ND	--
253	04/08/81	0.37	0.14	--
290	05/08/81	0.27	0.11	--
351	07/08/81	ND	ND	--
398	08/24/81	0.09	ND	--
		Residues containing 1,2,4-triazole		
28	08/19/80	0.41	0.30	--

[a] Not detected; detection limit was 0.05 ppm for propiconazole and residues containing 2,4-dichlorobenzene in soil and 0.01 ppm in water.

Table 2. Propiconazole, total residues containing the 2,4-dichlorobenzene moiety, and total residues containing the 1,2,4-triazole moiety (ppm propiconazole equivalents) in irrigated clay soil in Texas treated with propiconazole at 256 g ai/A on July 8 and 22, 1980.

Sampling interval (days)	Date	Sampling depth (inches) 0-3	Sampling depth (inches) 3-6	Irrigation water
		Propiconazole		
14 (1st application)	07/22/80	ND[a]	--	0.04
0 (2nd application)	07/22/80	--	--	0.50
5	07/27/80	ND	--	0.39
10	08/01/80	ND	--	0.22
17	08/07/80	0.82	--	0.09
22	08/12/80	0.70	ND	--
31	08/22/80	0.46	0.21	--
		Residues containing 2,4-dichlorobenzene		
14 (1st application)	07/22/80	0.24	--	--
0 (2nd application)	07/22/80	--	--	--
5	07/27/80	0.29	--	0.44
10	08/01/80	ND	--	0.30
16	08/06/80	--	--	0.18
17	08/07/80	1.20	--	0.10
21	08/11/80	--	--	--
22	08/12/80	0.68	0.14	--
28	08/19/80	--	--	--
31	08/22/80	0.35	0.36	--
104	11/03/81	0.19	ND	--
253	04/01/81	1.50	0.56	--
290	05/08/81	1.00	0.23	--
351	07/08/81	0.08	ND	--
398	08/24/81	0.56	ND	--
		Residues containing 1,2,4-triazole		
31	08/19/80	0.56	0.85	--

[a] Not detected; detection limit was 0.05 ppm for propiconazole and residues containing 2,4-dichlorobenzene moiety.

Table 3. Propiconazole, total residues containing the 1,2,4-triazole moiety, and total residues containing the 2,4-dichlorobenzene moiety (ppm propiconazole equivalents) in rotational crops grown in clay soil treated with propicanozole (3.6 lb/gal EC) at 128 + 128 and 256 + 256 g ai/A.

Rotational crop	Plant part	Sampling date	Treatment-to-harvest interval (days)	Propiconazole	1,2,4-Triazole moiety	2,4-Dichloro-benezene moiety
				128 + 128 g ai/A		
Sorghum	Fodder	08/24/81	398	ND[a]	6.70[b]	0.06
	Grain	08/24/81	398	--	1.90	ND
Wheat	Fall forage	01/12/81	159	--	--	0.08
	Spring forage	04/01/81	238	--	--	0.06
	Straw	05/19/81	286	--	--	ND
	Grain	05/19/81	286	--	--	ND
				256 + 256 g ai/A		
Sorghum	Fodder	08/24/81	398	--	9.20	0.11
	Grain	08/24/81	398	--	6.90	ND

a Not detected; detection limit was 0.05 ppm for propiconazole and for residues containing the 2,4-dichlorobenzene moiety.

b Concentration of residues containing 1,2,4-triazole in control samples was 0.78-1.3 ppm propiconazole equivalents.

CASE GS -- PROPICONAZOLE STUDY 7 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01
Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1983. Field rotational crop studies on propiconazole in California. 2-FR-21-82. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260801 and 260802. References 61, 62, 63, 64, 65, and 76.

SUBST. CLASS = S.

DIRECT RVW TIME = 4 (MH) START-DATE END DATE

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Portions of this study were previously reviewed by Dynamac and EPA, and were found to be unacceptable because insufficient field and analytical data were provided. No new data have been submitted by the registrant, but a discussion of the study protocol and an index were provided with this submission.

Propiconazole (3.6 lb/gal EC), at 100 g ai/A, was applied to field plots in Fresno, California, on May 10 and 21, 1982. The plots were planted with corn on June 18, sugar beets on June 18, sorghum on June 18, lettuce on November 22, and barley on December 7, 1982. Immature and mature crops were analyzed for propiconazole using method AG-407 as described in Study 3. Propiconazole was not detected (<0.05 ppm) in any plant sample.

This study cannot be validated because no soil data were provided to confirm the application rate of propiconazole. In addition, this study would not fulfill EPA Data Requirements for Registering Pesticides because degradates in the plants were not addressed and the meteorological data were inadequate.

CASE GS -- PROPICONAZOLE STUDY 8 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 12 - EMULSIFIABLE CONCENTRATE (EC)

FICHE/MASTER ID None CONTENT CAT 01
Staley, J., S.O. Madrid, and J.E. Cassidy. 1982. The uptake of triazole. ^{14}C-CGA-64250 and its soil degradation products in field rotational winter wheat, lettuce, corn, and carrots. Report No. ABR-82007. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260803, pgs. 189, 344, 348, 352, and 382.

SUBST. CLASS = S.

DIRECT RVW TIME = 16 (MH) START-DATE END DATE

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CONCLUSIONS:

Confined Accumulation - Rotational Crops

1. This study is scientifically valid.

2. [^{14}C]Residues accumulated in winter wheat planted 3 weeks and lettuce, carrots, and corn planted 28 weeks after the last of ten applications of triazole-labeled [^{14}C]propiconazole to a silt loam soil in Mississippi. A total of 900 g ai/A of [^{14}C]propiconazole (3.6 lb/gal EC) was applied to the soil over a 14-week period. Total [^{14}C]residues at harvest were 1.66, 2.58, and 7.39 ppm in wheat stalks, husks, and seed; 7.35 ppm in lettuce heads; 5.87 and 1.30 ppm in carrot stalks and roots; and 1.33, 2.31, and 13.18 ppm in corn stalks, cobs, and kernels. The majority of residues in the plant stalks and lettuce heads were acidic polar compounds containing the triazole but not the phenol moiety. The majority of residues in the corn kernels were the triazole-1-alanine conjugate. The majority of residues in wheat grain were the triazole-1-alanine conjugate and triazole-1-acetic acid conjugate. In the 0- to 3-inch depth of the soil, triazole-labeled [^{14}C]residues dissipated with a half-life of 11-28 weeks, from 1.52 to 0.71 ppm, following the final application of propiconazole; ~32% of the radioactivity in the soil was propiconazole at 2 weeks posttreatment.

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because the test substance was not analytical grade or purer, meteorological data were inadequate, and degradates were not adequately characterized.

MATERIALS AND METHODS:

Triazole-labeled [^{14}C]propiconazole (Tilt, 3.6 lb/gal EC, specific activity 48.5 μCi/mg) was applied eight times (7/2, 7/16, 7/30, 8/13, 8/27, 9/10, 9/24, and 10/8/80) at 70 g ai/A and twice (7/23 and 8/13/80) at 170 g ai/A to a field plot (3 x 16 feet) of silt loam soil (38.5% sand, 49.6% silt, 11.9% clay, 1.7% organic matter, pH 7.0, CEC 15.1 meq/100 g) planted (7/2/80) to peanuts that was located near Greenville, Mississippi. The peanuts were harvested at maturity and the soil rototilled to a depth of 3 inches. The plots were planted with winter wheat on 10/28/80, 119 days after the first application and 20 days after the last application of propiconazole. Lettuce, carrots, and corn were planted on 4/21/81, 294 and 195 days after the first and last applications. Soil samples (0- to 3-, 3- to 6-, and 6- to 12-inch depths) were taken 2, 3, 11, 28, 33, 41, and 48 weeks after the final application. Winter wheat was sampled 8, 25, and 30 weeks after planting, lettuce 13 weeks after planting, and carrots and corn 13 and 20 weeks after planting. Samples were frozen until analysis.

Total radioactivity in the soil and plants was determined using LSC following combustion. Using method AG-351, the soil was extracted by shaking with methanol:water (9:1, v:v). The extracted soil and the organic and aqueous phases of the extract were analyzed for total radioactivity using LSC. The organic phase was further analyzed using TLC on silica gel plates developed in ethyl acetate. Using method AG-214, the plant samples were extracted by shaking with chloroform: methanol:water. The organic and aqueous phases were separated and analyzed for total radioactivity using LSC. The extracts were separated using TLC on silica gel plates developed in one dimension with ethyl acetate or in two dimensions with 2-propanol:water (9:1) and chloroform:methanol:ammonium hydroxide (50:50:5). The radioactive areas were scraped from the plates and characterized using ion-exchange, enzymatic hydrolysis, sulfuric acid and kjeldahl treatments, and derivatization coupled with GC.

REPORTED RESULTS:

Triazole-labeled [^{14}C]residues dissipated with a half-life of 11-28 weeks in the 0- to 3-inch depth of the soil following the final application of propiconazole (Table 1). Less than ~32% of the radioactivity in the soil was propiconazole at 2 weeks posttreatment. [^{14}C]Residues were detected in the 3- to 6- and 6- to 9-inch soil depths at ≤0.37 and ≤0.36 ppm, respectively.

[^{14}C]Propiconazole residues accumulated in all plant parts, and maximum accumulations occurring in the wheat grain, carrot top, and corn kernel (lettuce was analyzed as a whole plant). The majority of the residues were extracted in the aqueous phase of the extracting solution, while the organic phase contained ≤4% of the recovered radioactivity (Table 2). When separated using TLC, [^{14}C]residues in the aqueous fraction migrated primarily to zones I (stalks of mature plants) and J (wheat grain and corn kernels) of the plates (Tables 3 and 4). Zone I residues were polar compounds with an acidic nature, of which ~80% contained only the triazole ring moiety (the propiconazole ring had been cleaved). In the wheat grain, the major degradates were the triazole-1-acidic acid conjugate (zone I) and the triazole-1-alanine conjugate (Zone J). In corn kernels, the major degradate was the triazole-1-alanine conjugate (Zone J).

DISCUSSION:

1. The only degradates conclusively identified were the major degradates in the corn kernel and wheat grain.

2. Adequate meteorological data for the test site were not provided.

3. The test substance was formulated and applied as an EC rather than as an analytical grade.

Table 1. [^{14}C]Propiconazole residues in silt loam soil treated eight times with [^{14}C]propiconazole (3.6 lb/gal EC) at 70 g ai/A and twice with propiconazole at 170 g ai/A between July 2 and October 8, 1980.

Sampling interval[a] (weeks)	Total [^{14}C] (ppm)	Organic fraction: Total	Organic fraction: Propiconazole	Aquatic fraction	Non-extractable
		% of recovered			
0- to 3-inch depth					
2	1.52	46.5	32.0	7.4	37.6
3	0.89	42.2	--	7.1	38.9
11	0.89	44.0	--	8.4	50.9
28	0.71	36.7	--	11.2	63.2
33	0.77	28.1	12.3	13.1	52.3
41	0.70	22.7	16.4	7.4	65.8
48	0.49	16.1	--	5.0	66.6
3- to 6-inch depth					
2	--	--	--	--	--
3	0.11	10.1	--	34.3	57.1
11	0.12	10.9	--	22.7	59.8
28	0.15	8.5	--	28.6	56.2
33	0.13	<6.8[b]	--	35.1	69.9
41	0.37	20.1	--	8.6	72.3
48	0.13	7.5	--	19.0	41.8
6- to 9-inch depth					
2	--	--	--	--	--
3	0.06	<11.3[b]	--	28.6	62.1
11	0.08	10.3	--	23.0	49.0
28	0.13	11.0	--	26.1	45.0
33	0.09	<7.0[b]	--	36.0	86.4
41	0.36	23.0	--	8.0	62.4
48	0.09	--	--	--	45.0

[a] Weeks after the final application.

[b] Detection limit was not specified.

Table 2. [^{14}C]Propiconazole residues in rotational crops planted in silt loam soil treated with a total of 900 g ai/A of [^{14}C]propiconazole (3.6 lb/ gal EC) over a 14-week period.

Crop	Plant part	Planting-to-harvest interval[a] (weeks)	Treatment-to-harvest interval[a] weeks	Total [^{14}C] (ppm)	Organic fraction	Aquatic fraction	Non-extractable
					% of recovered		
Winter wheat	Stalk	8	11	8.25	4.0	99.3	6.1
	Stalk	25	28	3.28	0.5	85.7	4.8
	Stalk	30	33	1.66	<1.7[b]	89.6	14.7
	Husk	30	33	2.58	<2.2[b]	126.4	21.3
	Grain	30	33	7.39	<0.1[b]	88.8	11.9
Lettuce	Head	13	41	7.35	1.5	88.1	6.1
Carrots	Whole plant	13	41	2.97	1.6	90.5	4.9
	Stalk	20	48	5.87	0.6	79.3	5.1
	Root	20	48	1.30	2.2	95.0	3.8
Corn	Stalk	13	41	3.55	1.0	77.1	3.3
	Stalk	20	48	1.33	0.7	65.1	25.7
	Cob	20	48	2.31	0.2	81.1	15.5
	Kernel	20	48	13.18	0.2	84.8	11.0

a Weeks after the final application.

b Detection limit was not specified.

Table 3. [^{14}C]Propiconazole residues in the stalks of mature rotational crops planted 3-28 weeks after the soil was treated with [^{14}C]-propiconazole

		Winter wheat	Lettuce	Carrot	Corn
Total [^{14}C] (ppm)		1.66	7.35	5.87	1.33
		% of recovered			
Extract: Organic		<1.7	1.5	0.6	0.7
Aqueous		89.6	88.1	79.3	65.1
Nonextractable		14.7	6.1	5.1	25.7
TLC zones of Aqueous extract:	F	2.7	2.9	2.0	2.3
	G	1.2	0.7	0.5	0.6
	H	3.1	1.2	0.7	0.5
	I	36.0	67.9	66.3	49.0
	I'	35.8	4.9	--	--
	J	10.1	6.7	--	--
	I'+J	--	--	9.1	10.3

Table 4. [^{14}C]Propiconazole residues in the grain and kernels of mature wheat and corn planted 3 and 28 weeks, respectively, after the soil was treated with [^{14}C]propiconazole.

	Winter wheat		Corn	
	Grain	Husk	Kernel	Cob
Total [^{14}C] (ppm)	7.39	2.58	13.18	2.31
	% of recovered			
Extract: Organic	<0.1	<2.2	0.2	0.2
Aqueous	88.8	126.4	84.8	81.1
Nonextractable	11.9	21.3	11.0	15.5
TLC zones of Aqueous extract: F	0.1	0.9	0.4	0.3
G	1.0	1.4	0.2	1.3
H	1.2	2.1	0.4	0.8
I+I'	28.6	45.5	2.4[a]	68.7
J	47.3	43.1	79.4[b]	8.9

[a] Zone I only.

[b] Zone I' + J.

CASE GS -- PROPICONAZOLE STUDY 9 PM --

CHEM -- Propiconazole

BRANCH EAB DISC --

FORMULATION 90 - FORMULATION NOT IDENTIFIED

FICHE/MASTER ID None CONTENT CAT 01
Madrid, S.O. and J.E. Cassidy. 1983. Soil uptake of phenyl ^{14}C vs. triazole ^{14}C-CGA-64250 in target peanuts followed by rotational winter wheat and corn. A side by side comparison in the greenhouse. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260800, Reference 10 and Acc. No. 260803, pgs. 236, 279, 363, and 367.

SUBST. CLASS = S.

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CONCLUSIONS:

Confined Accumulation - Rotational Crops

1. This study is scientifically valid.

2. [^{14}C]Residues accumulated in winter wheat and corn planted 151 days after a sandy loam soil was treated with triazole- and phenyl-labeled [^{14}C]-propiconazole (purity unspecified) at 1.5 lb ai/A. Total triazole-labeled [^{14}C]residues at harvest were 1.0, 1.9, and 1.6 ppm in wheat straw, husk, and grain; and 0.9, 0.1, and 0.3 ppm in corn stalk, cob, and grain. Total phenyl-labeled [^{14}C]residues were 0.4, 0.3, and 0.1 ppm in wheat straw, husk, and grain; and 0.5, 0.1, and 0.01 ppm in corn stalk, cob, and grain. Total [^{14}C]residues in the soil decreased from 1.93 and 1.12 ppm (triazole and phenol labels, respectively) to 1.09 and 0.95 ppm between treatment and wheat harvest (290 days posttreatment).

3. This study does not fulfill EPA Data Requirements for Registering Pesticides because the purity of the test substance was not specified and the degradates in the plants were not adequately characterized.

MATERIALS AND METHODS:

A Georgia sandy loam soil (78% sand, 18% silt, 4% clay, 2.6% organic matter, pH 6.3, CEC 6.8 meq/100 g) was limed (2 g/kg). Aliquots (8 kg) of the soil were blended with an ethanol solution of either phenyl-labeled [^{14}C]propiconazole (specific activity 39.1 μCi/mg, purity not specified) or triazole-labeled [^{14}C]propiconazole (specific activity 59.5 μCi/mg, purity not specified). Each aliquot of treated soil was equally divided into four portions and placed in 12-quart buckets in a 2-inch layer over 6 inches of untreated soil. Each bucket contained 9.8 mg of propiconazole (1.5 lb ai/A based on the surface area of the soil in each bucket). Two buckets of untreated soil were used as a control.

Five peanut seeds were planted in each bucket 14 days after pesticide treatment. The plants were culled to one per pot 2-3 weeks postplanting. Peanuts were harvested, and field corn (G-4444) and winter wheat (Florida 301) were each planted in half of the pots at 151 days posttreatment. The corn and wheat were harvested at maturity, 252 and 290 days posttreatment, respectively. The wheat was separated into straw, husk, and grain; the corn into stalk, cob, and kernel. Soil samples (0- to 3-, 3- to 6-, and 6- to 8-inch depths) were collected immediately after treatment and when rotational crops were planted and harvested. All samples were frozen until analyzed.

Plant parts and soil were individually homogenized and total ^{14}C in each fraction was determined by LSC following combustion. Soil samples were extracted with methanol:water according to Method AG-351. Plant samples were extracted using biphasic extractants, according to Method AG-214. Methods are described in Study 8.

A second plant sample extraction involved blending the plant homogenates three times with methanol:water (9:1). Aliquots of the combined extract underwent acid digestion: H_2SO_4, Kjeldahl digestion, and HNO_3.

The H_2SO_4 digestion was performed to hydrolyze three ring residues and the alkanol metabolite to the ketone and olefin derivatives, respectively. The residue from an aliquot of the methanol:water extract (evaporated to dryness) and 100 mg of technical propiconazole were refluxed in 60% aqueous H_2SO_4 for 6 hours. The digestion mixture was diluted, neutralized, and then partitioned twice in methanol. The methanol was evaporated to dryness under vacuum. The residue was dissolved in water, which was then partitioned three times with methylene chloride. The combined organic phases were dried (Na_2SO_4) and evaporated to near dryness under vacuum (40°C). The residue was dissolved in methanol and was analyzed by TLC.

The Kjeldahl treatment consisted of refluxing (6 hours at 300-305°C) residues from an evaporated aliquot of the methanol:water plant extract with H_2SO_4, HgO, K_2SO_4, and 100 mg of technical propiconazole. Sample work up was as described for the H_2SO_4 digestion. This procedure yielded the triazole ring from any residue that contained this moiety.

Refluxing with HNO_3 reduced propiconazole residues leaving only the chlorinated phenyl group intact (as chlorinated benzoic acid). This treatment entailed refluxing (16 hours) a concentrated sample of the methanol:water extract with 70% HNO_3. After cooling, the solution was diluted with water and then was partitioned three times with methylene chloride. The methylene chloride phase was dried over absorbant cotton and was concentrated for TLC analyses.

Both phases of the biphasic plant extracts were analyzed by TLC (silica gel plates) using ethyl acetate or 2-propanol:water (9:1) as solvent systems. The organic and aqueous phases from the H_2SO_4 and Kjeldahl digestions were chromatographed with ethyl acetate and ethyl acetate:methanol:ammonium hydroxide (85:10:5). An acetonitrile: ammonium hydroxide:water (9:1:1) solvent system was utilized for the TLC analysis of the methylene chloride phase from the HNO_3 digestion. Standards used in these analyses were visualized on the TLC plates under UV light (ketone and olefin degradates) or by exposure to iodine vapors (triazole, propiconazole isomers, and analine conjugate of the triazole).

Total ^{14}C activity in all extracts was determined by LSC.

REPORTED RESULTS:

[^{14}C]Residues were found in all plant parts of mature corn and wheat (Table 1). Accumulation of plant residues from the triazole-ring label was higher than residues from the phenyl-ring label. This was particularly apparent in the grain. The distribution of ^{14}C in the organic and aqueous phases of the extractable and nonextractable residues was similar in stalks and straw for both phenyl- and triazole-labeled studies. This similarity was not observed with the ^{14}C distribution in the grain. From this the registrant hypothesized that little or no bridge cleavage occurs in the stalks and straw, but cleavage was extensive in the grain.

The TLC analyses of the biphasic extracts indicated that the parent and the alanine conjugate of the triazole ring are residues in corn and wheat. Two unidentified spots and the parent were isolated from the organic phase of the wheat straw extract. The registrant stated that one spot contained four β-hydroxy isomers of propiconazole. Analyses of the aqueous phase from wheat and corn indicated that the alanine conjugate of the triazole ring was present in the stalks, straw, and grain. It was stated in the report that unconjugated triazole was not found as a plant constituent, but a spot on the TLC of corn and wheat grain extracts corresponding to the triazole standard was apparent. A number of other metabolites were also separated by the TLC, but were not identified.

Recoveries of three ring residues, the alkanol metabolite, and residues containing the triazole and dichlorophenyl moieties are summarized in Table 2. Collectively these data indicate that residues in the straw and stalks contained three ring residues (ketone), the alkanol derivative (olefin), and a number of metabolites which contain the triazole, the phenyl (benzoic acid), and/or the triazole-phenyl groups. Some alteration of the phenyl group (dechlorination, hydroxylation) was indicated by the ^{14}C in the aqueous fraction and the unknowns in the methylene chloride fraction following the HNO_3 treatment. Residues in the grain were associated with the triazole moiety, but this fraction did not contain three ring compounds for the most part. The registrant hypothesized that triazole ring metabolites are selectively translocated to the grain.

The recovery of total [^{14}C]residues from the treated soil is summarized in Table 3. The loss of radioactive residues from the soil treated with triazole-labeled [^{14}C]propiconazole was slow (37% decrease in 290 days). No decrease of ^{14}C in the soil treated with phenyl-labeled [^{14}C]propiconazole was observed. The extractability of the radioactivity was assessed but residues were not characterized.

DISCUSSION:

1. The purity of the test substance was not specified.

2. Rotational crops were analyzed only at maturity.

3. Soil residues were not characterized.

4. No data for root and leafy vegetable crops were generated.

5. A number of degradates were isolated but were not identified.

Table 1. Total ^{14}C distribution in rotational crops grown in soil treated with phenyl-labeled and triazole-labeled [^{14}C]propiconazole.

Crop	Plant part	Total ^{14}C (ppm)[b]	Organic phase	Aqueous phase	Not extracted
				%	
		Triazole ^{14}C label			
Wheat	Straw	1.009	16.5	54.8	15.1
	Husk	1.933	8.1	53.7	13.8
	Grain	1.582	1.3	68.3	6.9
Corn	Stalk	0.893	14.2	63.9	21.4
	Cob	0.097	42.3	44.3	18.9
	Grain	0.338	1.4	96.4	7.9
		Phenyl ^{14}C label			
Wheat	Straw	0.400	17.5	58.2	20.5
	Husk	0.261	35.2	22.0	30.1
	Grain	0.090	18.7	51.2	30.5
Corn	Stalk	0.541	16.5	58.6	24.3
	Cob	0.067	45.1	37.2	23.6
	Grain	0.012	--	--	--

[a] Rotational crops planted 151 days after soil treatment.

[b] Value not defined. Presumed by reviewer to be expressed as equivalents of propiconazole.

Table 2. Characterization of [^{14}C]residues in rotational crops grown in triazole- and phenyl-labeled [^{14}C]propiconazole treated soil.[a]

Residue fraction	Triazole ^{14}C label: Wheat Straw	Triazole ^{14}C label: Wheat Grain	Triazole ^{14}C label: Corn Stalk	Triazole ^{14}C label: Corn Grain	Phenyl ^{14}C label[b]: Wheat straw	Phenyl ^{14}C label[b]: Corn stalk
H_2SO_4 treatment						
Methylene chloride fraction	39.5	10.5	54.6	2.1	50.2	40.4
Olefin	1.7	0.2	18.8	--	9.1	11.5
Ketone	19.3	5.7	30.2	--	34.8	29.9
Unknown(s)	9.7	--	3.7	--	--	--
Aqueous fraction	34.7	67.9	22.7	79.8	13.5	8.8
Triazole	6.9	1.6	8.3	26.5	--	--
Unknown(s)	26.7	67.2	10.6	50.5	--	--
Kjeldahl treatment						
Methanol fraction						
Triazole	26.4	46.4	78.1	63.9	--	--
Unknown(s)	1.4	0.6	1.2	0.8	--	--
Origin	27.2	27.2	6.1	17.6	--	--
HNO_3 treatment						
Methylene chloride fraction						
Benzoic acid	44.8	--	49.4	--	--	--
Unknown(s)	2.5	--	3.3	--	--	--
Origin	0.1	--	0.1	--	--	--
Aqueous fraction	7.0	--	11.8	--	--	--

[a] Residues characterized by acid treatment and TLC analysis.

[b] Analyses on grain not performed because of low concentration of ^{14}C.

Table 3. Distribution of ^{14}C in triazole-labeled and phenyl-labeled [^{14}C]propiconazole-treated sandy loam soil.

Sampling interval	0- to 3-inch depth: Total residue (ppm)	0- to 3-inch depth: Extracted (%)	0- to 3-inch depth: Not extracted (%)	3- to 6-inch depth: Total residue (ppm)	3- to 6-inch depth: Extracted (%)	3- to 6-inch depth: Not extracted (%)	6- to 8-inch depth: Total residue (ppm)
Triazole ^{14}C label							
Immediate posttreatment	1.93	113.9	3.4	--	--	--	--
Crop planting (151 days)[a]	1.89	72.5	26.5	0.09	--	--	0.01
Corn harvest (252 days)	1.32	73.3	31.6	0.17	52.2	48.6	0.05
Wheat harvest (290 days)	1.09	68.0	32.2	0.13	21.7	48.5	0.09
Phenyl ^{14}C label							
Immediate posttreatment	1.12	99.6	2.7	--	--	--	--
Crop planting (151 days)	1.19	63.0	30.3	0.03	--	--	0.04
Corn harvest (252 days)	1.00	84.6	25.9	0.12	35.3	55.1	0.08
Wheat harvest (290 days)	0.95	59.2	37.3	0.17	37.3	45.9	0.05

[a] Time after treatment in parentheses.

EXECUTIVE SUMMARY

The data summarized here are scientifically valid data that have been reviewed in this report but do not fulfill data requirements unless noted in the Recommendations section of this report.

Propiconazole (3.6 lb ai/gal EC), at 5 lb ai/A, degraded in silt loam (Illinois) and sandy loam (California) soils with a half-life of <1 month, from 6.8 to 2.8 ppm and from 1.8 to 0.29 ppm in the silt loam and sandy loam soils, respectively. 1,2,4-H-Triazole was ≤0.07 ppm at the Illinois site and ≤0.12 ppm at the California site at all sampling intervals.

The concentration of propiconazole in three soils stored frozen for ~2 years did not decline.

Residues containing the 1,2,4-triazole moiety accumulated (0.43-11.0 ppm propiconazole equivalents) in cabbage, corn, and sweet potatoes planted 149-188 days after the soil was treated with propiconazole (3.6 lb/gal EC) at 100 + 100 or 200 + 200 g ai/A. Residues containing the 2,4-dichlorobenzene moiety accumulated (≤0.72 ppm) in winter wheat planted 28 days after the soil was treated with propiconazole at 100 + 100 g ai/A, but were not detected (<0.05 ppm) in cabbage, corn, sweet potatoes or second growth wheat planted in soil treated at 100 + 100 g ai/A. Propiconazole decreased from 0.35 to <0.05 ppm (detection limit) in soil treated at 100 + 100 g ai/A and from 0.39 to 0.07 ppm in soil treated at 200 + 200 g ai/A during the 179 days following treatment.

Propiconazole and residues containing the 2,4-dichlorobenzene moiety were ≤0.05 ppm (propiconazole equivalents) in winter wheat planted 9 and 365 days, corn planted 238 and 621 days, sugar beets planted 256 and 621 days, and lettuce planted 279 and 636 days after the soil was treated with propiconazole (3.6 lb/gal EC) at 100 + 100g ai/A. Propiconazole and residues containing the 2,4-dichlorobenzene moiety were not detected (<0.05 ppm) in sugar beets and lettuce planted 256 and 279 days, respectively, after the soil was treated with propiconazole at 200 + 200g ai/A. Residues containing the 1,2,4-triazole moiety were ≤1.25 ppm in sugar beets and lettuce planted 256 and 279 days after the soil was treated with propiconazole at 100 + 100 or 200 + 200 g ai/A. In the soil, propiconazole and residues containing the 2,4-dichlorobenzene moiety degraded with a half-life of <9 days following the second application of propiconazole, from an initial concentration of 0.22-0.71 ppm to ≤0.16 ppm in the 0- to 6-inch depth 238 days posttreatment.

Propiconazole did not accumulate (<0.05 ppm) in sorghum planted 222 days after an irrigated clay soil was treated with propiconazole (3.6 lb/gal EC) at 128 + 128 or 256 + 256 g ai/A. Residues containing the 1,2,4-triazole moiety were <0.25 ppm in cabbage, 0.25-0.86 ppm in sorghum, and 0.30-0.53 ppm in sweet potatoes planted 222, 222, and 257 days, respectively, posttreatment.

Propiconazole did not accumulate (<0.05 ppm) in sorghum planted 253 days after an irrigated clay soil was treated with propiconazole at 128 + 128 g ai/A; residues containing the 1,2,4-triazole moiety were 1.9-9.2 ppm in sorghum, planted in irrigated soil treated at 128 + 128 and 256 + 256 g ai/A. Residues containing the 2,4-dichlorobenzene moiety were ≤0.11 ppm in sorghum planted in soil treated at 128 + 128 and 256 + 256 g ai/A and ≤0.08 ppm in wheat planted 58 days after the soil was treated at 128 + 128 g ai/A. Propiconazole was ≤0.19 ppm in the soil and ≤0.43 ppm in the irrigation water treated at 128 + 128 g ai/A at all sampling intervals and ≤0.82 and 0.50 ppm in the soil and water, respectively, treated at 256 + 256 g ai/A at all sampling intervals.

Propiconazole (3.6 lb/gal EC), at 100 g ai/A, was applied to field plots in Fresno, California, on May 10 and 21, 1982. The plots were planted with corn on June 18, sugar beets on June 18, sorghum on June 18, lettuce on November 22, and barley on December 7, 1982. Immature and mature crops were analyzed for propiconazole using method AG-407 as described in Study 3. Propiconazole was not delected (<0.05 ppm) in any plant sample.

[^{14}C]Residues accumulated in winter wheat planted 3 weeks and lettuce, carrots, and corn planted 28 weeks after the last of ten applications of triazole-labeled [^{14}C]propiconazole to a silt loam soil in Mississippi. A total of 900 g ai/A of [^{14}C]propiconazole (3.6 lb/gal EC) was applied to the soil over a 14-week period. Total [^{14}C]residues at harvest were 1.66, 2.58, and 7.39 ppm in wheat stalks, husks, and seed; 7.35 ppm in lettuce heads; 5.87 and 1.30 ppm in carrot stalks and roots; and 1.33, 2.31, and 13.18 ppm in corn stalks, cobs, and kernels. The majority of residues in the plant stalks and lettuce heads were acidic polar compounds containing the triazole but not the phenol moiety. The majority of residues in the corn kernels were the triazole-1-alanine conjugate. The majority of residues in wheat grain were the triazole-1-alanine conjugate and triazole-1-acetic acid conjugate. In the 0- to 3-inch depth of the soil, triazole-labeled [^{14}C]residues dissipated with a half-life of 11-28 weeks, from 1.52 to 0.71 ppm, following the final application of propiconazole; ~32% of the radioactivity in the soil was propiconazole at 2 weeks posttreatment.

[^{14}C]Residues accumulated in winter wheat and corn planted 151 days after a sandy loam soil was treated with triazole- and phenyl-labeled [^{14}C]-propiconazole (purity unspecified) at 1.5 lb ai/A. Total triazole-labeled [^{14}C]residues at harvest were 1.0, 1.9, and 1.6 ppm in wheat straw, husk, and grain; and 0.9, 0.1, and 0.3 ppm in corn stalk, cob, and grain. Total phenyl-labeled [^{14}C]residues were 0.4, 0.3, and 0.1 ppm in wheat straw, husk, and grain; and 0.5, 0.1, and 0.01 ppm in corn stalk, cob, and grain. Total [^{14}C]residues in the soil decreased from 1.93 and 1.12 ppm (triazole and phenol labels, respectively) to 1.09 and 0.95 ppm between treatment and wheat harvest (290 days posttreatment).

RECOMMENDATIONS

Available data are insufficient to fully assess the environmental fate of, and the exposure of humans and nontarget organisms to propiconazole. The submission of data relevant to full registration requirements (Subdivision N) for field and vegetable crop, orchard crop, and aquatic foodcrop use sites is summarized below:

Hydrolysis studies: Based on previously submitted data, no additional data are required.

Photodegradation studies in water: Based on previously submitted data, no additional data are required.

Photodegradation studies on soil: Based on previously submitted data, no additional data are required.

Photodegradation studies in air: No data were submitted, but the registrant has been advised that no data are required.[a]

Aerobic soil metabolism studies: Based on previously submitted data, no additional data are required.

Anaerobic soil metabolism studies: No data were submitted. The requirement for anaerobic aquatic metabolism studies, which may be submitted in lieu of anaerobic soil metabolism studies, has been deferred by EPA until after registration is complete.

Anaerobic aquatic metabolism studies: This data requirement has been deferred by EPA until after registration is complete.

Aerobic aquatic metabolism studies: This data requirement has been deferred by EPA until after registration is complete.

Leaching and adsorption/desorption studies: Based on previously submitted data, no additional data are required.

Laboratory volatility studies: No data were submitted, but the registrant has been advised that no data are required.[a]

Field volatility studies: No data were submitted, but the registrant has been advised that no data are required.[a]

Terrestrial field dissipation studies: One study (Honeycutt, 1985a, Acc. No. 260799; 1985b, Acc. No. 260797; 1985c, Acc. No. 260798; 1985d, Acc. No. 260796) was reviewed and is scientifically valid. This study fulfills data requirements by providing information on the dissipation of propiconazole at two sites.

Aquatic field dissipation studies: Two studies were submitted. One study (Cheung et al., 1982b, Acc. Nos. 260800, 260801, and 260802) cannot be validated because the movement of water into and out of the system was not described. In addition, this study would not fulfill data requirements because the formation and decline of degradates were inadequately addressed, degradates were not characterized, and meteorological data were inadequate. The second study (Cheung et al., 1982d, Acc. Nos. 260800, 260801, and 260802) cannot be validated because the movement of water into and out of the system was not described and the data (128 + 128 g ai/A) were too variable to accurately assess the decline of propiconazole in an aquatic system. In addition, this study does not fulfill data requirements because the formation and decline of degradates were inadequately addressed, degradates were not characterized, and meteorological data were inadequate. All data are required.

Forestry dissipation studies: No data were submitted; however, no data are required because propiconazole has no forestry use.

[a] Omitted from lists of data gaps previously submitted to the registrant.

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Dissipation studies for combination products and tank mix uses: No data were submitted; 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 submitted, but the registrant has been advised that no data are required.

Confined accumulation studies on rotational crops: Two studies were reviewed. One study (Staley, 1982, Acc. No. 260803) is valid but does not fulfill data requirements because the test substance was not analytical grade or purer, meteorological data were inadequate, and degradates were not adequately characterized. The second study (Madrid and Cassidy, 1983, Acc. Nos. 252646 and 260803) is valid but does not fulfill data requirements because the purity of the test substance was not specified and the degradates in the plants were not adequately characterized. All data are required.

Field accumulation studies on rotational crops: Two studies were reviewed. One study (Cheung et al., 1983, Acc. Nos. 260801 and 260802) cannot be validated because no soil data were provided to confirm the application rate of propiconazole. In addition, this study would not fulfill data requirements because degradates in the plants were not addressed and the meteorological data were inadequate. The remaining studies (Cheung et al., 1982a, 1982b, 1982c, 1985d, Acc. Nos. 260800, 260801, and 260802) were valid but did not fulfill data requirements because the methods were nonspecific, degradates were not identified, and meteorological data were inadequate. All data may be required depending upon the results of the confined accumulation studies.

Accumulation studies on irrigated crops: No data were submitted, but the registrant has been advised that no data are required since the label currently prohibits use of treated water for irrigation of unregistered crops.

Laboratory studies of pesticide accumulation in fish: Based on previously submitted data, no additional data are required.

Field accumulation studies on aquatic nontarget organisms: No data were submitted, but no data are required because propiconazole has no forestry, aquatic noncrop, or aquatic impact use.

Reentry studies: No data were submitted, but all data may be required.

Ancillary studies: One ancillary study (Honeycutt, 1985e, Acc. No. 260800) was reviewed and is scientifically valid.

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Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982c. Field rotational crop studies on propiconazole in Nebraska. 4-FR-1-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 13, 14, 16, 30, 31, 32, 33, 36, 39, 40, 43, 46, 47, 48, 49, 70, 71, 72, and 77.

Cheung, M.W., R.A. Kahrs, and W.B. Nixon. 1982d. Field rotational crop studies on propiconazole in Texas. SW-FR-805-80. Ciba-Geigy Corporation, Greensboro, NC. Acc. Nos. 260800, 260801, and 260802. References 20, 21, 22, 23, 24, 25, 55, 56, 57, 58, and 74.

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Honeycutt, R.C. 1985a. Field dissipation studies on CGA-64250 (Tilt) (Columbia Co., NY). Report No. EIR-85028. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260799.

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Honeycutt, R.C. 1985d. Field dissipation studies on CGA-64250 (Tilt) (Lenoir, NC). Report No. EIR-85018. Ciba-Geigy Corp., Greensboro, NC. Acc. No. 260796.

Honeycutt, R.C. 1985e. The freezer storage stability of CGA-64250 in field soil. Report No. EIR-85004. Ciba-Geigy Corp. Greensboro, NC. Acc. No. 260800. Reference 68.

Staley, J., S.O. Madrid, and J.E. Cassidy. 1982. The uptake of triazole. ^{14}C-CGA-64250 and its soil degradation products in field rotational winter wheat, lettuce, corn, and carrots. Report No. ABR-82007. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260803, pgs. 189, 344, 348, 352, and 382.

Madrid, S.O. and J.E. Cassidy. 1983. Soil uptake of phenyl ^{14}C vs. triazole ^{14}C-CGA-64250 in target peanuts followed by rotational winter wheat and corn. A side by side comparison in the greenhouse. Ciba-Geigy Corporation, Greensboro, NC. Acc. No. 260800, Reference 10 and Acc. No. 260803, pgs. 236, 279, 363, and 367.

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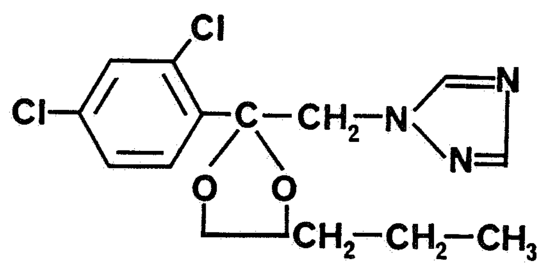
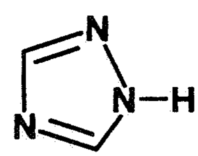
APPENDIX

STRUCTURES OF PROPICONAZOLE AND ITS MAJOR SOIL DEGRADATE

DESMEL, BANNER, TILT



1-[2-(2,4-Dichlorophenyl)-4-propyl-1,3-dioxolan-2-ylmethyl]-1H-1,2,4-triazole



1,2,4-H-Triazole
(CGA-71019)